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Economic Commission for Latin America and the Caribbean

**A GUIDE TO WATER RESOURCES ADMINISTRATION  
IN THE COUNTRIES OF LATIN AMERICA  
AND THE CARIBBEAN <sup>2/</sup>**

<sup>2/</sup> This document has been prepared by the Division of Natural Resources and Energy, Economic Commission for Latin America and the Caribbean (ECLAC).

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### Explanatory note

All maps have been adapted from CorelGALLERY!, version 1.00.D3, 1994 Corel Corporation (these maps are licensed to Corel Corporation by Cartesia Software and One Mile Up, Inc) and WordPerfect Presentations, version 2.0, WordPerfect Corporation 1990, 1992. All maps have been prepared exclusively for the convenience of readers and are intended only to indicate the approximate location of the country in question. Some of them may not show the whole territory of the country. *The boundaries and place names shown on all maps do not imply official endorsement or acceptance by the United Nations.*

Sectoral withdrawal and water use estimates are from the World Resources Institute in collaboration with the United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP), *World resources 1994-95*, Oxford University Press, 1994, ISBN 0-19-521044-1 and S.N. Kulshreshtha, *World water resources and regional vulnerability: impact of future changes*, RR-93-10, International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria, June 1993, ISBN 3-7045-0120-4. Totals may not add because of rounding.

Irrigation data are from BADEANU and the Food and Agriculture Organization of the United Nations (FAO), *FAO yearbook. Production. Vol. 40. 1986*, FAO Statistics Series Nº 76, Rome, 1987, ISBN 92-5-002566-1 and *FAO yearbook. Production. Vol. 47. 1993*, FAO Statistics Series Nº 117, Rome, 1994, ISBN 92-5-003525-X.

Hydroelectric installed capacity is the United Nations, Department of Economic and Social Affairs, Statistical Office, *World energy supplies 1950-1974*, ST/ESA/STAT/SER.J/19, New York, 1976, United Nations Publication Sales Nº E.76.XVII.5 and United Nations, Department of Economic and Social Information and Policy Analysis, Statistical Division, *1991 energy statistics yearbook*, ST/ESA/STAT/SER.J/35, New York, 1993, United Nations Publication Sales Nº E/F.93.XVII.5, ISBN 92-1-061151-9.

Drinking water supply and sanitation coverage data are from Organización Panamericana de la Salud (OPS), Oficina Regional de la Organización Mundial de

la Salud (OMS), *Las condiciones de salud en las Américas. Edición de 1994. Volumen I*, Publicación Científica N° 549, Washington, D.C., 1994, ISBN 92 75 31549 3; the World Resources Institute in collaboration with the United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP), *World resources 1994-95*, Oxford University Press, 1994, ISBN 0-19-521044-1; Pan American Health Organization (PAHO), Pan American Sanitary Bureau, Regional Office of the World Health Organization (WHO), *Situation of the water supply and sanitation sector at the end of the decade. Region of the Americas*, Washington, D.C., April 1990; and Michelle Mendez, *Planning for water and sanitation programs in the Caribbean*, WASH Field Report N° 335, prepared for the Bureau for Latin America and the Caribbean, U.S. Agency for International Development under WASH Task N° 219, February 1992. Definitions of drinking water supply and sanitation coverage may vary.

Total population is from Latin American Demographic Center (CELADE), *Demographic bulletin*, LC/DEM/G.140, year XXVII, N° 53, Santiago, Chile, January 1994, ISSN 0378-5386; BADEANU; and United Nations, Department of Economic and Social Information and Policy Analysis, *World urbanization prospects: the 1992 revision. Estimates and projections of urban and rural populations and of urban agglomerations*, ST/ESA/SER.A/136, New York, 1993, United Nations Publication Sales N° E.93.XIII.11, ISBN 92-1-151256-5.

Annual internal renewable water resources are from the World Resources Institute in collaboration with the United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP), *World resources 1994-95*, Oxford University Press, 1994, ISBN 0-19-521044-1. Annual internal renewable water resources data refer to the average annual flow of rivers and groundwater generated from endogenous precipitation. Per capita annual internal renewable water resources data were calculated using 1992 population estimates.

Precipitation data are from the Food and Agriculture Organization of the United Nations (FAO), *Agroclimatological data for Latin America and the Caribbean*, FAO Plant Production and Protection Series N° 24, Rome, 1985, ISBN 92-5-002294-8; and the United Nations Educational, Scientific and Cultural Organization (UNESCO), International Hydrological Programme, *First Workshop on the Hydrological Atlas of the Caribbean Islands. Santo Domingo, Dominican Republic, 7-10 October 1986. Final Report*, UNESCO Regional Office for Science and Technology for Latin America and the Caribbean (ROSTLAC), Montevideo, Uruguay, 1986.

## **Preface**

The "Guide to Water Resources Administration in the Countries of Latin America and the Caribbean" is presented in an attempt to provide the reader with recent information of the structure of water resources administration in the countries of Latin America and the Caribbean. In case where no new information was available the entry is the same as that which appeared in UN/ECLAC, 1991.

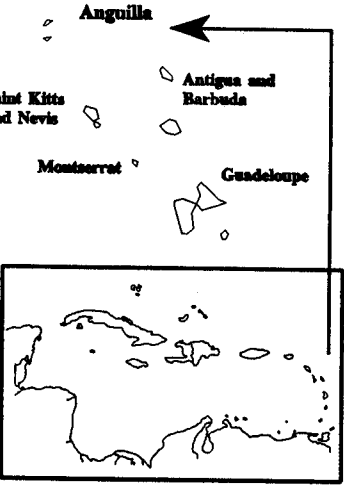
The material, on which this Guide is based, has been taken from a very large variety of sources and some of them may not be available to the public. Although an attempt has been made to prepare this report from the best sources available, the authors have not been able to review the legislation for many countries. Nor have we always had access to detailed information on the institutional structure of water administration. Finally, due to the pace of change in institutional structure in many countries, some information as to the status of particular countries/sectors is no doubt already out of date. The interpretation of the situation in each country is, however, the responsibility of the authors.

This publication should be treated as preliminary and it is kindly requested that any reader wishing to supplement this report with new data and/or encountering errors please inform the Division of Natural Resources and Energy, Economic Commission for Latin America and the Caribbean (ECLAC) so that the pertinent additions and/or corrections can be incorporated in the final report scheduled to appear during 1995.

Please address any comments to:

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# 1. Anguilla

	<b>Estimated sectoral water withdrawals (1987)</b>	<b>Water sector profile</b>
Population in 1990: 7 000	Not available	Area under irrigation (1 000 ha): • 1970 ..... • 1992 ..... Hydroelectric installed capacity: • 1970 ..... • 1991 ..... Drinking water supply and sanitation coverage in 1992: • urban water supply ..... • rural water supply ..... • urban sanitation ..... • rural sanitation .....
	Mean annual precipitation: 1 100 mm	Total area: 91 km <sup>2</sup>

## (a) *Drinking water supply and sanitation*

The Water Supply Administration of Anguilla is responsible for all aspects of drinking water supply, including planning, construction, operation, maintenance and water quality control.

There is no sewerage on Anguilla.

## (b) *Irrigation and drainage*

No information is available on the institutions involved in the administration of irrigation and drainage.

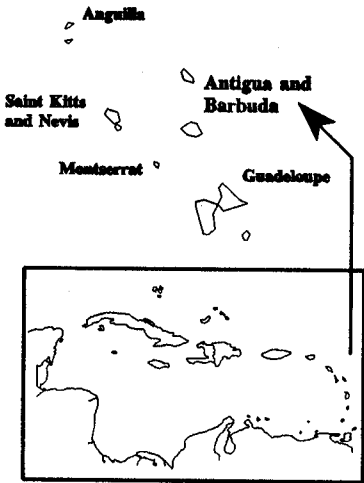
## (c) *Hydroelectricity*

No information is available on the institutions involved in the administration of hydroelectricity.

## (d) *Other water uses*

The Environmental Health Department is responsible for the provision of low-cost sanitation, for safeguarding environmental quality and for wastewater management.

## 2. Antigua and Barbuda

	<b>Estimated sectoral water withdrawals (1987)</b>	<b>Water sector profile</b>
Population in 1993: 67 000	Not available	Area under irrigation (1 000 ha): • 1970 ..... • 1992 ..... Hydroelectric installed capacity: • 1970 ..... • 1991 ..... Drinking water supply and sanitation coverage in 1992: • urban water supply ..... • rural water supply ..... • urban sanitation ..... • rural sanitation .....
	Mean annual precipitation: 1 099 mm	Total area: 440 km <sup>2</sup>

The Ministry of Works, Communications and Public Utilities sets the policy framework for the Public Utilities Authority, the members of which are appointed by the Governor, which is responsible for water resources administration.

### (a) *Drinking water supply and sanitation*

The provision and regulation of drinking water supply and sewerage services are the responsibility of the Public Utilities Authority (Water Division) and, in Barbuda, of the Barbuda Local Council.

The Public Utilities Authority is responsible for the management, development and conservation of surface-water resources and wells.

The Central Planning and Housing Authority has primary responsibility for the implementation of government land development schemes, including schemes for the provision of water supplies.

There are no sewerage systems on Antigua or Barbuda.

The Central Board of Health of the Ministry of Health monitors drinking water quality.

### (b) *Irrigation and drainage*

The Food and Agriculture Organization of the United Nations (FAO) does not report any land under irrigation in Antigua and Barbuda.

### (c) *Hydroelectricity*

The Statistical Division of the Department of Economic and Social Information and Policy Analysis of the United Nations does not report any hydroelectric generation capacity in Antigua and Barbuda.

### (d) *Other water uses*

Legislation related to environmental protection, including sanitation, is dispersed among many




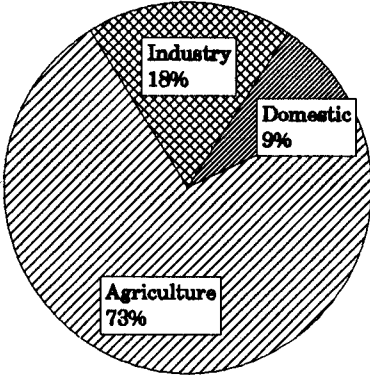
jurisdictions, including the Central Board of Health, the Public Utilities Authority, and the Development Control Authority which is responsible for physical planning. The recently established Historical, Conservation and Environmental Commission has been invested with an advisory and a watch-dog role.

The Public Utilities Authority and, in Barbuda, the Barbuda Council are empowered to issue *ad hoc* regulations for the prevention and control of water pollution, including the

pollution of water supplied for domestic and business purposes. The Ministry of Health is responsible for the public health aspects of water-related activities. The Central Board of Health is responsible for environmental health, including wastewater management, water quality control, vector control, and environmental monitoring.

The Meteorological Service is concerned with meteorology.

### 3. Argentina

	<b>Estimated sectoral water withdrawals (1987)</b>	<b>Water sector profile</b>
Population in 1993: 33 778 000		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 1 280</li> <li>• 1992 ..... 1 700</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 609 MW</li> <li>• 1991 ..... 6 607 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply ... 73 %</li> <li>• rural water supply .... 17 %</li> <li>• urban sanitation ..... 100 %</li> <li>• rural sanitation ..... 29 %</li> </ul>
	Annual internal renewable water resources: 20 970 m <sup>3</sup> /person	Total area: 2 766 890 km <sup>2</sup>

According to the constitution of the Republic of Argentina, natural resources belong to the provinces and their governments are responsible, therefore, for water resources management and for the environmental preservation of inland waters, including natural lakes. At present there are initiatives in several provinces to introduce institutional reforms to establish integrated water resource management.

The competence of the national government is restricted to the territories under its direct jurisdiction (at present limited to the Federal Capital - central Buenos Aires - and coastal areas) and to those cases where more than one provincial jurisdiction is concerned, as in watersheds shared by two or more provinces (most major water systems in Argentina fall within this category). In these cases, the allocation of water rights, conflict among users and transboundary pollution are issues to be addressed in common by provincial governments with national coordination. Under the constitution, the national government, also, has

jurisdiction over navigable water courses and man-made reservoirs built with national funding.

The National Directorate of Water Resources (Dirección Nacional de Recursos Hídricos), Secretariat of Public Works and Communications (Secretaría de Obras Públicas y Comunicaciones), Ministry of Economy and Public Works and Services (Ministerio de Economía y Obras y Servicios Públicos), is responsible for the administration of the water resources which fall under the jurisdiction of the national government.

#### (a) *Drinking water supply and sanitation*

The National Sanitation Works (Obras Sanitarias de la Nación - OSN) had been charged for many decades with the provision of these basic services through a system of regional management and operational agencies. In 1980, the management of drinking water supply and sanitation systems was transferred from the federal government to the provinces. In most cases, the systems were assumed by the

provincial governments, although in some cases by the municipalities. The federal government remained responsible for the system serving the Federal Capital and surrounding municipalities of the Province of Buenos Aires.

This system was transferred in a 30-year concession in 1993 to Aguas Argentinas, a consortium of several companies led by Lyonnaise des Eaux Dumez of France. Under this arrangement, Aguas Argentinas assumed full responsibility for the entire water supply and sewerage system, including commercial and technical operations and maintenance. Under the concession, Aguas Argentinas must finance and execute the investments necessary to achieve specified service targets. A Tripartite Sanitary Works and Services Authority (Ente Tripartito de Obras y Servicios Sanitarios - ETOSS) with representation from the federal, provincial, and municipal governments has been established to ensure enforcement of the contract, including the conditions of service, investment plans and allowable tariffs.

The Provinces differ in their administrative approach to the provision of services. In some provinces the services are organized as public utilities, with varying degrees of autonomy, while others are ministerial dependencies, with little administrative and financial autonomy. For example, in Mendoza, a Provincial Water Supply and Sanitation Authority (Ente Provincial de Agua y Saneamiento), has recently been created with responsibility for regulating and controlling water supply and sanitation companies, as well as, for monitoring and controlling water quality in the province.

Some (usually small) municipalities manage their own sanitation services. Cooperatives commonly provide services in rural areas.

The use of concessions in the management of water and sewerage services is being applied or under consideration by various provincial governments.

The Federal Water Supply and Sanitation Council (Consejo Federal de Agua Potable y Saneamiento - CoFAPyS) was created in 1988 by Law Nº 23.615. Its mission is to search solution for the problems existing in the basic sanitation sector and to render technical, financial and social promotion assistance to all agencies working in the sector.

### *(b) Irrigation and drainage*

Irrigation in Argentina also falls under provincial jurisdiction. The former Water and Electricity Corporation (Agua y Energía Eléctrica - AYEE) of the national government operated irrigation districts developed in relation to hydro-electric projects. With the privatization of electricity generation and distribution and the dismemberment of the AYEE, these districts have been transferred to the provinces.

In some provinces, management of irrigation has traditionally been centralized, whereas in others there are autonomous institutions with considerable user participation. For example, in the Province of Mendoza (with over 303 thousand hectares under irrigation, more than 24 per cent of the total area under irrigation in Argentina), the General Department of Irrigation, an autonomous and financially independent public agency, has responsibility for rivers, diversion structures and the main canals. The Waterway Inspection Offices, entirely managed and financed by the farmers, are responsible for the administration of the distribution system.

In many provinces, as part of the general process of reform of the government administration, the management of irrigation systems is being transferred to farmers. In those provinces, where irrigation is of lesser importance, it is normally entirely private.

### *(c) Hydroelectricity*

Within the national government, the Energy Secretariat (Secretaría de Energía) in the Ministry of Economy and Public Works and

Services formulates sector policies and has administrative functions in the field of energy generation, transmission, distribution, dispatch, etc. The National Electric Regulation Authority (Ente Nacional Regulador de la Electricidad - ENRE) is responsible for monitoring and promoting competition in the sector, quality control and for policing entrance into and withdrawal from the sector. The Wholesale Electric Market Administration Company (Compañía Administradora del Mercado Mayorista Eléctrico Sociedad Anónima - CAMMESA), coordinates dispatch operations and administers transactions effected through the National Grid (Sistema Interconectado Nacional).

With a few exceptions, the generation and distribution of electricity has been privatized, including the management responsibility for major reservoirs.

The Joint Technical Commission for Salto Grande (Comisión Técnica Mixta de Salto Grande) formed with Uruguay is responsible for operating the Salto Grande hydroelectric power plant on the Uruguay River. The Yacyretá Binational Authority (Entidad Binacional Yacyretá) formed with Paraguay is responsible for the Yacyretá hydroelectric power project on the River Paraná. The two governments have agreed in principle to privatize its management.

#### (d) *Other water uses*

Important steps have recently been taken to improve environmental management. The most significant was the creation in 1992 of the Natural Resources and Human Environment Secretariat (Secretaría de Recursos Naturales y Ambiente Humano) within the Presidency. It is the principal environmental authority of the national government. The Secretariat coordinates environmental measures at the national level, including water pollution control

policy. The National Directorate of Environmental Quality and Development (Dirección Nacional de Calidad y Fomento Ambiental) within the Secretariat is responsible for all aspects of environmental protection, specifically for water pollution. The National Institute for Water Science and Technology (Instituto Nacional de Ciencia y Técnica Hídricas - INCYTH) is now part of the Secretariat. INCYTH has responsibility for establishing water quality norms and controlling the sampling process as well as for various other aspects of water resources research and for the dissemination of knowledge and training in water resource management.

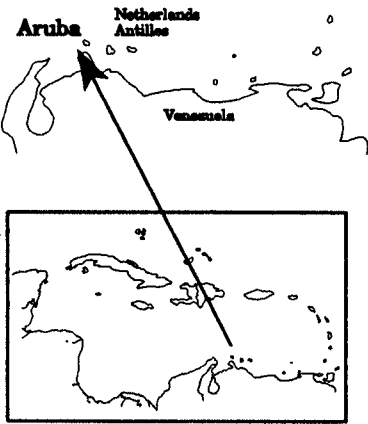
Water pollution control is, however, also a provincial responsibility.

The Federal Environmental Council (Consejo Federal del Medio Ambiente) is a coordination body formed by provincial environmental agencies. The Natural Resources and Human Environment Secretariat is also a member. Its main purpose is to produce a federal environmental agreement (acuerdo federal ambiental). In 1993 agreement was reached in the Council to support nation-wide environmental policies, to create a framework for agreements between the national and the provincial governments and to streamline the environmental protection system and making it more efficient, in accordance with the principles of Agenda 21.

A draft Environmental Code (Código Ambiental Nacional) is currently being processed through the legislature. Several of the provinces have established their own legal framework for environmental protection.

For some inter-provincial rivers, such as the Río Colorado and the Río Negro, inter-provincial authorities have been formed for some aspects of water management.

## 4. Aruba

	Estimated sectoral water withdrawals (1987)	Water sector profile
	Not available	Area under irrigation (1 000 ha): <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1992 ..... ..</li> </ul> Hydroelectric installed capacity: <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1991 ..... ..</li> </ul> Drinking water supply and sanitation coverage in 1992: <ul style="list-style-type: none"> <li>• urban water supply ..... ..</li> <li>• rural water supply ..... ..</li> <li>• urban sanitation ..... ..</li> <li>• rural sanitation ..... ..</li> </ul>
Population in 1990: 61 000	Mean annual precipitation: 426 mm	Total area: 190 km <sup>2</sup>

### (a) *Drinking water supply and sanitation*

The Water and Electricity Department is responsible for the supply of water. Sewage disposal is mainly by septic tanks, but both Oranjestad and St. Nicholas have sewage collection systems.

### (b) *Irrigation and drainage*

The Food and Agriculture Organization of the United Nations (FAO) does not report any land under irrigation in Aruba.

### (c) *Hydroelectricity*

The Statistical Division of the Department of Economic and Social Information and Policy

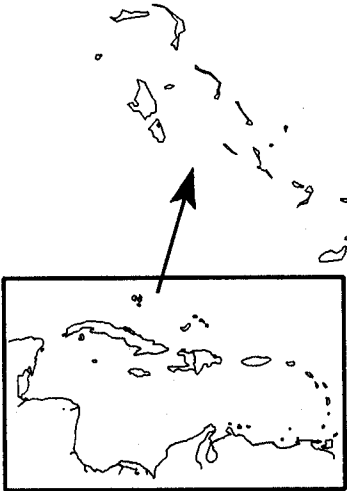
Analysis of the United Nations does not report any hydroelectric generation capacity in Aruba.

### (d) *Other water uses*

The Environmental Protection Department of the Ministry of Health and Justice is responsible for environmental health.

The Land Use Department, responsible for land use planning and zoning, and the Public Works Department, concerned with beach conservation, coastal defence works, dredging, ports and harbours, are active in coastal conservation.

## 5. Bahamas

	Estimated sectoral water withdrawals (1987)	Water sector profile
	Not available	<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1992 ..... ..</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1991 ..... ..</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply ... 97 %</li> <li>• rural water supply .... 98 %</li> <li>• urban sanitation ..... 98 %</li> <li>• rural sanitation ..... 100 %</li> </ul>
Population in 1993: 269 000	Mean annual precipitation: 1 252 mm	Total area: 13 880 km <sup>2</sup>

The Bahamas Water and Sewerage Corporation is responsible for the control, optimum development and protection of water resources and their use.

### (a) *Drinking water supply and sanitation*

The Ministry of Works and Lands formulates national policies for this sector in coordination with the Ministry of Public Health and Environment.

The Water and Sewerage Corporation is responsible for the provision of an adequate water supply for domestic and industrial use, as well as for the provision of adequate facilities for the safe discharge of domestic wastewater and industrial effluents. Its duties include system construction and design, and it also provides consultancy services. The Corporation's operations are, however, largely confined to New Providence Island.

The Ministry of Public Health and Environment and the Building Control Division of the Ministry of Works and Lands oversee the provision of sewerage services for hotel and

condominium development. The Environmental Health Inspectorate has the responsibility of policing existing facilities and monitoring pollution.

### (b) *Irrigation and drainage*

The Food and Agriculture Organization of the United Nations (FAO) does not report any land under irrigation in the Bahamas.

### (c) *Hydroelectricity*

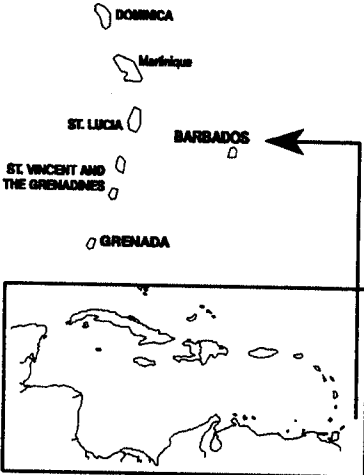
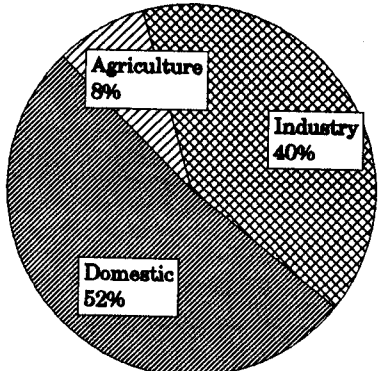
The Statistical Division of the Department of Economic and Social Information and Policy Analysis of the United Nations does not report any hydroelectric generation capacity in the Bahamas.

### (d) *Other water uses*

The Environmental Health Services Department is responsible for environmental protection.

The Meteorological Department of the Ministry of Transport operates the meteorological network.

## 6. Barbados

	Estimated sectoral water use (1990)	Water sector profile
Population in 1993: 260 000		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 .....</li> <li>• 1992 .....</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 .....</li> <li>• 1991 .....</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply .... 100 %</li> <li>• rural water supply .... 100 %</li> <li>• urban sanitation ..... 100 %</li> <li>• rural sanitation ..... 100 %</li> </ul>
	Mean annual precipitation: 1 174 mm	Total area: 430 km <sup>2</sup>

The Barbados Water Authority is charged to manage, allocate and monitor the water resources of Barbados with a view to ensuring their best development, utilization, conservation and protection in the public interest.

### (a) *Drinking water supply and sanitation*

The Barbados Water Authority and the Land and Water Use Unit of the Ministry of Agriculture are responsible for drinking water supply and sanitation activities on the island. The Authority manages drinking water supply and sewerage.

The Bridgetown, West and South Coasts Sewerage Project was established in 1976 to administer the pre-feasibility and feasibility studies for the construction of sewerage systems for the South and West Coasts and the Greater Bridgetown Area.

### (b) *Irrigation and drainage*

The Food and Agriculture Organization of the United Nations (FAO) does not report any land under irrigation in Barbados.

### (c) *Hydroelectricity*

The Statistical Division of the Department of Economic and Social Information and Policy Analysis of the United Nations does not report any hydroelectric generation capacity in Barbados.

### (d) *Other water uses*

The Environmental Unit of the Ministry of Labour, Consumer Affairs and the Environment has responsibility for the formulation of environmental policy, environmental impact assessment, legislation, education and public

awareness, research and planning. It is the national focal point for environmental matters. The Unit has responsibility for the formulation of the National Conservation Strategy for Barbados.

The Environmental Engineering Division of the Ministry of Health monitors and controls pollution; drinking water quality; and monitors and controls wastewater treatment works.

A number of Committees have been set up to address specific environmental and developmental concerns. The Government is presently in the process of considering the

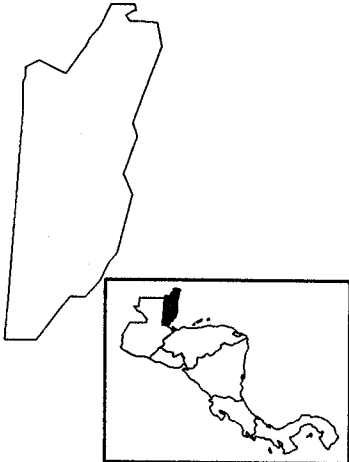
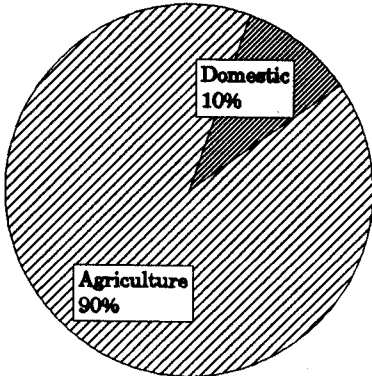
establishment of a strong central authority to coordinate environmental issues in Barbados.

The National Conservation Commission is a statutory organization with responsibility for the conservation of the natural beauty, historic buildings, sites and monuments; maintaining public access to beaches; providing life-guard services and ensuring the observance of sanitary conditions and practices in public parks, gardens, beaches and caves.

The Coastal Conservation Project, a specialized unit, has responsibilities for coastal monitoring and the design and construction of sea defence works.



## 7. Belize

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 1</li> <li>• 1992 ..... 2</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1991 ..... ..</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply .... 95 %</li> <li>• rural water supply ..... 53 %</li> <li>• urban sanitation ..... 76 %</li> <li>• rural sanitation ..... 22 %</li> </ul>
Population in 1993: 203 000	Annual internal renewable water resources: 80 810 m <sup>3</sup> /person	Total area: 22 960 km <sup>2</sup>

The Water and Sewerage Authority (WASA), Ministry of Energy and Communications, is responsible for maintaining and developing waterworks, for increasing and improving the water supply, and for promoting the conservation and proper use of water resources in the country. WASA may grant licenses to abstract water for industrial purposes; may make by-laws requiring records and information from persons abstracting water; and may make by-laws for preventing waste, misuse or contamination of water, and for protecting against water pollution. WASA is also responsible for maintenance of sewers; sewage disposal; and the provision of sewerage facilities for new buildings.

### (a) *Drinking water supply and sanitation*

WASA is responsible for drinking water supply in urban areas. It also has a programme for drilling wells and installing handpumps.

Other institutions involved in the sector include the Ministry of Health, which establishes sector goals; the Public Health Inspectorate, within this Ministry, which runs

the rural water supply programme; and the Ministry of Natural Resources, which provides drinking water to small population centres. Some private firms also drill wells.

The Ministry of Health is responsible for drinking water quality, as well as, ensuring an adequate supply. WASA controls quality in municipal systems.

### (b) *Irrigation and drainage*

The Ministry of Natural Resources administers irrigation development.

### (c) *Hydroelectricity*

The Statistical Division of the Department of Economic and Social Information and Policy Analysis of the United Nations does not report any hydroelectric generation capacity in Belize.

A group of private developers is implementing the Mollejon hydroelectric project on the Macal river under a build, operate and transfer and power purchase arrangements with the Government and Belize Electricity Limited.

The Government granted a franchise to a joint venture of two U.S. companies to construct and operate this hydroelectric plant as well as a transmission line in 1991. The developers formed the Belize Electricity Company Limited which has a power purchase agreement with Belize Electricity Limited.

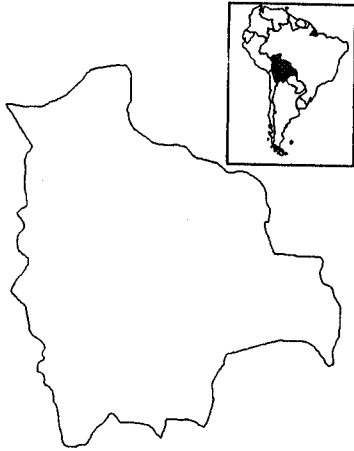
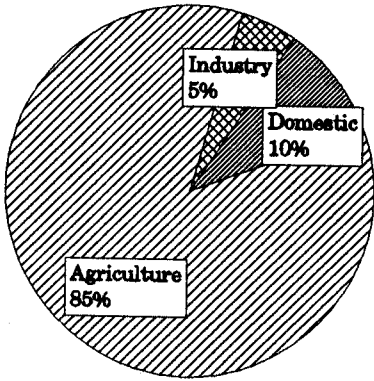
(d) *Other water uses*

The Ministry of Tourism and the Environment, responsible for environmental legislation and

administration of protected and tourist sites, prepared a Policy and Strategy Statement in 1992. An Environmental Protection Act was enacted in 1993 to enforce environmental standards and provide guidelines for the environmental assessment of projects.

The Ministry of Natural Resources is responsible for the administration of the Land Utilization Act and for the Special Development Areas. The Ministry of Fisheries manages coastal zones.

## 8. Bolivia

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 80</li> <li>• 1992 ..... 175</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 172 MW</li> <li>• 1991 ..... 306 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply ..... 82 %</li> <li>• rural water supply ..... 21 %</li> <li>• urban sanitation ..... 64 %</li> <li>• rural sanitation ..... 18 %</li> </ul>
Population in 1993: 7 064 000	Annual internal renewable water resources: 39 870 m <sup>3</sup> /person	Total area: 1 098 580 km <sup>2</sup>

The government of Bolivia is organized at two levels, one, the Central Government, with its ministerial departments, and, two, municipal governments. The Bolivian Government has a policy to foster the political and administrative role of municipalities and the whole country, for the first time, covered by municipal governments.

The Regional Development Corporations, decentralized public entities, under the supervision of the Ministry of Sustainable Development and the Environment (Ministerio de Desarrollo Sustentable y de Medio Ambiente), are administratively, financially and technically autonomous. Their main objective is to promote economic development. They have independent sources of income, mostly royalties from the exploitation of natural resources, mainly mining and hydrocarbons.

The Ministry of Sustainable Development and the Environment is elaborating a long-term National Development

Strategy (Estrategia Nacional de Desarrollo) which would harmonize economic growth, social equity, the governability of the political system and the rational use of natural resources.

A system of performance contracts between the Government and large public enterprises was introduced in 1990 to help restructure them into more business-like, competitive and efficient firms. Contracts were signed with several state-owned companies, including the National Electric Company (Empresa Nacional de Electricidad S.A. - ENDE) and the La Paz water and sewerage company (Servicio Autónomo Municipal de Agua Potable y Alcantarillado - SAMAPA). It is now expected that many of these companies will be privatized.

### (a) *Drinking water supply and sanitation*

Recently there has been a total restructuring of the Executive Power and the number of Ministries has been drastically reduced. Some of these changes affected the organization of the

drinking water supply and sanitation sector. The sector, once the responsibility of a number of government institutions, has been regrouped under just one ministry which has been given the responsibility for drinking water supply and sanitation in the whole country. It has an overall policy making and regulatory function, as well as, responsibility for activities coordination. The general direction of the reform process is towards decentralization to the Regional Development Corporations level.

The Regional Development Corporations have water and sanitation units (Unidades or Gerencias de Saneamiento Básico) responsible for formulating plans and programmes at the departmental level, especially for smaller cities and rural areas, implementing national policies and strategies in the sector, providing technical assistance to local-level operating organizations, designing and implementing projects, and performing other monitoring and supervisory tasks.

At the local level, the responsibility for drinking water supply and sanitation rests with the municipalities. In many cases the municipalities have transferred the responsibilities to public enterprises or to cooperatives. In the rural areas, some community administrative boards have been organized.

Operationally autonomous companies are responsible for water and sewerage services in the departmental capitals; these companies are cooperatives in some cities and municipal utilities in others. Privatization of some municipal services, including water supply, is under way in several municipalities.

The National Fund for Regional Development (Fondo Nacional de Desarrollo Regional) has financed basic sanitation projects in medium-sized cities. The Social Investment Fund (Fondo de Inversión Social) provides grants for investment projects with high social

justification, including drinking water supply and sewerage facilities in rural areas and marginal low-income urban zones.

The National Association of Drinking Water and Sewerage Companies and Institutions (Asociación Nacional de Empresas e Instituciones de Servicio de Agua Potable y Alcantarillado - ANESAPA) has as one of its main objectives the training of sector staff.

### (b) *Irrigation and drainage*

The Department of Water Resources in the Ministry of Agriculture and Peasant Affairs (Ministerio de Asuntos Campesinos y Agropecuarios) coordinates water use in agriculture, forestry and fisheries.

Four institutions share overall responsibility for implementing the sector's public investments: the Ministry, itself; its decentralized agencies; the Regional Development Corporations; and special *ad-hoc* development funds created as a parallel structure to the Ministry and the Regional Development Corporations.

Only two irrigation districts are currently managed by the regional directorates of the Ministry. Small projects, executed by donor-supported public and private institutions, form the bulk of new investments in irrigation. Beneficiaries are organized into users' committees and take full responsibility for the systems' operation and management. Traditional small irrigation schemes account, however, for most private irrigation. Operation and maintenance are normally organized through a water authority (Juez de Aguas) or a users' committee.

### (c) *Hydroelectricity*

The Ministry of Energy and Hydrocarbons (Ministerio de Energía e Hidrocarburos - MEH) is responsible for energy

policy and for regulating electrical power system operations. It authorizes the installation of power plants, gives concessions and regulates the operations of power companies. The ministry approves tariffs through the National Bureau of Electricity (Dirección Nacional de Electricidad - DINE).

The Bureau for Energy Development in Rural Areas (Dirección de Fomento Energético al Area Rural - DIFER), under MEH, is charged with the coordination and promotion of energy provision in rural areas.

The state-owned ENDE is responsible for generating and transmitting electricity for the country's main systems, about 80 per cent of installed capacity. It plans the power sector's development, constructs new generation and transmission facilities, and operates them. It is mainly a wholesaler of electricity, since most sales to final users are handled by independent, local distributors organized mainly as cooperatives. The only exceptions are ENDE's direct sales of electricity to large, individual users. ENDE is in the process of being privatized.

The privately owned Bolivian Electricity Company (Compañía Boliviana de Electricidad - COBEE) is responsible for

generating electricity in the departments of La Paz and Oruro through a concession contract with MEH, and for distributing electricity in the city of La Paz through a concession contract with the municipality of La Paz.


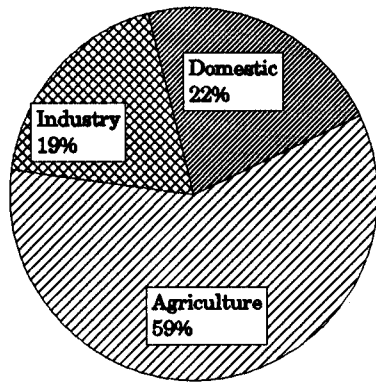
(d) *Other water uses*

An Environmental Action Plan developed in 1991 establishes a permanent environmental planning process, identifies key environmental issues, incorporates public participation as an essential element in environmental planning, guides the actions of government agencies, the private sector and the non-governmental organizations and promotes environmental planning at the national, regional and local level.

A new Environmental Law was passed by Congress in 1992. It defines in broad terms the institutional framework to meet the conservation and development needs of the country. The Law also incorporates the need for environmental impact assessments of investments and creates the National System of Protected Areas.

The Ministry of Sustainable Development and the Environment is concerned with environmental issues.

## 9. Brazil

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 796</li> <li>• 1992 ..... 2 800</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 8 828 MW</li> <li>• 1991 ..... 46 700 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply .... 99 %</li> <li>• rural water supply ..... 68 %</li> <li>• urban sanitation ..... 83 %</li> <li>• rural sanitation ..... 35 %</li> </ul>
Population in 1993: 156 491 000	Annual internal renewable water resources: 33 680 m <sup>3</sup> /person	Total area: 8 511 970 km <sup>2</sup>

In Brazil, water belongs in the public domain. The Federal Government has preemptive powers, attributions and responsibilities over matters of national interests, including water bodies not limited to the boundaries of a single state. It is also exclusively responsible for water legislation. The development of hydroelectricity is a prerogative of the Federal Government, although policies are coordinated with the States. The Federal Government is also responsible for interstate navigation, formulation and implementation of development plans, enactment of water legislation, and disaster prevention, particularly, floods and droughts.

Under the new constitution, the Federal Government must create a National Water Resource Management System, and propose criteria for the granting of water rights. Within the Federal Government, granting of water rights in general is normally through the National Department for Water Resources and Electrical Energy (Departamento Nacional de Águas e Energia Elétrica - DNAEE) under the

Ministry of Mining and Energy (Ministério de Minas e Energia). Responsibilities for registration and monitoring of water rights are shared with the states and municipalities.

The federal, state and municipal governments are jointly responsible for environmental protection and pollution control and can legislate on pollution control, resource conservation, and environmental protection. The Union, through the Ministry of Environment and Amazon Affairs (Ministério do Meio Ambiente e da Amazônia Legal), is responsible for general legislation, while the States can enact supplementary legislation. In the absence of federal legislation the states have full legislative competence to enact legislation according to their peculiarities.

There are proposals in both the federal and state governments to establish a management system for water resources based on integrated river basin management. The proposed National Water Resource Management System would consist of a

National Water Resources Council, Committees for Hydrographic Regions, River Basins Commissions, River Basin Agencies and an Executive Secretariat.

Some of the States have already enacted legislation. For example, the government of the State of Sao Paulo, through the Water Law of 30 December, 1991 established an Integrated Water Management System with considerable public participation through consortiums of municipalities and user associations. A similar system has been established in the state of Ceara.

#### (a) *Drinking water supply and sanitation*

Drinking water supply and sanitation is the responsibility of the municipalities. The municipalities either operate the systems directly or through concessions. In the 1960s, the Federal Government created the Sanitation Financing System through National Housing Bank under the Ministry of Interior to help finance the sector.

The National Housing Bank was abolished in 1986, but its main operational portfolios were transferred to the Federal Savings Bank which continues to be the administrator of the Federal Government Employee's Pension Fund which constitutes the Financing System's source of funds.

The Sanitation Financing System financed the National Sanitation Plan which encompassed the design, construction and operation of urban drinking water supply, sewage and drainage, and the training of the sector's managerial personnel. The Plan was implemented through State Water Companies formed in each state by consolidating municipal water companies. A significant number of municipalities, however, did not join the Plan.

The decentralization brought about by the reform of the Brazilian Constitution in 1988 established that urban development would be managed by the municipalities under federal

guidance. This has enhanced the role of state and municipal governments in the organization and regulation of water and sanitation programmes. For example, tariff-setting was formally transferred from the federal authorities to the State governments.

The Federal Government continues, however, to participate in drinking water and sanitation policies through the National Secretariat for Water Supply and Sanitation, created in 1988, within the Ministry for Social Welfare responsible for:

- setting national policies for water supply and sanitation;
- consolidating planning and investment priorities;
- coordinating federal activities with state and municipal initiatives; and
- supporting the Ministry for Social Welfare in its function as manager of the Federal Government Employee's Pension Fund.

#### (b) *Irrigation and drainage*

The Irrigation Secretariat (Secretaria de Irrigação - SIR), under the Ministry of Regional Integration (Ministério da Integração Regional), responsible for the granting of water rights to irrigators from federal rivers, and the Ministry of Agriculture share responsibilities for federal irrigation policies.

SIR collaborates with regional agencies such as the San Francisco Valley Development Corporation in irrigation management.

Most irrigation is privately managed.

#### (c) *Hydroelectricity*

DNAEE is the regulatory agency for the energy sector. It grants licenses for generating plants, assigns concessions, approves expansion plans, and sets tariff levels and structures. In some areas of responsibility, the approval of other Federal authorities is also required.

An important initiative to improve energy sector planning was the creation of the Energy Matrix Commission responsible for assessing energy sector strategies; policies for energy pricing, energy conservation, and the environment; and investment planning and related policies regarding major supply sectors, including electric power.

The Federal Government has the exclusive right to the ownership of all hydroelectric facilities, the exploitation of which can only occur through governmental concession or authorization. The Federal Government also has a monopoly over electric power generation and distribution, although these can be delegated by concession. In practice, the Federal Government has granted concessions to joint Federal and State companies, as well as to private interests for both generation and distribution. Large-scale generation and high-voltage inter-regional transmission of electricity are controlled by four Federal concessions.

The Centrais Elétricas Brasileiras (ELETROBRAS) serves as a holding company for the Federal concessions and also holds the 50 per cent interest of the Federal Government in Itaipú Binacional (the agency set up by the Governments of Brazil and Paraguay to build and operate the Itaipú hydroelectric facility on the Parana River). It also owns minority stock interests in State-owned utilities. ELETROBRAS analyzes expansion plans for major generating and transmission facilities; and coordinates and supervises the inter-connected public power system. Privatization is being considered.

#### (d) *Other water uses*

The basis of Brazil's current environmental strategy was defined in 1981, when the National Environment Policy Law (Law Nº 6938, August 31, 1981) established the National Environmental Policy and constituted the National Environmental System to implement that policy.

The National Environmental Policy's objectives are defined as the preservation, improvement and recovering of environmental quality propitious to life, aiming at insuring socio-economic development conditions, attending to the interests of National Security and to the protection of human dignity.

The Law considers: the establishment of environmental quality standards; environmental zoning; evaluation of environmental impacts; the licensing and the revision of activities that are effectively or potentially polluting; incentives for the production and installation of equipment and the creation or adoption of technology directed towards environmental quality improvement; and the creation of reserves, ecologic stations and environmental protection areas.

Under the National Environmental System, policy guidelines and basic laws, e.g., minimum emissions, ambient standards, licensing requirements for new projects, and budgetary decisions are controlled by the Federal Government, water pollution management is essentially under the control of state governments. While the municipalities focus on drainage, solid waste management, and drinking water supply and sanitation services.

At the federal level, the Ministry of Environment and Amazon Affairs is responsible for planning and coordination. Decisions are taken by the National Environmental Council (Conselho Nacional do Meio Ambiente - CONAMA) which drafts environmental protection guidelines. All the States are represented on CONAMA, as well as industry and non-governmental organizations. The Brazilian Institute of the Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis - IBAMA) is responsible for formulating and enforcing federal environmental regulations derived from the National Environmental Policy.



Every state has a ministry responsible for environmental issues. Some states have a separate environmental ministry, in others, the planning, natural resources management, or science and technology ministries are responsible. There are states' environmental councils.


The state environmental protection agencies have concurrent jurisdiction with the federal agencies to: control the quality of water destined for public water supplies and certain other uses; establish environmental standards and discharge limitations governing pollution of the air, water, and soil; issue installation and

operating licenses for new and existing sources of pollution; monitor polluting activities; impose fines; and request the temporary or permanent closure of polluting industries.

Recent legislative developments include a proposal for an Environmental Protection Code to consolidate all federal legislation respecting environmental issues.

Within the Federal Government, DNAEE is responsible for hydrological monitoring (water quality and water quantity) and operates a network of monitoring stations.

## 10. British Virgin Islands

	Estimated sectoral water withdrawals (1987)	Water sector profile
	Not available	Area under irrigation (1 000 ha): • 1970 ..... • 1992 ..... Hydroelectric installed capacity: • 1970 ..... • 1991 ..... Drinking water supply and sanitation coverage in 1992: • urban water supply ..... • rural water supply ..... • urban sanitation ..... • rural sanitation .....
Population in 1990: 16 000	Mean annual precipitation: 1 358 mm	Total area: 150 km <sup>2</sup>

### (a) *Drinking water supply and sanitation*

An agency under the Ministry of Communications and Works, is responsible for drinking water supply and sanitation.

Most of the population is not sewered.

The Environmental Health Department, Ministry of Health, controls water quality and inspects water treatment plants.

### (b) *Irrigation and drainage*

There is limited irrigation with treated wastewaters for vegetable production.

### (c) *Hydroelectricity*

The Statistical Division of the Department of Economic and Social Information and Policy

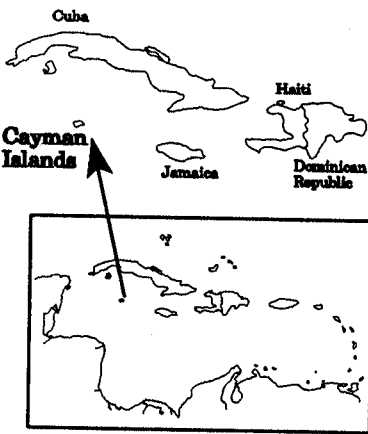
Analysis of the United Nations does not report any hydroelectric generation capacity in the British Virgin Islands.

### (d) *Other water uses*

The Department of Conservation and Fisheries, Ministry of Natural Resources is responsible for the marine environment and in cooperation with the agency responsible for drinking water supply and sanitation monitors water quality in recreation areas.

The Office of the Chief Minister is concerned with town and country planning and economic planning. The Ministry of Communications and Works is responsible for sea defence works, ports and harbours.

## 11. Cayman Islands

	Estimated sectoral water withdrawals (1987)	Water sector profile
	Not available	Area under irrigation (1 000 ha): • 1970 ..... • 1992 ..... Hydroelectric installed capacity: • 1970 ..... • 1991 ..... Drinking water supply and sanitation coverage in 1992: • urban water supply ..... • rural water supply ..... • urban sanitation ..... • rural sanitation .....
Population in 1990: 27 000	Mean annual precipitation: 1 222 mm	Total area: 260 km <sup>2</sup>

The Water Authority was established as a Statutory Body in 1983. The Water Authority Law, 1982 vests groundwater in the Crown and requires that the Authority protect and manage the resource. The Law also requires that the Authority provide public water supplies and public sewerage systems. The Water Authority Regulations, promulgated in 1985, provide the Authority with the framework in which to operate. The affairs of the Authority are managed by a Board, appointed by the Government, and a Chief Executive Officer.

### (a) *Drinking water supply and sanitation*

The Water Authority is responsible for the provision of public water supplies and public sewerage systems.

Traditionally, households have satisfied their own water requirements on-site, either by individual rain-water catchments, groundwater abstraction or a combination of both, the latter being the most common. Treatment and disposal of wastewater is also accommodated on-site. A number of tourist accommodations

outside the franchise area (see below) have invested in sea-water reverse osmosis equipment.

On Grand Cayman, a private water company, the Cayman Water Company, provides desalinated water via a pipeline to properties within its franchise area, where the majority of the tourist accommodations are located. The Company operates in accordance with the Water Supply and Production Law (1979). The franchise is administered by the Water Authority, and a royalty on sales is payable to the Government.

Several companies operate as water truckers. These companies obtain their water from Water Authority wells and reservoirs, the Cayman Water Company and private wells.

On the other islands there are no public systems.

The principal tourist area is served by a sewage treatment plant. Elsewhere there are individual systems.

(b) *Irrigation and drainage*

The Food and Agriculture Organization of the United Nations (FAO) does not report any land under irrigation in Cayman Islands.

(c) *Hydroelectricity*

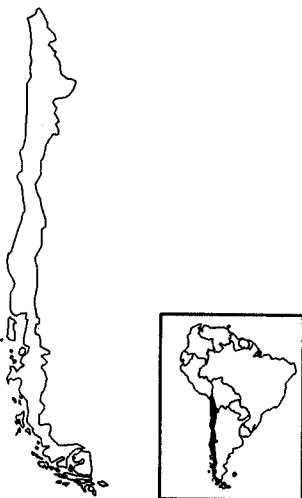
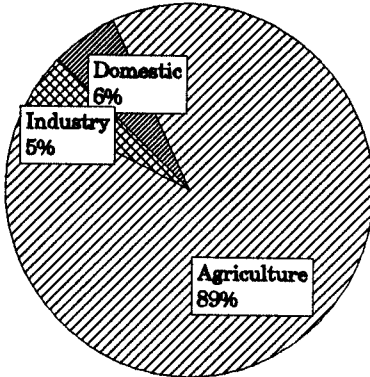
The Statistical Division of the Department of Economic and Social Information and Policy

Analysis of the United Nations does not report any hydroelectric generation capacity in Cayman Islands.

(d) *Other water uses*

The Environmental Health Section is responsible for water quality and for approving all construction permits.

## 12. Chile

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 1 180</li> <li>• 1992 ..... 1 268</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 1 067 MW</li> <li>• 1991 ..... 3 071 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply ... 100 %</li> <li>• rural water supply .... 31 %</li> <li>• urban sanitation ..... 100 %</li> <li>• rural sanitation ..... 6 %</li> </ul>
Population in 1993: 13 822 000	Annual internal renewable water resources: 34 410 m <sup>3</sup> /person	Total area: 756 950 km <sup>2</sup>

The Chilean Constitution provides that the granting of water rights gives their holders the right of property over them.

The Water Code (Código de Aguas) establishes the definitions and concepts governing the ownership and use of water. Under the Code, water is a public good with the right to use granted to private parties. Water rights are considered private assets which, subject to the Civil Code, can be sold or mortgaged separately from the land. The right to use water is an actual or real right that confers ownership. The owner is entitled to use water, obtain benefits from it, and dispose of it. After the initial granting of a right, the State ceases to have authority over its allocation and the future distribution of rights among users is left to market forces.

The Department of Water Resources (Dirección General de Aguas - DGA) of the Ministry of Public Works (Ministerio de Obras Públicas - MOP) is responsible for coordinating and controlling the management of both surface

and ground water resources. Its prime responsibility is the issuing and registration of water rights. Other duties include research on and measurement of the water resource through the National Hydrometric Service, planning, monitoring and policing of waters in natural river beds and the supervision of the functioning of the user organizations. It is in charge of implementing government policies to protect water quality and of coordinating the work of other public institutions. Recently, it has been charged with the formulation of a comprehensive national water policy.

### (a) *Drinking water supply and sanitation*

Under the Sanitation Services Law (Ley General de Servicios Sanitarios) and the corresponding regulations, the provision of drinking water supply and sanitation is through concession. Separate concessions are granted for drinking water supply and treatment, for drinking water distribution, for the provision of sewerage disposal and for the treatment of sewerage. Concessions are granted for an

indefinite period of time and are transferable. They are granted through a decree of MOP subject to a previous report of the Superintendency of Sanitation Services (Superintendencia de Servicios Sanitarios).

The drinking water supply and sanitation companies provide service within a defined area, to both rural and urban populations, in accord with the terms of their concession. There are 13 publically-owned regional companies and a number of smaller private companies. The regional companies are registered as joint-stock companies under the Corporation for the Promotion of Production (Corporación de Fomento de la Producción - CORFO), the Government's holding company.

The two largest regional companies - the Metropolitan (Santiago) Sanitary Works Company (Empresa Metropolitana de Obras Sanitarias S.A. - EMOS) and the Valparaíso Sanitation Company (Empresa de Obras Sanitarias de Valparaíso S.A. - ESVAL) have minor private ownership and their shares are quoted on the stock exchange.

The Superintendency of Sanitation Services within MOP is responsible for the regulation and control of the companies holding concessions. It is an autonomous, decentralized agency, with juridical personality and an independent budget. It oversees the compliance of the service provided with the technical standards related to system design, construction and operation. The Superintendency is also responsible for the application and monitoring of compliance with the norms governing tariff-setting; and the application of the concession regime. In addition, the Superintendency is authorized to interpret all the dispositions and technical norms related to the provision of the drinking water supply and sanitation services. It is also responsible for the application of the legislation on the disposal of liquid industrial effluents.

In rural areas the regional companies provide service in collaboration with Drinking Water Committees or Cooperatives (Comités o Cooperativas de Agua Potable).

Private sector companies provide services in some areas such as, the eastern sector of the city of Santiago, the city of Valdivia and in a number of resort centres. Private participation is expanding and increased private participation in the sector is currently under consideration.

The Ministry of Health (Ministerio de Salud) has responsibilities for sanitation and environmental hygiene. The Ministry sets the quality standards for drinking water for human and animal consumption, as well as, for water used for irrigation, recreation and aesthetics and fish production.

#### (b) *Irrigation and drainage*

The Bureau of Irrigation (Dirección de Riego) and the DGA, both in the MOP, the Ministry of Agriculture (Ministerio de Agricultura), the Executive Secretariat (Secretaría Ejecutiva) of the National Irrigation Commission (Comisión Nacional de Riego - CNR) and the Ministry of Planning and Cooperation (Ministerio de Planificación y Cooperación), all play a role in determining and executing government policies and programmes in irrigation and drainage.

The MOP has long been the predominant public institution involved in policy for public investments in irrigation. The Bureau of Irrigation is responsible for the study, design, construction, maintenance, repair and operation of irrigation works built with public funds until they are transferred to the users. The Ministry of Agriculture has responsibilities for policy towards the development of irrigated agriculture at the farm level.

The CNR, chaired by the Minister of Economic Affairs, Development and

Reconstruction (Ministerio de Economía, Fomento y Reconstrucción) includes the Ministers of Finance (Ministerio de Hacienda), Public Works, Agriculture, and Planning and Cooperation, has the objective of ensuring the expansion and improvement of the area under irrigation in Chile. It is responsible for the planning, study and formulation of integrated irrigation projects. Its main task is the implementation of the Law to Encourage Private Investment in Irrigation and Drainage Works (Fomento a la Inversión Privada en Obras de Riego y Drenaje) promulgated in 1985. Under this law, the State may reimburse up to 75 per cent of the cost of private investment in the construction or rehabilitation of irrigation and drainage works and equipment for mechanical irrigation that increase the irrigated area, improve water availability in an area of short supply, or reclaim poorly drained or waterlogged land for agricultural production. Funds are allocated on a competitive basis.

The Water Law stipulates that the irrigators must create organizations to assume responsibility for water management when more than one user has rights over any body of water. These institutions have played an active role in both the administration of the water resources and in the development of hydraulic infrastructure for more than 150 years. The users have a national organization, the Confederation of Irrigation Canal Users Associations (Confederación de Asociaciones de Canalistas).

The water committees (Comunidades de Agua) and user associations (Asociaciones de Canalistas) construct, operate and maintain the canal systems. They elect a directorate, appoint staff and have the right to charge a tariff to cover the costs of the operation of the water control systems under their jurisdiction. The oversight committees (Juntas de Vigilancia) control the distribution of water in rivers. The committees are formed from representatives of all holders of water rights. The committees are

responsible for the assignment of water from the river or river section under its jurisdiction to each association or user according to the rights they possess. In moments of water shortage the committees have the power to redistribute the water among users. The committees construct, operate and maintain the required water control works such as dams and intake structures.

It is government policy to transfer all irrigation works to the users.

### (c) *Hydroelectricity*

National policy in energy is set by the National Energy Commission (Comisión Nacional de Energía) and the Superintendency of Electricity and Fuels (Superintendencia de Electricidad y Combustibles). The functions of the Energy Commission include proposing of policies, legislation, and standards for the sector, the calculation of regulated prices (they are set by the Ministry of Economic Affairs, Development and Reconstruction), and the elaboration of a planning strategy for each subsector. This planning is obligatory for state-owned companies, but voluntary for private companies.

The Superintendency of Electricity and Fuels in the Ministry of Economic Affairs, Development and Reconstruction, has responsibility for ensuring that companies, materials and equipment comply with established legal regulations and standards.

Most generation companies, the main grid and all distribution companies are privately owned. All the remaining publically owned companies have minority private shareholders and all capital increases come from the issuing of shares to the private sector gradually diluting the government share in ownership.

### (d) *Other water uses*

The National Environmental Commission (Comisión Nacional del Medio

Ambiente - CONAMA) develops environmental policies; periodically informs on the compliance with and application of environmental legislation; maintains a national system of environmental information; administers the environmental impact assessment system at the national level; coordinates the standard-setting process in the field of environmental quality; and, finances projects and activities aimed at the protection of the environment, the preservation of nature and the conservation of the environmental heritage.

The Secretary-General of the Presidency (Ministerio Secretaría General de la Presidencia) is President of CONAMA and presides over the Governing Council (Consejo Directivo) made up by the Ministers of Economic Affairs, Development and Reconstruction, Public Works, Agriculture, Natural Resources (Bienes Nacionales), Health, Mining (Minería), Housing and Urbanization (Vivienda y Urbanismo), Transport and Telecommunications (Transportes y Telecomunicaciones), and Planning and Cooperation. CONAMA is advised by an Executive Office (Dirección Ejecutiva), a Consultive Council (Consejo Consultivo) and Regional Environmental Commissions (Comisiones Regionales del Medio Ambiente). The Special Commission for the Decontamination of the Metropolitan Region

(Comisión Especial de Descontaminación de la Región Metropolitana) will become the regional environmental commission for Santiago.

CONAMA administers the Environment Protection Fund (Fondo de Protección Ambiental). The fund finances, wholly or in part, projects and activities aimed at the protection and recuperation of the environment, the preservation of nature or the conservation of the environmental heritage.


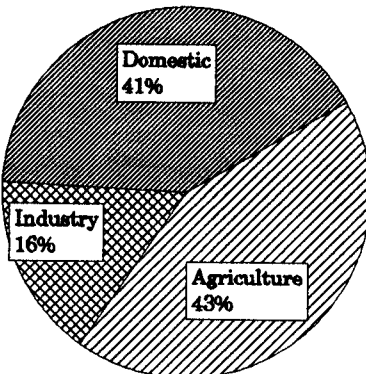
The Ministry of Mining establishes standards for regulating the environmental impact of mineral exploitation and energy use.

The Ministry of Agriculture regulates the use of agro-chemicals and the Agriculture and Livestock Service (Servicio Agrícola y Ganadero - SAG) regulates the impacts of agricultural activities on water courses.

The Ministry of National Defence (Ministerio de Defensa Nacional) through the General Directorate of the Maritime Territory and National Merchant Marine (Dirección General del Territorio Marítimo y Marina Mercante Nacional) of the Navy (Armada de Chile) is responsible for coastal and ocean water, as well as the discharge of wastewaters from industry, mining activities and municipalities into lakes and the sea.



## 13. Colombia

	<b>Estimated sectoral water withdrawals (1987)</b>	<b>Water sector profile</b>
Population in 1993: 33 987 000		Area under irrigation (1 000 ha): • 1970 ..... 250 • 1992 ..... 530  Hydroelectric installed capacity: • 1970 ..... 1 796 MW • 1991 ..... 7 604 MW  Drinking water supply and sanitation coverage in 1992: • urban water supply .... 90 % • rural water supply ..... 90 % • urban sanitation ..... 70 % • rural sanitation ..... 27 %
	Annual internal renewable water resources: 32 010 m <sup>3</sup> /person	Total area: 1 138 910 km <sup>2</sup>

Colombia is making radical changes in its administrative and legal structure in relationship to environmental policy, including water resources. The traditional government structure, organized according to sectors of social and economic activity has been transformed into the one directed to environmental objectives and economic development, with strong decentralization of authority, support for the development of a regional system of management, and strengthening of the Autonomous Regional Corporations (Corporaciones Autónomas Regionales).

The creation of the Ministry of the Environment (Ministerio del Medio Ambiente), had led to reorganization of the public sector responsible for the management and conservation of the environment and renewable natural resources, including water. The National Environmental System (Sistema Nacional Ambiental) and the promulgation of the new Land Management Law (Ley de Adecuación de Tierras) have also contributed to the change in administrative policy.

The Autonomous Regional Corporations are public corporations with jurisdiction over territorial units that, because of their geographical characteristics, constitute a single ecosystem or form a geopolitical, biogeographical or hydrogeographical unit. They have financial and administrative autonomy and are responsible for the administration of the environment and renewable natural resources, including water, within their jurisdictions in conformance with the legal dispositions and policies of the Ministry of the Environment. Their principal directive and administration organs are a Corporate Assembly (Asamblea Corporativa), an Executive Council (Consejo Directivo) and a General Director (Director General). The new environmental law both validates the existing Corporations, with some change of names or jurisdictions, and creates new ones. The Law also creates Corporations for Sustainable Development (Corporaciones para el Desarrollo Sostenible) with the same functions in Regions under Special Regime (Regiones con Régimen Especial).

(a) *Drinking water supply and sanitation*

Responsibility for the operation of drinking water supply and sanitation services is being decentralized to the municipalities in accordance with the Drinking Water Supply Adjustment Plan (Plan de Ajuste Sectorial de Agua Potable) managed by the National Development Financial Office (Financiera de Desarrollo Territorial), created in 1989 to support municipal development through the provision of drinking water supply and sanitation services.

The Ministry of Economic Development (Ministro de Desarrollo Económico) is responsible for the formulation of government policy on housing, community equipment, urban planning and development and drinking water supply and basic sanitation. The Vice-Minister for Housing, Urban Development and Drinking Water Supply (Viceministro de Vivienda, Desarrollo Urbano y Agua Potable) has three departments, including the Drinking Water and Basic Sanitation Department (Dirección de Agua Potable y Saneamiento Básico). Its responsibilities include the preparation of a development plan for water supply and sanitation, in coordination with the Regional Planning Councils (Consejos Regionales de Planificación); to provide technical and institutional support; to design and coordinate programmes of research; to design and promote special drinking water supply and sanitation programmes for rural areas; to elaborate and coordinate the execution of the national sectoral training plan; to propose to the corresponding authorities actions and programmes aimed at the conservation of water sources. An advisory and coordinating agency has been created, the Superior Council for Development, Social Housing and Water Supply (Consejo Superior de Desarrollo Urbano, Vivienda Social y Agua Potable).

The Water Supply and Basic Sanitation Control Commission is responsible for the

promotion of competition among providers of drinking water supply and basic sanitation services and to regulate monopolies where competition is not possible; to define efficiency criteria and develop guidelines and models for evaluating the companies providing service; to impose technical standards; to fix tariffs. The commission can establish a regime of regulated freedom (*libertad regulada*) or monitored freedom (*libertad vigilada*) or indicate where tariffs can be freely fixed. It also is required to establish criteria and standards for protecting the rights of the users in connection with billing, marketing and other aspects of service provision.

The Ministry of Health (Ministro de Salud) is responsible for drinking water quality standards.

(b) *Irrigation and drainage*

The Ministry of Agriculture (Ministerio de Agricultura) has the principal responsibility for land management policies. The Superior Land Management Council (Consejo Superior de Adecuación de Tierras) is an advisory and coordinating entity; the National Land Management Institute (Instituto Nacional de Adecuación de Tierras), together with private and public organizations, are executive agencies; and the National Land Management Fund (Fondo Nacional de Adecuación de Tierras), is an administrative unit for the financing of irrigation, drainage and flood control projects.

Until 1992, public irrigation was in the hands of the Colombian Institute of Hydrology, Meteorology and Land Improvement (Instituto Colombiano de Hidrología, Meteorología y Adecuación de Tierras), responsible to the Ministry of Agriculture. All districts are now being transferred to the farmers.

The users are organized in User Associations (Asociaciones de Usuarios). There is a National Federation of Irrigation Districts'

Users (Federación Nacional de Usuarios de Distritos de Riego).

(c) *Hydroelectricity*

The Ministry of Mining and Energy (Ministerio de Minas y Energía) formulates energy sector policies, plans and regulations. The Mining and Energy Planning Unit (Unidad de Planeación Minero Energética) carries out sector planning, studies demand and supply for energy, undertakes sector evaluations and diagnostics, and elaborates the energy plan and the electric sector expansion plan.

The Electric Interconnection (Interconexión Eléctrica S.A. - ISA) operates the interconnected power system. Its shareholders include all the largest municipal power companies and the power companies owned by the central government.

The Commission for Energy Regulation (Comisión de Regulación Energética), a special unit of the Ministry of Mining and Energy, is in charge of regulation of the energy market, tariffs and operation of the electric sector and the National Energy Financial Office (Financiera Energética Nacional), under the Ministry of Mining and Energy, is charged with the mobilization of domestic and external investment funds. As a part of the reform of the energy sector the National Energy Financial Office was given responsibility for the coordination of the supervision of the Performance Agreements (Convenios de Desempeño) signed by the Government and the companies operating in the sector. Performance Agreements set administrative, financial and operation objectives for the companies.

A number of measures have been adopted to facilitate private sector participation in the energy sector. It is expected that over the next four years, the private sector will add at least 500 MW of generation capacity.

(d) *Other water uses*

The Ministry of the Environment defines the policies and regulations for the recuperation, conservation, protection, management and use of renewable natural resources and the environment, approves regulations of the Autonomous Regional Corporations and administers the National Environmental Fund (Fondo Nacional Ambiental) and the Amazon Environmental Fund (Fondo Ambiental de la Amazonía). Both Funds constitute special accounting systems in the Ministry of the Environment, with legal status and independent funding, but with neither administrative structure nor staff.

The National Environmental Fund is a financial instrument of support for the implementation of the environmental and renewable natural resources management policies. It will finance the implementation of activities, studies, investigations, plans, programmes and projects aimed at strengthening environmental management, for the preservation, conservation, protection, improvement and recuperation of the environment and for the adequate management of the renewable natural resources. The Amazon Environmental Fund finances activities in the Amazon Basin.

The Ministry of the Environment assumes functions previously exercised in the field of the protection of the environment and renewable natural resources by the National Institute for Renewable Natural Resources and the Environment (Instituto Nacional de los Recursos Naturales Renovables y del Ambiente), the Ministry of Agriculture, the Ministry of Health, the Ministry of Mining and Energy and the National Planning Department (Departamento Nacional de Planeación).

The National Environmental Council (Consejo Nacional Ambiental), formed by the

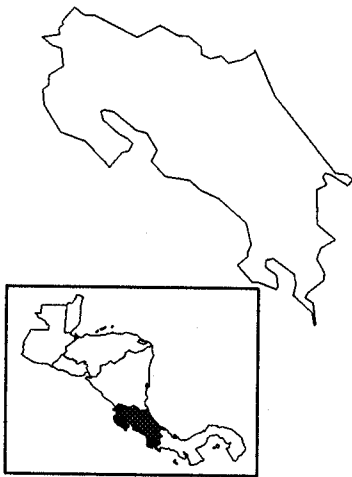
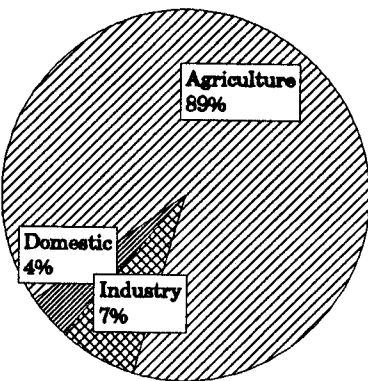
Minister of the Environment who chairs the council and the Ministers of Agriculture, Health, Economic Development, Mining and Energy, National Education (Ministro de Educación Nacional), Public Works and Transport (Ministro de Obras Públicas y Transporte), National Defence (Ministro de Defensa Nacional), Foreign Trade (Ministro de Comercio Exterior), Director of the Administrative Department of National Planning (Departamento Administrativo de Planeación Nacional), and representatives of other government, community and private organizations, has as its objective intersectoral coordination of policies, plans and programmes for the environment and renewable natural resources.

The new Hydrology, Meteorology and Environmental Studies Institute (Instituto de Hidrología, Meteorología y Estudios

Ambientales) gathers, analyzes, processes and disseminates basic hydrological, hydrogeological, meteorological, etc. information. It assumes basic research activities of the former National Institute for Renewable Natural Resources and the Environment and the groundwater responsibilities of the Institute of Investigation in Geological Sciences, Mining and Chemistry (Instituto de Investigaciones en Geociencias, Minería y Química).

Four more institutes are to be created: for coastal and marine research (Instituto de Investigaciones Marinas y Costeras), for biological resources (Instituto de Investigación de Recursos Biológicos), for the study of the Amazon (Instituto Amazónico de Investigaciones Científicas), and for the study of the Pacific environmental systems (Instituto de Investigaciones Ambientales del Pacífico).

## 14. Costa Rica

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 26</li> <li>• 1992 ..... 120</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 182 MW</li> <li>• 1991 ..... 767 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1988:</p> <ul style="list-style-type: none"> <li>• urban water supply ... 100 %</li> <li>• rural water supply .... 84 %</li> <li>• urban sanitation ..... 100 %</li> <li>• rural sanitation ..... 93 %</li> </ul>
Population in 1993: 3 269 000	Annual internal renewable water resources: 29 760 m <sup>3</sup> /person	Total area: 51 100 km <sup>2</sup>

The Ministry of Natural Resources, Energy and Mining (Ministerio de Recursos Naturales, Energía y Minas - MIRENEM) is responsible for the formulation, planning and execution of policies in natural resources, energy, minerals and the environment, as well as policies for their control, supervision, inspection, promotion and development. Its responsibilities also include the protection of river basins.

The National Electricity Service (Servicio Nacional de Electricidad - SNE) is the regulatory body for public services and administrator of the national waters of Costa Rica. It grants rights to use through concessions. It has the widest competence for the application of the water law. The Service is also responsible for reviewing and approving utility tariffs including those for drinking water supply and sewerage services. The Government has proposed a new Law for the Regulation of Public Services, which seeks to transform SNE into a Regulatory Agency for Public Services (Autoridad Reguladora de los Servicios Públicos).

The Costa Rican Council for Sustainable Development (Consejo Costarricense de Desarrollo Sostenible) was created by an executive decree of MIRENEM of 1994 according to which the Council will be the superior instance for the national dialogue, for the formulation of sustainable development policies to be implemented in a coordinated way at all levels of the public and private sectors.

The Water Law (Ley de Aguas) dates back to 1942. It has been reformed. A new water law is presently under consideration in the Legislative Assembly.

### (a) *Drinking water supply and sanitation*

The autonomous Costa Rican Water Supply and Sanitation Institute (Instituto Costarricense de Acueductos y Alcantarillados - AyA) has authority to determine policies in drinking water supply and sanitation and provides services in both urban and rural areas. AyA provides technical support to rural communities that have Local Rural Water Supply and Sewerage

Committees (Comités de Acueductos y Alcantarillados Rurales). AyA is also responsible for policies towards liquid industrial wastes, urban storm drainage, the conservation of river basins and ecological protection. It has a programme of natural resources management with a special emphasis on integrated development of water resources.

The Institute for Municipal Development and Advisory Assistance (Instituto de Fomento y Asesoría Municipal - IFAM) and the Ministry of Public Health (Ministerio de Salud Pública) are also active in the sector. About half the services, supplying 25% of the population, are operated by the municipalities. AyA advises and gives technical support.

The Ministry of Public Health has responsibility for services for the dispersed rural population, for whom it designs and constructs water systems and latrines. Both the Ministry of Public Health and AyA have responsibilities for water quality. The Ministry of Public Health sets drinking water quality standards and monitors compliance. AyA monitors and controls drinking water quality.

IFAM aids local governments with concessionary loans and technical assistance. It also plays a role in the sector by strengthening municipal systems and encouraging efficient operation of the services that the municipalities provide. The Institute also channels government and external funds to finance all types of works covering the complete range of municipal services, including water supply and sewerage.

#### **(b) *Irrigation and drainage***

The National Agricultural Sector Council (Consejo Agropecuario Nacional), an advisory body to the Ministry of Agriculture and Livestock (Ministerio de Agricultura y Ganadería), is a forum for the discussion of sectoral policies and programme coordination. It is responsible for analyzing problems and proposing sectoral policy, and for coordinating plans, programmes and projects of the

institutions within the sector. The Council is assisted by the Agricultural Planning Department (Secretaría Ejecutiva de Planificación del Sector Agropecuario).

The National Service for Groundwater, Irrigation and Drainage (Servicio Nacional Aguas Subterráneas, Riego y Avenamiento - SENARA) is responsible for irrigation.

The Agricultural Development Institute (Instituto de Desarrollo Agrario - IDA) provides settlements for smallholders, with basic infrastructure, such as water, electricity and social facilities.

#### **(c) *Hydroelectricity***

The Directorate for Energy (Dirección Sectorial de Energía), in MIRENEM, has the prime responsibility for energy planning and coordination. The Directorate coordinates its activities with the Costa Rican Petroleum Refinery (Refinadora Costarricense de Petróleo, S.A.) and the Costa Rican Electricity Institute (Instituto Costarricense de Electricidad - ICE). ICE carries out research, as well as, operating generation and distribution systems.

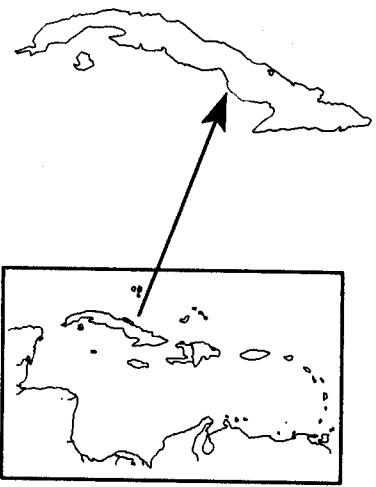
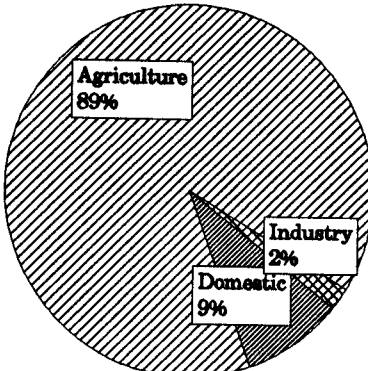
The government has announced its intention to privatize at least parts of ICE. Private generation of electricity is authorized subject to some restrictions.

#### **(d) *Other water uses***

The Technical Secretariat for Riverbasin Management (Secretaría Técnica de Manejo de Cuencas) was created in 1990 through an inter-institutional agreement. It has responsibilities for integrated river basin management.

The National Meteorology Institute (Instituto Meteorológico Nacional) is responsible for meteorological services.

## 15. Cuba

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 450</li> <li>• 1992 ..... 910</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 44 MW</li> <li>• 1991 ..... 49 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply ... 100 %</li> <li>• rural water supply .... 91 %</li> <li>• urban sanitation ..... 100 %</li> <li>• rural sanitation ..... 68 %</li> </ul>
Population in 1993: 10 872 000	Annual internal renewable water resources: 3 190 m <sup>3</sup> /person	Total area: 110 860 km <sup>2</sup>

The National Water Resources Institute (Instituto Nacional de Recursos Hidráulicos), within the National System for the Protection of the Environment and the Rational Use of Natural Resources (Sistema Nacional de Protección del Ambiente y Uso Racional de los Recursos Naturales), is charged with the direction, execution and monitoring compliance with all government policies regarding the planning and control of water resources. Water resource administration and management are carried out through the 33 Hydraulic Complexes (Complejos Hidráulicos) which cover the whole country.

### (a) *Drinking water supply and sanitation*

The National Water Resources Institute is responsible for the drinking water supply and sanitation sector. Systems operations are supervised by bureaus under the authority of the provincial governments.

The local organs of the "People's Power Structure" (municipalities) also invest in water supply and sewerage systems.

The Ministry of Public Health and Sustainable Development (Ministerio de Salud Pública y Desarrollo Sustentable) is responsible for sanitary standards, including standards for water, soils and air, as well as for all installations and all types of dwellings and for sanitary regulations for construction projects. The Ministry, the National Water Resources Institute and the local operating entities are in charge of the water quality control programmes.

The Housing Institute (Instituto de la Vivienda) promotes and directs housing construction, reconstruction and maintenance planning, including drinking water supply and sewerage systems in areas where new housing is being constructed.

**(b) *Irrigation and drainage***

The National Water Resources Institute is responsible for irrigation and drainage projects. The Irrigation and Drainage Research Institute (Instituto de Investigación en Riego y Drenaje) undertakes the research and development required to improve irrigation and drainage. The Ministry of Sugar (Ministerio del Azúcar) and the Ministry of Agriculture (Ministerio de Agricultura) are also involved in the area of agricultural water uses.

**(c) *Hydroelectricity***

The National Energy Commission (Comisión Nacional de Energía) functions as an advisory and information body to the Council of Ministers (Consejo de Ministros del Estado) in the formulation of energy policies and in the control of the distribution and utilization of energy.

Operating companies are responsible directly to the Ministry for Basic Industry (Ministerio de la Industria Básica - MINIBAS). Some large electric power stations are operated,

however, by industrial companies, especially in the sugar industry. Any, excess energy is transferred to the Electric Union (Unión Eléctrica) for distribution within the National Electric Energy System (Sistema Electroenergético Nacional), the national grid.

The Cuban Academy of Sciences (Academia de Ciencias de Cuba), the Superior Polytechnic Institute José Antonio Echeverría (Instituto Superior Politécnico José Antonio Echeverría) and other academic and educational institutions play an important role in energy-related research, investigation and training.

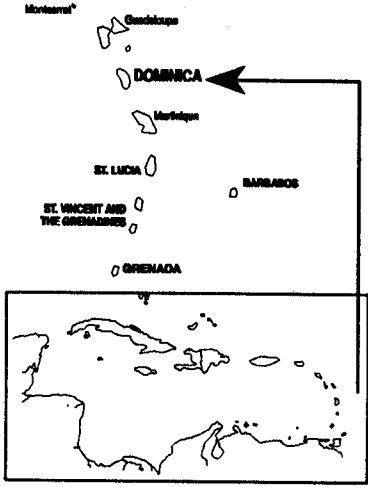
**(d) *Other water uses***

The National Water Resources Institute operates the national network of water quality control stations and, through the National Hydrologic Service (Servicio Hidrológico Nacional), the network of hydrological stations.

The Meteorological Institute (Instituto de Meteorología) operates the national network of weather stations.



## 16. Dominica

	Estimated sectoral water withdrawals (1987)	Water sector profile
	Not available	Area under irrigation (1 000 ha): <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1992 ..... ..</li> </ul> Hydroelectric installed capacity: <ul style="list-style-type: none"> <li>• 1970 ..... 1 MW</li> <li>• 1991 ..... 3 MW</li> </ul> Drinking water supply and sanitation coverage in 1992: <ul style="list-style-type: none"> <li>• urban water supply ..... ..</li> <li>• rural water supply ..... ..</li> <li>• urban sanitation ..... ..</li> <li>• rural sanitation ..... ..</li> </ul>
Population in 1993: 72 000	Mean annual precipitation: 1 966 mm	Total area: 750 km <sup>2</sup>

The Water and Sewerage Act 1989 makes provision for a national water policy and for the granting of an exclusive license to the Dominica Water and Sewerage Company Limited for the development and control of water supply and sewerage facilities in Dominica.

### (a) *Drinking water supply and sanitation*

Under the 1989 Act, the Minister may appoint a Water and Sewerage Advisory Council to advise on the conservation and use of water resources or the sewerage system and sewerage disposal. The functions, powers and duties of the Dominica Water and Sewerage Company Limited are defined in the Act. The Company is responsible for maintaining and developing the waterworks and providing a safe, adequate and reliable water supply.

The Company has been privatized and is scheduled to take over responsibility for sewerage.

The Ministry of Health is responsible for the construction of latrines.

### (b) *Irrigation and drainage*

The Food and Agriculture Organization of the United Nations (FAO) does not report any land under irrigation in Dominica.

### (c) *Hydroelectricity*

The Ministry of Communications and Public Works is responsible for the electricity sector, oversees the electric power utility (Dominica Electricity Services Limited) and is in charge of activities relating to new or less conventional energy generation technologies. The Electricity Supply Act empowers Dominica Electricity Services Limited to change its electricity rates subject to the Ministry of Communications and Works's approval. In those cases where rate changes are not approved, the request is referred to the Public Utilities Commission.

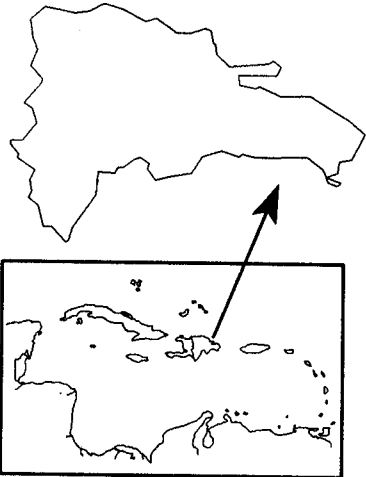
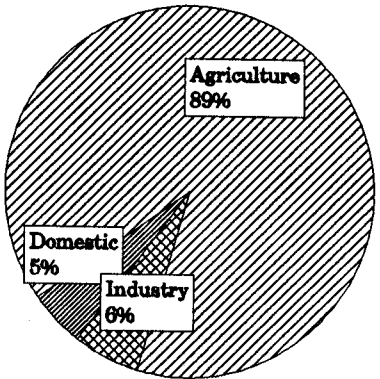
For the formulation of energy policies, the Government has relied on the expert advice of the Economic Affairs Secretariat of the Organization of Eastern Caribbean States (OECS).

At the end of 1987 an Inter-Ministry Energy Committee, composed of representatives of several ministries, was established to coordinate the pricing of energy products.

(d) *Other water uses*

The Ministry of Planning is responsible for environmental issues. The Ministry of Agriculture, through the Department of Forestry and Wildlife, is charged with watershed protection and park and forest management. The Ministry of Tourism has a Natural Resource Management Division. The Ministry of Health is concerned with environmental health.

## 17. Dominican Republic

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 125</li> <li>• 1992 ..... 230</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 16 MW</li> <li>• 1991 ..... 207 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply .... 75 %</li> <li>• rural water supply .... 40 %</li> <li>• urban sanitation ..... 75 %</li> <li>• rural sanitation ..... 38 %</li> </ul>
Population in 1993: 7 542 000	Annual internal renewable water resources: 2 680 m <sup>3</sup> /person	Total area: 48 730 km <sup>2</sup>

The National Water Resources Institute (Instituto Nacional de Recursos Hidráulicos), an autonomous state agency under the Ministry of Agriculture (Secretaría de Estado de Agricultura), is responsible for administering, managing, planning, developing, and regulating water resources.

A proposal for a new water code (proyecto de Código de Agua) is before the National Congress (Congreso Nacional).

### (a) *Drinking water supply and sanitation*

The National Institute for Drinking Water and Sanitation (Instituto Nacional de Agua Potable y Alcantarillado) administers drinking water supply and sewerage networks in rural areas and urban communities except in the two largest cities, Santo Domingo and Santiago, which have separate state-owned utilities. It also coordinates all national activities in the sector.

The Unit for Drinking Water and Wastewater Disposal (Unidad de Agua Potable

y Disposición de Aguas Negras), State Secretariat for Public Health and Social Assistance (Secretaría de Estado de Salud Pública y Asistencia Social) monitors drinking water quality and builds small water systems and latrines in rural communities.

Local Drinking Water Committees (Comites de Agua Potable) help implement the rural water supply programme and operate and maintain the systems.

The Public Works Coordination and Inspection Office (Oficina Coordinadora y Fiscalizadora de las Obras del Estado), a dependency of the Presidency, builds water supply and sewerage systems in connection with the President's housing programme.

The Ministry of Public Works and Communications (Secretaría de Obras Públicas y Comunicaciones) constructs drinking water supply projects in Santo Domingo and in the tourist resort of Sosua.

**(b) *Irrigation and drainage***

Of the 264 thousand hectares estimated to be under irrigation in 1989, 218 thousand were administered by the National Water Resources Institute and 46 thousand by the private sector.

The Government has begun implementing a programme to make irrigation districts financially self-sufficient, and to transfer responsibility for operation and maintenance to the users. Legislation provides for the creation of Water User Associations (*Asociación de Usuarios de Agua*) to enlist active participation of the users in the cleaning and maintenance of the secondary canal systems and in the control and supervision of water management and distribution structures. Associations have been created at the irrigation district level for three projects. Their representatives are elected democratically and employ irrigation professionals. The National Water Resources Institute and the Farm-Level Water Management Project (*Proyecto de Administración de Aguas para Agricultura*) provide technical assistance.

**(c) *Hydroelectricity***

The National Commission for Energy Policy (*Comisión Nacional de Política Energética*) advises on energy planning and policies. The National Planning Office (*Oficina Nacional de*

*Planificación*) also has energy planning responsibilities. Decisions on energy pricing and investment normally are taken by the Presidency. The Directorate for Development and Regulation of the Electrical Energy Industry has responsibility to facilitate private sector participation in electricity generation.

The state-owned Dominican Electricity Corporation (*Corporación Dominicana de Electricidad - CDE*) is responsible for electricity generation, transmission and distribution in the public grid. The National Water Resources Institute is charged with the study, planning, design and execution of hydroelectric generation projects. There is substantial self-generation by industry.

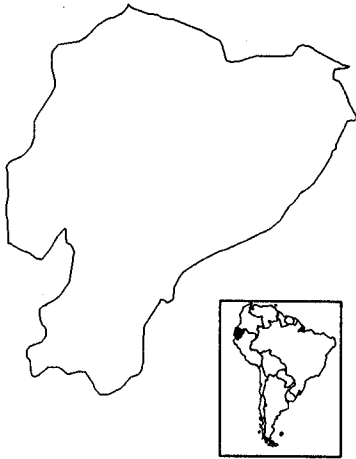
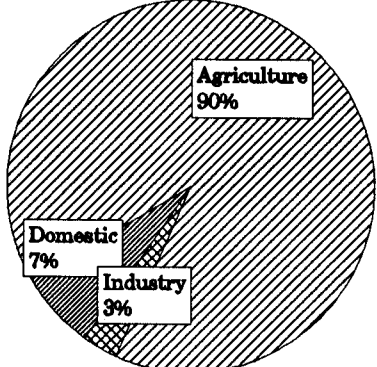
Since the end of 1989, the private sector has been entitled to participate in generation, transmission and distribution of electricity.

**(d) *Other water uses***

The National Water Resources Institute, the Ministry of Agriculture and the Forestry Directorate (*Dirección General Forestal*) share responsibility for river basin management and conservation.

The National Meteorological Office (*Oficina Nacional de Meteorología*) operates and maintains the meteorological network.

## 18. Ecuador

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 470</li> <li>• 1992 ..... 556</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 106 MW</li> <li>• 1991 ..... 1 467 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply .... 79 %</li> <li>• rural water supply .... 45 %</li> <li>• urban sanitation ..... 69 %</li> <li>• rural sanitation ..... 35 %</li> </ul>
Population in 1993: 10 981 000	Annual internal renewable water resources: 28 400 m <sup>3</sup> /person	Total area: 283 560 km <sup>2</sup>

The Ecuadorian Institute for Water Resources (Instituto Ecuatoriano de Recursos Hidráulicos - INERHI) is the principal water management institution. Its substantive activities fall into two broad groups:

- research and planning;
- construction, operation and maintenance of infrastructure works for irrigation, drainage and flood control.

### (a) *Drinking water supply and sanitation*

The Ecuadorian Institute for Sanitary Works (Instituto Ecuatoriano de Obras Sanitarias) is responsible for the planning of the drinking water supply and sanitation sector, setting standards, preparing drinking water supply, sewage and storm drainage projects, securing funding for projects, and managing the construction and maintenance of drinking water supply systems in both urban and rural areas of the country. The Institute encourages the development of local management boards. Such

boards operate mainly in the larger cities, such as Quito and Guayaquil, leaving responsibility for the rural population in the hands of the Institute itself.

The Institute is authorized to support community-level Committees (Juntas) for the Administration of Water Supply Systems in rural communities.

The municipalities are responsible for planning and delivery of various urban services, including drinking water supply and sewerage, and drainage. Municipalities are authorized to establish public companies to provide these services. According to the Municipal Regulation Law, a public municipal company is an entity incorporated by ordinance, with autonomy over administration and assets, to operate on a commercial basis. Fees for services provided may be set only with the approval of the municipal council.

In addition to drinking water supply and sanitation, municipal governments together with

regional development corporations and provincial councils provide a great deal of the basic physical infrastructure needs including drainage and other public works for low-income communities in both urban and rural areas.

The Ecuadorian Development Bank (Banco Ecuatoriano de Desarrollo) provides technical and financial assistance to municipalities for infrastructure projects.

#### (b) *Irrigation and drainage*

The Ministry of Agriculture and Livestock (Ministerio de Agricultura y Ganadería), the Ministry for Social Welfare (Ministerio de Bienestar Social), through the Rural Development Undersecretariat (Sub Secretaría de Desarrollo Rural), and the National Development Council are the main policy-making agencies overseeing agricultural and rural development. A number of semi-autonomous agencies are responsible for planning and implementing water-related development programmes. INERHI is in charge of the planning, operation and maintenance of irrigation and drainage systems.

Regional development corporations have been increasingly involved in the planning, implementing, and managing of a wide array of irrigation, drainage and flood control schemes. The Ecuadorian Land Reform and Settlement Institute (Instituto Ecuatoriano de Reforma Agraria y Colonización) is in charge of land reform, colonization and land titling. The National Development Bank (Banco Nacional de Fomento) is the major source of financing for the agricultural sector, although several private commercial banks and saving and loan associations also provide credit to the sector.

User organizations, known as Irrigation and Drainage Commissions (Comisiones de Riego y Drenaje) construct and maintain water regulation and distribution works within irrigation and drainage schemes constructed with public funds. Their establishment is

approved by INERHI which also supervises them and monitors compliance with the objectives and functions for which they were created. Annual tentative or alternative cultivation and irrigation plans are formulated jointly by the Institute and the Commissions together with the local departments (direcciones) of the Ministry of Agriculture and Livestock.

Privately built canal systems are managed by user associations known as Water Directorates (Directorio de Aguas). These are responsible for the distribution of water, the operation of control structures and water conservation. The officers, the Water Council (Consejo de Aguas) are elected by the owners of water rights at the General Membership Meeting (Junta General). Their regulations are also approved by INERHI and they are subject to the technical, legal and administrative dispositions imparted by it.

#### (c) *Hydroelectricity*

The Ecuadorian Electrification Institute (Instituto Ecuatoriano de Electrificación - INECEL) has overall responsibility for the supply of electricity. It prepares and implements the National Electrification Plan (Plan Nacional de Electrificación). INECEL has a monopoly on electricity generation, transmission and distribution, but it can authorize private operation. Practically all distribution companies are private corporations, with INECEL as the largest shareholder and the balance of the shares owned mainly by the municipalities.

Work on a restructuring and privatization plan for the electricity sector is under way. It is expected that reform would develop along the following lines: INECEL would be divided and sold; new private investment in generation would be encouraged; the distribution companies would be merged into larger and more manageable units and privatized; the national transmission system

would be separated into a separate company, either autonomous or owned by the distribution companies; a regulatory agency and system would be introduced to maintain the tariff system and to establish the ground rules for competition and to lower costs.

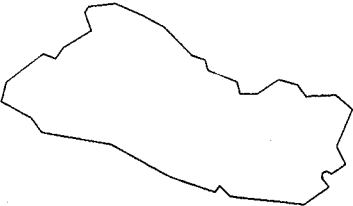
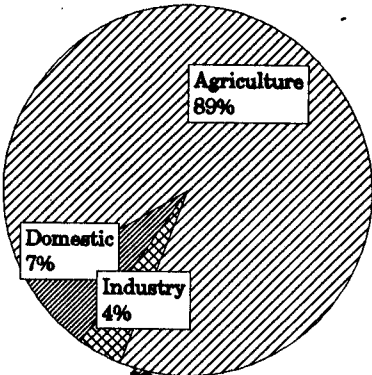
(d) *Other water uses*

The President's Environmental Advisory Commission (Comisión Asesora Ambiental de la Presidencia de la República - CAAM),

established in 1993, is responsible for the systematization of environmental management in Ecuador, through the promotion of policies and establishment of mechanisms capable of lessening conflicts and coordination of the allocation of resources for environmental programmes and policies.

The National Meteorology and Hydrology Institute (Instituto Nacional de Meteorología e Hidrología) is responsible for the meteorology and hydrology networks.

## 19. El Salvador

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 20</li> <li>• 1992 ..... 120</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 108 MW</li> <li>• 1991 ..... 406 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply ..... 95 %</li> <li>• rural water supply ..... 16 %</li> <li>• urban sanitation ..... 91 %</li> <li>• rural sanitation ..... 53 %</li> </ul>
Population in 1993: 5 517 000	Annual inter renewable water resources: 10 m <sup>3</sup> /person	Total area: 21 040 km <sup>2</sup>

The Ministry of Economic and Social Development Planning and Coordination (Ministerio de Planificación y Coordinación del Desarrollo Económico y Social - MIPLAN) ensures the coordination of the plans and investments of all institutions involved in water management and regulates the use of all water resources.

The Water Resources Protection Executive Committee (Comité Ejecutivo Protector de los Recursos Hídricos) acts in an advisory capacity to all government institutions involved in water-related activities.

### (a) *Drinking water supply and sanitation*

The National Water Works and Sewerage Administration (Administración Nacional de Acueductos y Alcantarillados - ANDA) is responsible for the provision of water services and sanitation facilities to towns with population above 2 000 persons and to rural villages with under 300 residents. Towns with

populations between 300 and 2 000 are served by local Water Administration Committees within the National Basic Rural Sanitation Plan (Plan Nacional de Saneamiento Básico Rural - PLANSABAR), Ministry of Public Health and Welfare (Ministerio de Salud y Asistencia Social).

The National Committee of Drinking Water and Sanitation Agencies (Comité Nacional de Instituciones de Agua Potable y Saneamiento - CONIAPOS) determines policy for the sector.

### (b) *Irrigation and drainage*

The Irrigation and Drainage Bureau (Dirección General de Riego y Drenaje) is concerned with irrigation and drainage.

### (c) *Hydroelectricity*

The main institutions involved in the energy sector are the Lempa River Executive



Commission (Comisión Ejecutiva Hidroeléctrica del Río Lempa - CEL) and the Direction of Energy, Mining and Hydrocarbons (Dirección de Energía, Minas e Hidrocarburos - DEMH) under the Ministry of Economic Affairs (Ministerio de Economía).

The responsibilities of CEL include electricity generation and transmission at the national level, as well as distribution in some towns.

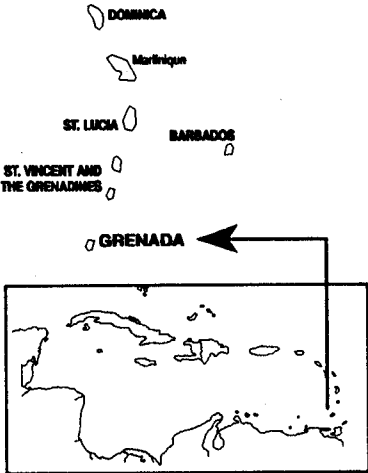
Tariffs are fixed and approved by the Ministry of Economic Affairs in accord with the formulation and proposal made by CEL.

Electricity distribution and commercialization in the capital city and other important towns until a few years ago was the responsibility of six distribution companies. When their concessions expired in 1986, four were acquired by the government and are now administered by CEL.

(d) *Other water uses*

The Meteorological and Hydrological Service (Servicio Meteorológico e Hidrológico) is responsible for the operation of the hydrological and meteorological networks.

## 20. Grenada

	Estimated sectoral water withdrawals (1987)	Water sector profile
	Not available	<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1992 ..... ..</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1991 ..... ..</li> </ul> <p>Drinking water supply and sanitation coverage in 1990:</p> <ul style="list-style-type: none"> <li>• urban water supply ..... 80 %</li> <li>• rural water supply ..... ..</li> <li>• urban sanitation ..... 95 %</li> <li>• rural sanitation ..... ..</li> </ul>
Population in 1993: 91 000	Mean annual precipitation: 1 000 - 3 700 mm	Total area: 340 km <sup>2</sup>

Responsibility for water resources is shared between several agencies, including the Ministry of Health, the National Water and Sewerage Authority, and the Ministry of Agriculture.

### (a) *Drinking water supply and sanitation*

Grenada's National Water and Sewerage Authority is responsible for developing, operating, and maintaining drinking water supply and sewerage systems on the island.

### (b) *Irrigation and drainage*

The Food and Agriculture Organization of the United Nations (FAO) does not report any land under irrigation in Grenada.

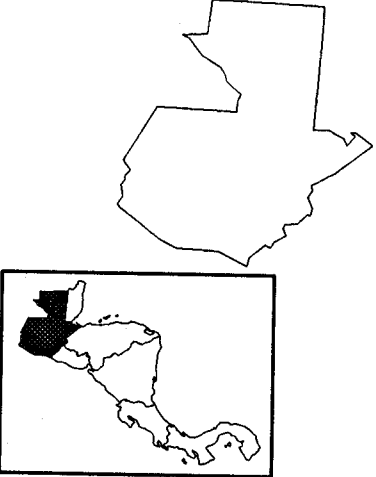
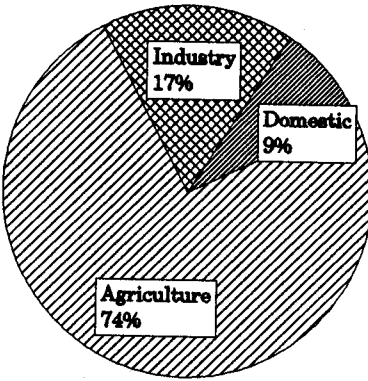
### (c) *Hydroelectricity*

The Statistical Division of the Department of Economic and Social Information and Policy Analysis of the United Nations does not report any hydroelectric generation capacity in Grenada.

### (d) *Other water uses*

The Ministry of Health is responsible for environmental protection.

## 21. Guatemala

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 56</li> <li>• 1992 ..... 125</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 96 MW</li> <li>• 1991 ..... 438 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply .... 84 %</li> <li>• rural water supply .... 51 %</li> <li>• urban sanitation ..... 82 %</li> <li>• rural sanitation ..... 64 %</li> </ul>
Population in 1993: 10 030 000	Annual internal renewable water resources: 11 900 m <sup>3</sup> /person	Total area: 108 890 km <sup>2</sup>

The Secretariat of Water Resources (Secretaría de Recursos Hidráulicos), created in 1992, is charged with coordinating actions and activities of water resource agencies. Its principal responsibilities include the establishment of a coherent national water resources policy, the formulation and development of a National Water Plan (Plan Hídrico Nacional), the elaboration of a water inventory and survey, as well as the administration of the national water resources.

The General Water Law Bill (anteproyecto de Ley General de Aguas), under discussion in parliament, provides for the creation of a National Water Institute (Instituto Nacional del Agua).

### (a) *Drinking water supply and sanitation*

The Executing Unit of the Xayá-Pixcayá National Water System (Unidad Ejecutora del Acueducto Nacional Xayá-Pixcayá), which is under the authority of the Ministry of Communications, Transport and Public Works

(Ministerio de Comunicaciones, Transportes y Obras Públicas), supplies water from the Xayá-Pixcayá reservoir. Drinking water supply and sewerage services in Guatemala City are provided by the Municipal Water Company of the Guatemala City (Empresa Municipal de Agua de la Ciudad de Guatemala) and the private Mariscal Water Company (Compañía del Agua del Mariscal S.A.).

Outside Guatemala City, the Water Works and Sewerage Department (Departamento de Acueductos y Alcantarillados) of the Bureau of Public Works (Dirección General de Obras Públicas), in the Ministry of Communications, Transport and Public Works, is responsible for the study and design of drinking water supply and sewerage systems in urban areas and in some rural localities.

The Institute for Municipal Development (Instituto de Fomento Municipal - INFOM) is responsible for financing and for the design and building of

water supply and sewerage systems. The municipalities operate and maintain the systems.

Rural drinking water supply and sanitation are the responsibility of two units of the Ministry of Public Health and Welfare (Ministerio de Salud Pública y Asistencia Social) - the Office of Environmental Health (División de Saneamiento del Medio) of the General Division of Health Services (División General de Servicios de Salud) and the Executing Unit for Rural Waterworks (Unidad Ejecutora de Acueductos Rurales). The General Division of Health Services programmes, coordinates and supervises activities related to the improvement of environmental sanitation. The Ministry of Public Health and Welfare is also concerned with drinking water quality.

The Permanent Coordination Committee for Drinking Water and Sanitation (Comité Permanente de Coordinación de Agua Potable y Saneamiento) coordinates activities of the different agencies.

The Ministry of Urban and Rural Development (Ministerio de Desarrollo Urbano y Rural) also is concerned with the drinking water supply and sanitation sector.

#### (b) *Irrigation and drainage*

The Ministry of Agriculture, Livestock and Food Distribution (Ministerio de Agricultura, Ganadería y Alimentación) is charged with the inventory, registration, control, development and protection of the water resources related to agriculture. The Technical Office for Irrigation and Land Reclamation (Dirección Técnica de Riego y Avenamiento) under the Bureau of Agricultural Services (Dirección General de Servicios Agrícolas) is responsible for the use of surface water for irrigation.

#### (c) *Hydroelectricity*

The Ministry of Energy and Mining (Ministerio de Energía y Minas - MEM) is in charge of national energy planning and coordination and plays an important mediating role between the utilities.

The National Electrification Institute (Instituto Nacional de Electrificación - INDE) is a state-owned national utility responsible for power generation and transmission. Tariffs are established in coordination between INDE and MEM. Other responsibilities of INDE include the conservation and defence of the water resource, the protection of river basins, and the implementation with the Ministry of Agriculture, Livestock and Food Distribution of integrated water resources development programmes for irrigation and hydroenergy generation.

The Guatemalan Electric Company (Empresa Eléctrica de Guatemala S.A. - EEGSA), a subsidiary of INDE, is in charge of electricity distribution and commercialization in Guatemala City and departments of the central region of the country.

There are small municipal and investor-owned utilities, which mostly buy from INDE, although they have some generation capacity.

An Executive Accord which contains important changes in the electric sector of Guatemala has recently come into force. The accord abolishes the state monopoly in the electric sector. It mandates INDE to promote participation of private national and foreign interests in the development of the sector. INDE may sell and purchase power produced by any independent generator or co-generator.

It can participate in the formation of corporations that will have, as their main purpose, the generation, transmission, distribution and commercialization of power. INDE will render technical assistance to any private investor.

In addition, INDE may sell assets and properties to private parties. The sale of several hydroelectric facilities has been announced. The will also sell a substantial amount of its shares in the Guatemalan Electric Company.

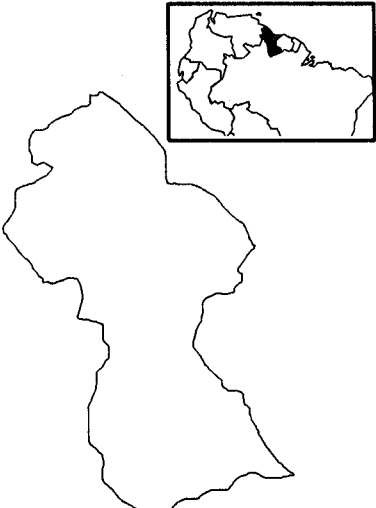
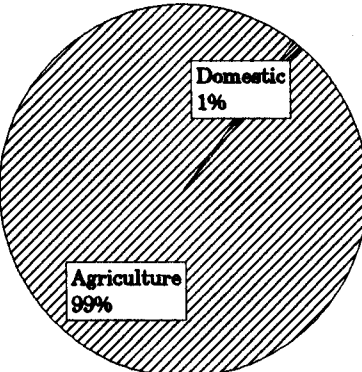
(d) *Other water uses*

The National Environmental Commission  
(Comisión Nacional del Medio

Ambiente - CONAMA), created under the Environment Protection and Improvement Law (Ley de Protección y Mejoramiento del Medio Ambiente), provides recommendations and coordinates all actions related to the formulation and application of the national policy for the protection and improvement of the environment.

The National Institute of Seismology, Volcanology, Meteorology and Hydrology (Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología) under the Ministry of Communications, Transport and Public Works, is responsible for carrying out basic studies on water resources and for the hydrological and meteorological networks.

## 22. Guyana

	<b>Estimated sectoral water withdrawals (1987)</b>	<b>Water sector profile</b>
Population in 1993: 819 000		Area under irrigation (1 000 ha): • 1970 ..... 115 • 1992 ..... 130  Hydroelectric installed capacity: • 1970 ..... • 1991 ..... 2 MW  Drinking water supply and sanitation coverage in 1992: • urban water supply ... 100 % • rural water supply .... 75 % • urban sanitation ..... 87 % • rural sanitation ..... 30 %
	Annual internal renewable water resources: 298 270 m <sup>3</sup> /person	Total area: 214 970 km <sup>2</sup>

The Ministry of Public Works, Communications and Regional Development has responsibility for establishing water sector policy.

### (a) *Drinking water supply and sanitation*

The Guyana Water Authority, under the policy direction of the Ministry of Public Works, Communications and Regional Development, has primary responsibility for sector planning and control. Responsibility for sewerage and sanitation activities lies with the Ministry of Health.

Since 1984, responsibility for provision of water services belongs to the Regional Democratic Councils. The Guyana Water Authority, has responsibility to control and monitor the Councils, while they are accountable to the Authority for carrying out an agreed operations and maintenance plan. Tariffs must be approved by the Minister of Public

Works, Communications and Regional Development as the chairperson of the Guyana Water Authority.

The Guyana Water Authority performs maintenance services, equipment repairs and rental, and specialized services such as well drilling for sector agencies and the private sector.

The Georgetown Sewerage and Water Commissioners operates the drinking water supply system in the city of Georgetown and its environs, the New Amsterdam Town Council operates the system in the city of New Amsterdam, the Sugar Industry Labour Welfare Fund Committee operates the systems on sugar estates and the Linden Mining Company provides water for the bauxite mining area.

The Government Analyst laboratory at the Ministry of Health, monitors water quality.

The municipalities are responsible for the construction, operation and maintenance of urban drainage systems.

**(b) *Irrigation and drainage***

Except for the sugar estates, all areas with fully developed drainage and irrigation facilities are classified as Declared Drainage and Irrigation Areas administered by the Regional Democratic Councils. The only exception is the Mahaica-Mahaicony-Abary system managed by an independent water authority.

The Ministry of Agriculture through the Hydraulics Department is responsible for the country's drainage and irrigation policy (this department is also responsible for sea defenses), including the formulation and implementation of new investments and the rehabilitation of existing schemes.

Water Conservancy Boards are responsible for maintenance of the conservancies and the release of water from the conservancies.

Management of each of the two main water conservancies, Boerasirie and East Demerara are the responsibility of a Conservancy Board. These Boards are responsible for sharing of water among the Declared Drainage and Irrigation Areas and the sugar estates, the operation of the reservoir, the maintenance of the dams and head regulators, and openings of these regulators. Each Board is supervised by a council comprising four members: the Chief Engineer of the Ministry of Agriculture's Hydraulics Department, the Chairperson of the Guyana Sugar Corporation and two private farmers.

The regions and the Mahaica-Mahaicony-Abary Agricultural Development Authority are responsible for determining each year what major maintenance work needs to be undertaken and preparing

budgetary estimates for the costs involved. The Ministry of Agriculture has to approve these estimates and provide a subsidy towards these works; the rest of the costs are supposed to be met through charges to water users. The Regional Democratic Councils do not themselves collect the water users' share of costs, this is the responsibility of the local authorities. Local authorities are required by the Drainage and Irrigation Act to assess the level of the drainage and irrigation rates on Declared Drainage and Irrigation Areas and levy charges on landowners.

**(c) *Hydroelectricity***

The main institutions in the energy sector include the Guyana Natural Resources Agency, the Guyana Electricity Corporation (GEC), the Guyana Forestry Commission, and the Guyana Oil Company, Ltd.

GEC, a public enterprise, is responsible for the generation, transmission and distribution of electricity in most populated areas. There is also substantial self-generation by industries.

The Hydropower Unit in the Guyana Water Resources Agency is responsible for investigating hydropower sites throughout Guyana.

**(d) *Other water uses***

The Guyana Agency for Health Sciences Education, Environment and Food Policy is charged with the development of a national environmental policy, environmental monitoring and co-ordination, and training. Development of natural resources, including mining, energy, fossil fuel development and forestry is the responsibility of the Guyana Natural Resources Agency.

The Inter-Agency Committee on Environment and Development has been given the responsibility for the formulation of national

environmental policies and plans. The Advisory Environmental Council has responsibility for coordinating ministries in environmental matters.

The Hydrometeorology Department of the Ministry of Agriculture has the responsibility for the monitoring and assessment of surface and ground water resources and for providing basic meteorological information.

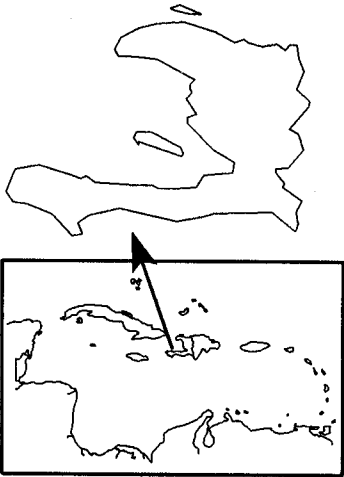
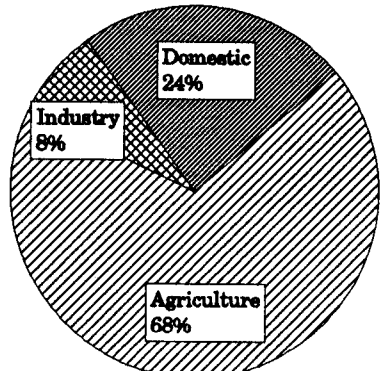
The Ministry of Public Works, Communications and Regional Development

has overall responsibility for the planning, construction, improvement, operation and regulation of the transport sector, including through its Transport and Harbours Department for ports, shipping and river transport.

The Fisheries Department of the Ministry of Agriculture is responsible for the management regulation and promotion of sustainable exploitation and development of fishery resources.



## 23. Haiti

	<b>Estimated sectoral water withdrawals (1987)</b>	<b>Water sector profile</b>
Population in 1993: 6 893 000		Area under irrigation (1 000 ha): • 1970 ..... 60 • 1992 ..... 75  Hydroelectric installed capacity: • 1970 ..... • 1991 ..... 70 MW  Drinking water supply and sanitation coverage in 1992: • urban water supply .... 55 % • rural water supply .... 34 % • urban sanitation ..... 43 % • rural sanitation ..... 16 %
	Annual internal renewable water resources: 1 630 m <sup>3</sup> /person	Total area: 27 750 km <sup>2</sup>

### (a) *Drinking water supply and sanitation*

The Ministry of Public Works, Transport and Communications (Ministère des Travaux Publics, Transports et Communications) is responsible for the overall management of the sector. Under this Ministry, the Autonomous Metropolitan Drinking Water Company (Centrale Autonome Métropolitaine d'Eau Potable), is responsible for services in Port-au-Prince and the National Drinking Water Service (Service National d'Eau Potable - SNAP), for services in the remainder of the country.

The Ministry of Health finances and constructs drinking water supply and sanitation facilities in small rural communities. Once completed, these systems are turned over to SNAP for operation and maintenance.

### (b) *Irrigation and drainage*

The Ministry of Agriculture, Natural Resources and Rural Development (Ministère de

l'Agriculture, des Ressources Naturelles et du Développement Rural) is responsible for the promotion of agriculture, for the conservation and utilization of natural resources, and for rural development.

Regional development organizations, such as the Organization for the Development of the Artibonite Valley (Organisme de Développement de la Vallée de l'Artibonite), the Organization for the Development of the Gonaïves Plain (Organisme de Développement de la Plaine des Gonaïves), the Artibonite River Basin Development Agency (Organisme de Développement du Bassin du Fleuve Artibonite), the Organization for the Development of the North (Organisme de Développement du Nord), etc.; and credit institutions, the Agricultural and Industrial Development Bank and the Agricultural Credit Bureau report to this Ministry.

The Directorate of Natural Resource (Direction des Ressources Naturelles) operates and maintains all public irrigation systems

through the Irrigation and Rural Engineering Service (Service des Irrigations et du Génie Rural). The service participates in planning especially of the small systems, while some of the larger systems are under the jurisdiction of specialized semi-autonomous regional organizations, such as the Organization for the Development of the Artibonite Valley and the Organization for the Development of the Gonaïves Plain.

The Water Resources Service is primarily concerned with data collection and the Watershed Management Service (Service d'Aménagement de Bassins Versants) is responsible for watershed management, including surveying and inventory of soil conservation programmes and assistance to peasants in implementing conservation work at the farm level.

Most irrigation systems are under the administrative control of the Irrigation and Rural Engineering Service. However, because of the Ministry's financial constraints, rehabilitation and maintenance operations are taking place under the auspices of other autonomous agencies operating with donor support: the Organization for the Development of the Artibonite Valley, the Organization for the Development of the Gonaïves Plain, the Organization for the Development of the North, etc.

#### (c) *Hydroelectricity*

The Electricity of Haiti (Electricité d'Haïti - EdH), an autonomous Government company, is the sole body responsible for electric power generation, transmission and retail distribution in the country. The Minister

of Public Works, Transport and Communications acts as the Chairperson of EdH's Board of Directors. Policy directives are set by the Minister of Public Works, Transport and Communications; the Board approves major investment plans, borrowings and policies, as well as electricity tariffs.

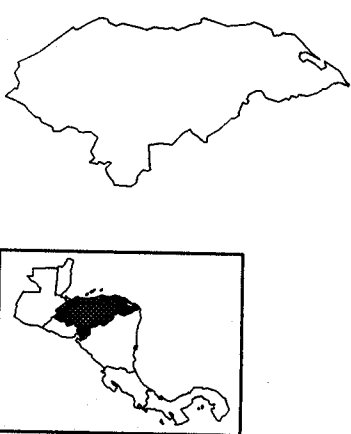
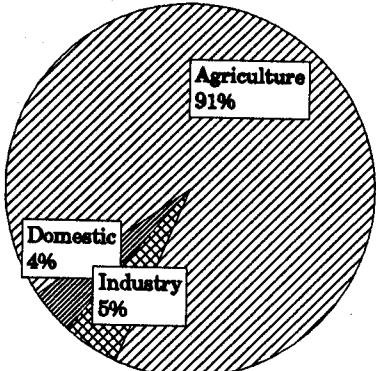
#### (d) *Other water uses*

The Ministry of Agriculture, Natural Resources and Rural Development has prime responsibility for protecting natural resources, but conservation policy rests with the Institute for the Safeguard of the National Patrimony (Institut de Sauvegarde de la Patrimoine Nationale), under the Ministry of Education.

The main duties of the Environmental Protection Service (Service de Protection de l'Environnement) of the Ministry of Agriculture, Natural Resources and Rural Development include the protection of endangered plant and animal species and valuable ecosystems, undertake baseline studies on natural resources, make recommendations on the establishment of parks and other reserved areas and to participate in the realization of environment impact studies of development projects and regional planning studies. It also has responsibilities for pollution prevention and protection.

The Artibonite River Basin Development Agency was created in 1982 with responsibilities to plan, program, coordinate, finance, administer and monitor development in all the Artibonite river basin except the delta which is managed by the Organization for the Development of the Artibonite Valley. At present, it has ceased operations.

## 24. Honduras

	Estimated sectoral water withdrawals (1987)	Water sector profile
Population in 1993: 5 336 000		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 70</li> <li>• 1992 ..... 92</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 30 MW</li> <li>• 1991 ..... 130 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply .... 90 %</li> <li>• rural water supply ..... 54 %</li> <li>• urban sanitation ..... 91 %</li> <li>• rural sanitation ..... 45 %</li> </ul>
	Annual internal renewable water resources: 11 610 m <sup>3</sup> /person	Total area: 112 090 km <sup>2</sup>

Water management is based on the 1927 National Waters Act and on the 1906 Civil Code. Other laws such as the National Aqueduct and Sewers Law, the Agrarian Reform Law, the Sanitary Code, and the Forestry Law also regulate different aspects of water management. Various projects have been formulated to update the water law. The latest has recently been withdrawn from Congress for revision.

Authority to manage the different uses of water is granted to the Ministry of Natural Resources (Ministerio de Recursos Naturales). There is a National Committee for Water Resources (Comité Nacional de Recursos Hídricos), formed by the Ministry of Natural Resources, the Autonomous National Water Works and Sewerage Service (Servicio Autónomo Nacional de Acueductos y Alcantarillados - SANAA), the Ministry of Communications, Public Works and Transport (Ministerio de Comunicaciones, Obras Públicas y Transporte - SECOPT) and the National Electric Power Company (Empresa Nacional de

Energía Eléctrica - ENEE). The National Commission for the Regulation of Public Services (Comisión Nacional Supervisora de Servicios Públicos - CNSSP) regulates and controls public utilities.

### (a) *Drinking water supply and sanitation*

The government has announced that the responsibility for the drinking water supply and sanitation will be transferred to the municipalities.

SANAA has been responsible for drinking water supply and sanitation services for communities with populations of over 500. The Service has a special unit concerned with executing projects in poor neighborhoods (Unidad Ejecutora Barrios Marginados).

Many municipalities, however, administer their own systems. Rural water works administrative boards manage their water supply systems. They are assisted by SANAA.

Smaller villages are serviced by the Division of Environmental Health, under the Ministry of Public Health and Social Assistance (Ministerio de Salud Pública y Asistencia Social).

The Ministry of Public Health and Social Assistance, through the Environmental Sanitation Programme (Programa de Saneamiento Ambiental), promotes community participation in drinking water supply and small aqueducts projects, wastewater disposal and sanitation.

The Honduran Social Investment Fund (Fondo Hondureño de Inversión Social - FHIS) finances social and economic infrastructure, social services, and other projects, including the installation of water and sewage systems, water tanks, and latrines. The final owner of the project, SANAA or the municipality, is required to provide for cost recovery and maintenance. FHIS has organized the formation of local water committees.

#### *(b) Irrigation and drainage*

The Ministry of Natural Resources, through the Office of Water Resources and the Natural Resources Management Project, is responsible for irrigation and drainage programmes, as well as for the management and conservation of the Choluteca river basin. The Honduran Corporation for Forestry Development (Corporación Hondureña de Desarrollo Forestal - CONDEFOR), together with the Ministry of Natural Resources, is responsible for river basin management and conservation. SECOPT, through its Bureau of Civil Engineering Works (Dirección General de Obras Civiles), is responsible for flood, erosion and silting control.

#### *(c) Hydroelectricity*

The National Energy Commission (Comisión Nacional de Energía - CNE) is charged with the

elaboration of an adequate framework for the operation of the energy sector. It coordinates plans, policies and strategies in the energy sector. The Energy Department of the Council for Economic Planning (Consejo Superior de Planificación Económica) is charged with the elaboration of national energy balances to facilitate an integrated approach to energy policy.

The Secretariat of Planning, Coordination and Budget (Secretaría de Planificación, Coordinación y Presupuesto - SECPLAN) is responsible for overseeing energy plans. ENEE is responsible for electricity generation, transmission and distribution and commercialization.

CONDEFOR has the specific responsibility for managing basins containing hydroelectric projects.

Sector reform is under consideration. Private, public and mixed capital companies will be allowed to operate in the sector subject to the same norms and regulations. The existing generation and transmission infrastructure would be the property of, and operated by, the state-owned Electric Energy Company (Empresa de Energía Eléctrica, S.A. - EDEESA), successor to ENEE. EDEESA would be in charge of the coordination of the operation of the generation and transmission facilities connected to the national interconnected system.

#### *(d) Other water uses*

CONDEFOR has responsibilities for watershed management. Other involved agencies include ENEE, SANAA, the Ministry of Natural Resources and the Municipal Division for Waters (División Municipal de Aguas).

The National Environmental and Development Commission (Comisión Nacional del Medio Ambiente y Desarrollo - CONAMA),

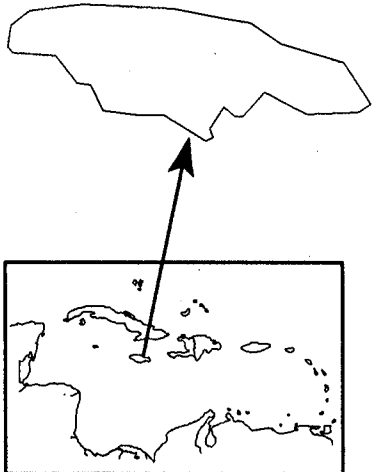
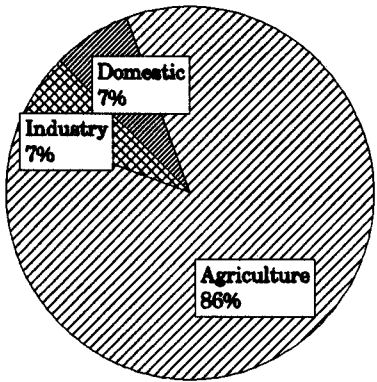
created in 1990, has advisory functions and is responsible for the promotion of the adequate management of natural resources and the protection and improvement of the environment.

The National Commission for the Conservation of Forests, Reforestation and Protection of Basins of Rivers, Lakes and

Lagoons (Comisión Nacional de Preservación de los Bosques, Reforestación y Protección de las Cuencas de los Ríos, Lagos y Lagunas) promotes forest conservation, reforestation and the protection of water courses.

The National Meteorological Service (Servicio Meteorológico Nacional) operates the meteorological network.

## 25. Jamaica

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 24</li> <li>• 1992 ..... 35</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 21 MW</li> <li>• 1991 ..... 20 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply ..... 92 %</li> <li>• rural water supply ..... 48 %</li> <li>• urban sanitation ..... 89 %</li> <li>• rural sanitation ..... 59 %</li> </ul>
Population in 1993: 2 508 000	Annual internal renewable water resources: 3 360 m <sup>3</sup> /person	Total area: 10 990 km <sup>2</sup>

Legislation is presently before Parliament to provide for a unified organizational framework for the administration of all surface and groundwater resources, with one Authority having overall responsibility.

### (a) *Drinking water supply and sanitation*

The National Water Commission, under the Ministry of Local Government, is responsible for planning, construction and operation of drinking water supply and sanitation works. Decisions on major drinking water supply and sanitation investments are made, however, at the cabinet level.

The Commission operates the drinking water supply and sewerage facilities for Kingston Metropolitan area and other cities. Responsibility for operation and maintenance of water supply systems in rural areas is now delegated to the local parish councils.

The Caribbean Engineering Corporation Limited, a parastatal agency

constructs the large projects, and the Urban Development Corporation, is in charge of urban infrastructure development.

The possibilities for private sector involvement in the drinking water supply and sewerage sector operations have been enhanced by the Government's recent decision to divest certain functions of the National Water Commission.

The Water Quality Monitoring System of the Ministry of Health monitors the quality of water provided.

### (b) *Irrigation and drainage*

The Ministry of Agriculture has responsibility to manage rural land use, irrigation, agricultural extension and agriculture-related infrastructure.

A comprehensive irrigation programme is implemented in the Mid-Clarendon Irrigation Authority of the National Irrigation Commission (NIC). This project includes the

rehabilitation of irrigation infrastructure in the Clarendon plains, as well as the implementation of measures such as a system of water charges. Other aspects of the project included the organization of water users' associations to take over operation and maintenance functions (this will serve as a pilot activity for an extended government support programme for the eventual management of irrigation and drainage facilities by farmers) and the provision of extension and training support from the Rural Agriculture Development Authority (RADA) and the Sugar Industry Research Institute (SIRI).

#### (c) *Hydroelectricity*

The Ministry of Public Utilities, Transport and Energy coordinates energy sector policies and plans with the Planning Institute of Jamaica to ensure integration of sector planning within national economic planning and macroeconomic policies.

The Jamaica Public Service Company Limited (JPSCo) has the sole responsibility for the generation, transmission and distribution of electricity for public supply. There are a number of private independent generators of electricity who produce power for their own consumption and, in some cases, for the national grid.

A Steering Committee for Private Sector Participation in the Energy Sector, headed by the Minister of Public Utilities, Transport and Energy, has been established in an effort to increase private sector participation in the energy sector.

Two studies have recently been commissioned to determine the framework for privatization of the electric power sector. In addition, an energy sector privatization fund supported by the World Bank, the Inter-American Development Bank and the European Investment Bank has been created to encourage investors by providing capital for commercial energy projects.

The build, own and operate scheme run by the JPSCo, which aims to expand electricity generating capacity through joint ventures with private companies, has attracted positive responses from foreign investors. The government is now looking for a foreign energy company to acquire JPSCo's entire energy-generating capacity.

#### (d) *Other water uses*

The Natural Resources Conservation Authority (NRCA), under the Ministry of Tourism and Environment, a statutory body, has responsibility for overall management and conservation of Jamaica's environment and natural resources. The Authority has the power to establish policies, promulgate regulations and standards and to develop and implement strategies to achieve them. It is the technical source for environmental standards, regulations, and guidelines, as well as the focal point for the interpretation and enforcement of environmental decisions.

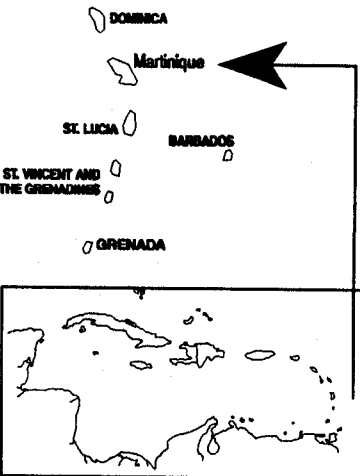
NRCA is also charged with promoting public awareness of Jamaica's ecosystems and their importance to social and economic well-being and with the management of the national parks, marine parks, protected areas, and public recreation facilities.

NRCA has published Interim Standards (Air and Water Quality).

NRCA also has overall responsibility for watershed conservation along with the National Water Commission, the Forestry and Soil Conservation Department and the Underground Water Authority. NRCA monitors land use, deforestation, illegal sand mining, possible flooding and the uncontrolled use of fire.

A framework for a national environmental policy has been established under the Jamaica National Environmental Action Plan (JANEAP).

## 26. Martinique

	<b>Estimated sectoral water withdrawals (1987)</b>	<b>Water sector profile</b>
Population in 1993: 371 000	Not available	Area under irrigation (1 000 ha): • 1970 ..... 1 • 1992 ..... 4  Hydroelectric installed capacity: • 1970 ..... ... • 1991 ..... ...  Drinking water supply and sanitation coverage in 1992: • urban water supply ..... • rural water supply ..... • urban sanitation ..... • rural sanitation .....
	Mean annual precipitation: 1 850 mm	Total area: 1 100 km <sup>2</sup>

### (a) *Drinking water supply and sanitation*

The Société Martiniquaise des Eaux is responsible for drinking water supply and sanitation.

### (b) *Irrigation and drainage*

No information is available on the institutions involved in the administration of irrigation and drainage.

### (c) *Hydroelectricity*


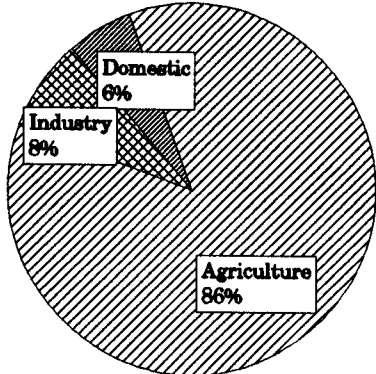
The Statistical Division of the Department of Economic and Social Information and Policy Analysis of the United Nations does not report any hydroelectric generation capacity in Martinique.

### (d) *Other water uses*

The Meteorological Centre operates the meteorological network.



## 27. Mexico

	Estimated sectoral water withdrawals (1987)	Water sector profile
Population in 1993: 90 031 000		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 3 583</li> <li>• 1992 ..... 6 100</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 3 326 MW</li> <li>• 1991 ..... 7 837 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply ..... 90 %</li> <li>• rural water supply ..... 66 %</li> <li>• urban sanitation ..... 81 %</li> <li>• rural sanitation ..... 29 %</li> </ul>
	Annual internal renewable water resources: 4 050 m <sup>3</sup> /person	Total area: 1 958 200 km <sup>2</sup>

The National Water Commission (Comisión Nacional del Agua - CNA), under the Ministry of Agriculture and Water Resources (Secretaría de Agricultura y Recursos Hidráulicos - SARH), was established in 1989 as the sole authority for national water management.

According to the Law for National Waters (Ley de Aguas Nacionales) of 1992, the Secretary of Agriculture and Water Resources (Secretario de Agricultura y Recursos Hidráulicos) proposes a national water resources policy and acts as the President of the Technical Council (Consejo Técnico) of CNA.

The responsibilities of CNA include, *inter alia*:

- To formulate, update and monitor the compliance with the national water programme (programa nacional hidráulico).
- The establishment of criteria and guidelines to ensure the

harmonization and coherency of the federal government actions in the field of water resources. To ensure and monitor the coherence between the respective programmes and the allocation of funds for the their execution.

- To promote and support the development of drinking water supply and sewerage systems; sanitation and wastewater treatment and reuse systems; irrigation and drainage systems; and flood control works.
- To administer and protect national waters and resources under its jurisdiction, to protect and control their quality. To promote riverbasin management.
- To programme, study, construct, operate, conserve and maintain, directly or through contracts or concessions, the federal water infrastructure.

- To grant concessions, assignments and authorizations under the Law for National Waters.

Under the Law for National Waters, it is considered to be in the public interest to promote and encourage private participation in the financing, construction and operation of hydraulic infrastructure, as well as in the provision of services. There has been growing private participation in the water sector in recent years, especially in investments in drinking water supply systems and sewage treatment plants.

The Law authorizes CNA to establish Riverbasin Councils (Consejos de Cuenca) as advisory bodies for coordinating and facilitating cooperation between the commission, other federal agencies, state or municipal agencies and user representatives to formulate and execute programmes and activities for the improvement of water management, the development of hydraulic infrastructure and related services and programmes for the conservation of resources of a riverbasin. One Council, in the Lerma-Chapala basin, has already been established. Currently, the formation of councils for the Río Bravo (Rio Grande) and for the Mexico valley are under negotiation.

Under the Federal Water Rights Law (Ley Federal de Derechos en Materia de Aguas) of 1993, the users of national waters must pay for the right of use. The level of the charges depends on several factors, including the volume of the water extracted, the point of extraction and the use. The law also establishes payments for the processing and issuance of the assignment or concession titles for water use, of discharge permits, and for any modification to titles and permits; payments for the use of the public property such as the shore and river beds; and payments for the discharge of wastewater.

#### (a) *Drinking water supply and sanitation*

Water rights for drinking water supply are granted by CNA to the respective municipalities and to the Government of the Federal District (Gobierno del Distrito Federal). In cases where the municipality cannot provide the services itself, CNA will grant water rights to parastatal or para-municipal entities which administer the systems.

CNA and the Ministry of Ecology and Social Development (Secretaría de Ecología y Desarrollo Social - SEDESOL) are currently experimenting with a number of different approaches for involving private companies. Nearly every major city has either given a concession to the private sector or is considering doing so. In Mexico City, for example, 4 concessions have been awarded to private water companies for the management and improvement of water and sewerage services over the next ten years. This water contract is one of the largest of its kind in the world and has some unique features. The city was divided into 4 zones and contracts were awarded to a different contractor for each zone with a view to promote competition between the companies. Ownership of the facilities is not transferred to the private operators. They are responsible only for the management of the water supply and sewerage network and billing. The arrangement is structured in phases, so that the private companies gradually assume more responsibility.

A National Association of Drinking Water and Sewerage Organizations (Asociación Nacional de Organismos de Agua Potable y Alcantarillado) has been founded to represent the water companies.

#### (b) *Irrigation and drainage*

The basis of the government's policy for irrigation is the promotion of private sector

involvement in new investments through the transfer of responsibility for capital investment, operation and maintenance to users' groups, the modification of the legal framework of the sector so as to promote private investment and water markets, the limiting of public investment to the rehabilitation of existing works, and minimizing public investments in new works.

Three types of irrigation management structures have traditionally existed in Mexico: irrigation units (*unidades de riego*), irrigation districts (*distritos de riego*), and private irrigation. Irrigation units are small and are owned, operated, and maintained by water user associations. Irrigation districts are large and built, owned, operated, and maintained by the state. They may contain, however, both large commercial farms and smaller communal farms, or *ejidos*. An *ejido* is a legal form of tenancy created during the Agrarian Reform, where land is held in common and an individual farmer or *ejidatario* has rights to use the land, but does not have property rights. The transfer of management responsibility to the users has required the modification of the law defining the *ejido* to permit land ownership.

The National Water Law stipulates that in cases where the Federal Government participated in the financing, construction, operation and administration of the works necessary for the operation of an irrigation district, CNA will proceed immediately to transfer its administration and operation to the users. The districts will then be administered, operated, preserved and maintained either by the users themselves or by whom they designate. Each irrigation district will establish a water committee (*comité hidráulico*) which will act as a collegiate decision-making body for the adequate management of the water and the infrastructure. This committee proposes the regulations for the district and monitors compliance.

Under the transfer process, Users' Associations (*Asociaciones de Usuarios*) are organized within Irrigation Districts. These associations receive concession titles for the utilization of the water resources, as well as of the infrastructure for whose operation and conservation they are responsible. CNA retains its responsibility for water use management, operation and conservation of the head works and principal canal and drainage networks. It carries out the engineering works in irrigation and drainage, and is responsible for the general supervision of the district as a whole. CNA provides technical assistance to the personnel of Users' Association responsible for subsystem operation. During the transfer process, the Federal Government through CNA provides financial support to users through investments in the rehabilitation and modernization projects, as well as in the acquisition of equipment and machinery for district conservation.

In the period 1989-1993, 2.2 million hectares or approximately 70 per cent of the total area in Irrigation Districts has been transferred to 283 users' associations in 49 districts.

The Mexican Institute of Water Technology (see below) provides training, research and technical assistance in irrigation and drainage, hydraulic infrastructure, and water supply. The National Institute for Forestry, Agriculture and Livestock Research (*Instituto Nacional de Investigaciones Forestales y Agropecuarias - INIFAP*) undertakes agronomic research for irrigated agriculture.

### (c) *Hydroelectricity*

The Mexican Constitution provides the national government with exclusive rights to the generation, transmission, distribution and commercialization of electric power for public service.

The Ministry of Energy, Mining and Semi-Public Industry (Secretaría de Energía, Minas e Industria Paraestatal - SEMIP) has the responsibility to define energy policy and to regulate the activities of the Federal Electricity Commission (Comisión Federal de Electricidad - CFE) and the Mexican Petroleum Company (Petróleos Mexicanos). CFE generates, transmits and distributes electricity on a country-wide basis, except for distribution in the Federal District and its environs which are served by a subsidiary, the Central Light and Power Company (Compañía de Luz y Fuerza del Centro).

CFE must obtain water use rights from CNA which also has the responsibility for programming the diversion and distribution of water to permit coordination with other water uses.

Under the Electric Public Service Law of 1992, private investors may participate in power generation through independent power production, co-generation, import of power and self-supply. The Energy Regulatory Commission (Comisión Reguladora de Energía) oversees that the principles established in the law are observed.

This regulatory framework, complemented with other legislation on foreign capital investments, is considered to provide confidence to attract private investments. In the past four years, CFE has been able to secure private financing to install, under build-lease-transfer schemes, about 4 000 MW of new generation. It is expected that most new generation capacity will be installed by the private sector, with the possible exception of complex hydroelectric projects and nuclear power. SEMIP will license new generating capacity.

CFE plans to transfer several existing plants (including hydroelectric and geothermal), totalling over 9 000 MW of generating capacity,

to the private sector during the next three years.

#### (d) *Other water uses*

The Mexican Institute of Water Technology (Instituto Mexicano de Tecnología del Agua - IMTA) also under SARH, and associated with CNA, the General Director is the president of IMTA. IMTA provides consultancy, information, professional training and development, scientific and technological research services.

SEDESOL has overall national responsibility for environmental affairs and is responsible for the enforcement of the General Ecology Law (Ley General del Equilibrio Ecológico y la Protección al Ambiente) of 1988. The law prescribes that all investments, public and private, must obtain approval of the Ministry before implementation.

The Office of the Attorney General for the Environment (Procuraduría Federal de Protección al Ambiente) is the principal agency responsible for environmental inspections and law enforcement. The National Ecology Institute (Instituto Nacional de Ecología) is responsible for environmental policy and setting of emission and ambient standards for pollutants of all media. The Institute also approves environmental impact assessments and grants operating licenses at the federal level.

The General Ecology Law reserves for the federal government the responsibility to establish federal environmental standards, to evaluate environmental impacts of major projects, to carry out environmental protection actions in areas under federal jurisdiction, and to create and manage federal natural protected areas. State and local governments have responsibility in such areas as regulating and controlling water pollution, routine monitoring and enforcement of regulations and standards for water pollution from municipal sewage

systems, and creating and managing state or municipal protected natural areas.

The legal framework delegates a significant role to the States to adopt their own legislation and establish processes to implement its mandate. Most states have promulgated their own environmental laws complementing the General Ecology Law. It is expected that within the next few years all states will have passed environmental legislation.

CNA is responsible for promoting, building and operating the federal infrastructure and the necessary services for the preservation, conservation and improvement of the quality of the water. It is also responsible for formulating integrated water resource protection programmes, monitoring compliance with the standards governing discharge of effluents, and for monitoring, in cooperation with other competent authorities, the quality of the water supply for human consumption. Under the Law for National Waters, a permit from CNA is required to discharge residual waters into all water bodies, including the sea (in coordination with the Navy (Secretaría de Marina) when

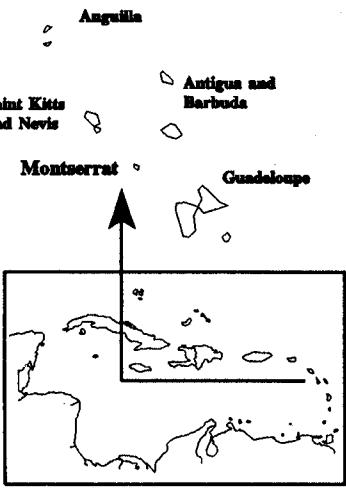
discharges are made from mobile sources or fixed platforms).

CNA sets discharge standards, by determining the assimilation and dilution capacity of water bodies and pollutant loads, as well as quality goals and the timetables to achieve them. A systems of water pollution charges has recently been instituted. The charges are applied to all discharges from both industries and municipalities.

CNA, 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. CNA 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.

CNA operates the National Meteorological Service (Servicio Meteorológico Nacional) which observes and records meteorological, climatological and hydrological information.

## 28. Montserrat

	Estimated sectoral water withdrawals (1987)	Water sector profile
	Not available	<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1992 ..... ..</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1991 ..... ..</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply ..... ..</li> <li>• rural water supply ..... ..</li> <li>• urban sanitation ..... ..</li> <li>• rural sanitation ..... ..</li> </ul>
Population in 1990: 11 000	Mean annual precipitation: 1 641 mm	Total area: 100 km <sup>2</sup>

Administrative responsibility for water resource management in Montserrat is held by the Minister in charge of water resources and the Montserrat Water Authority.

The Minister in charge of water resources is responsible for the administration of the licensing system for the use of groundwater resources and of the permit system for the use of surface water within designated water-controlled areas.

The Governor has the power to grant the required authorization for groundwater exploration activities, to designate water-controlled areas and to place the management of agricultural lands under direct government supervision for soil conservation purposes. The Governor also retains policy-making authority over the Montserrat Water Authority and the Montserrat Land Development Authority (see below).

### (a) *Drinking water supply and sanitation*

The Montserrat Water Authority reports to the Minister in charge of water resources and operates within the policy guidelines which the Governor-in-Council has the express authority to establish. It has an exclusive franchise for the sale of water for domestic use and is responsible for the provision of drinking water to the public. The Authority has rule-making powers for the regulation of the quality of water supply, and its statutory responsibilities include the licensing of land uses liable to affect the banks and shores of water bodies. It is also empowered to construct, operate and maintain the required works, acquire the necessary land and water rights, and levy water rates and charges.

Montserrat has no sewerage.

(b) *Irrigation and drainage*

The Food and Agriculture Organization of the United Nations (FAO) does not report any land under irrigation in Montserrat.

(c) *Hydroelectricity*

The Statistical Division of the Department of Economic and Social Information and Policy Analysis of the United Nations does not report any hydroelectric generation capacity in Montserrat.

(d) *Other water uses*

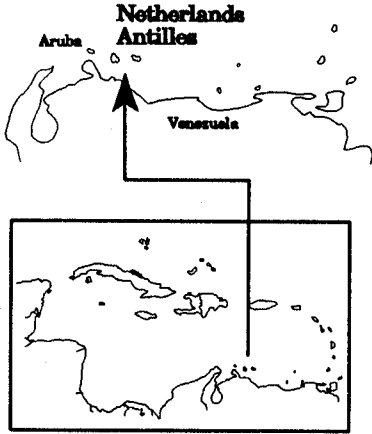
The Montserrat Land Development Authority undertakes soil and water conservation and water-supply works; the Development Control

Authority administers the land use permit system and regulates water supply and sewerage works; the Ministry of Agriculture, Trade, Lands and Housing administers the country's soil erosion prevention and control regulations; and the Ministry of Education, Health and Community Services administers public health legislation.

The major institutions involved in coastal area management include the Ministry of Communications and Works and Labour; the Ministry of Agriculture, Trade, Lands and Housing; the Development Control Authority; and the Land Development Authority.

The Meteorological Office operates the meteorological network.

## 29. Netherlands Antilles

	Estimated sectoral water withdrawals (1987)	Water sector profile
	Not available	<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 .....</li> <li>• 1992 .....</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 .....</li> <li>• 1991 .....</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply .....</li> <li>• rural water supply .....</li> <li>• urban sanitation .....</li> <li>• rural sanitation .....</li> </ul>
Population in 1993: 176 000	Mean annual precipitation: 529 mm	Total area: 800 km <sup>2</sup>

The Central Government of the Netherlands Antilles is based in Curaçao, but each island has its own Executive Council and its own departments and budget. The central government determines policy, whereas the island Governments are concerned with implementation.

### (a) *Drinking water supply and sanitation*

In Curaçao, the Kompania di Awa i Elektrisidat di Korsou, N.V. operates the Mundo Nobo desalination plant, which provides drinking water for the island's population.

### (b) *Irrigation and drainage*

The Food and Agriculture Organization of the United Nations (FAO) does not report any land under irrigation in the Netherlands Antilles.

### (c) *Hydroelectricity*

The Statistical Division of the Department of Economic and Social Information and Policy Analysis of the United Nations does not report any hydroelectric generation capacity in the Netherlands Antilles.

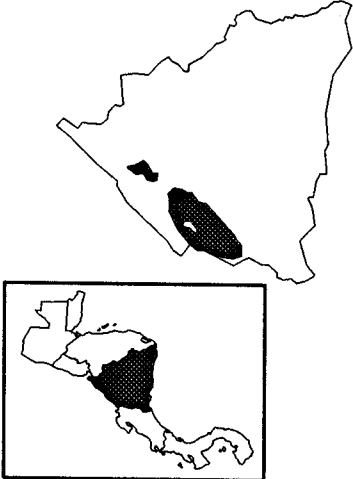
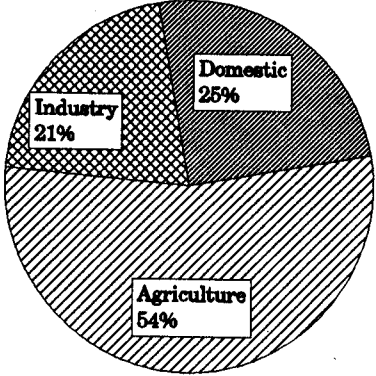
### (d) *Other water uses*

The Department for Development Cooperation funds pre-feasibility and feasibility studies and selects the companies that will be contracted to conduct coastal conservation studies. The Department also prepares development programmes for the smaller islands when they lack the resources to do so on their own.

The Meteorological Service of the Netherlands Antilles, a Central Government Agency under the authority of the Minister of Communications and Transport, operates the meteorological network.



## 30. Nicaragua

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 40</li> <li>• 1992 ..... 88</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 57 MW</li> <li>• 1991 ..... 103 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1990:</p> <ul style="list-style-type: none"> <li>• urban water supply .... 76 %</li> <li>• rural water supply ..... 21 %</li> <li>• urban sanitation ..... 32 %</li> <li>• rural sanitation ..... ...</li> </ul>
Population in 1993: 4 117 000	Annual internal renewable water resources: 44 250 m <sup>3</sup> /person	Total area: 130 000 km <sup>2</sup>

Reform of the National Commission for Water Resources (Comisión Nacional de Recursos Hídricos - CNRH) is under consideration. Under the reform, CNRH will coordinate the national policy on water resources. It will also draft projects on water-related legislation, plan, design, supervise and coordinate the execution of sector policies, and define protected areas in river basins of national importance. Finally it will undertake studies of the environmental impact of all water-related investment projects and promote the inventory of the water resources of the country.

The members of CNRH include the Nicaraguan Institute for Water Works and Sewerage Services (Instituto Nicaragüense de Acueductos y Alcantarillados - INAA), the Ministry of the Environment and Natural Resources (Ministerio del Ambiente y los Recursos Naturales - MARENA), the Nicaraguan Institute of Territorial Studies (Instituto Nicaragüense de Estudios Territoriales - INETER) under the Ministry of Construction and Transport (Ministerio de

Construcción y Transporte - MICONS), the Nicaraguan Energy Institute (Instituto Nicaragüense de Energía - INE), the Ministry of Agriculture and Livestock (Ministerio de Agricultura y Ganadería - MAG), and the Ministry of Health (Ministerio de Salud - MINSA).

The legislative assembly is currently discussing a draft Environmental Law which contains a chapter on water resources.

### (a) *Drinking water supply and sanitation*

INAA, an autonomous agency, is charged with planning, execution and control of urban and rural drinking water supply and sanitation systems in the whole country.

The Water and Sanitation Commission (Comisión de Agua y Saneamiento) coordinates drinking water supply and sanitation policies.

MINSA, with technical and financial cooperation of the Social Emergency

Investment Fund of Nicaragua (Fondo de Inversión Social de Emergencia de Nicaragua), installs latrines in marginal urban and rural sectors.

A proposed reorganization would establish a regulatory body for the sector and delegate drinking water supply either to users' associations, municipalities, or to private enterprise. Recently, the management of some systems has been delegated to the Departmental governments.

*(b) Irrigation and drainage*

MAG is responsible for policy formulation, regulatory and enforcement services, and market information services to agricultural producers.

*(c) Hydroelectricity*

INE, created in 1979, has both regulatory and production functions in the energy sector. It is responsible for policy formulation, planning, research and for the construction and operation

of the power facilities, and management and utilization of energy resources.

Sector reform is under consideration, including the separation of policy setting and regulatory functions from commercial activities, the separation of the electric and hydrocarbon sub-sectors, and the establishment of a National Energy Commission (Comisión Nacional de Energía) responsible for the overall energy policy and of a separate regulatory body. In addition, a licensing system would be established for the use of water for energy production.

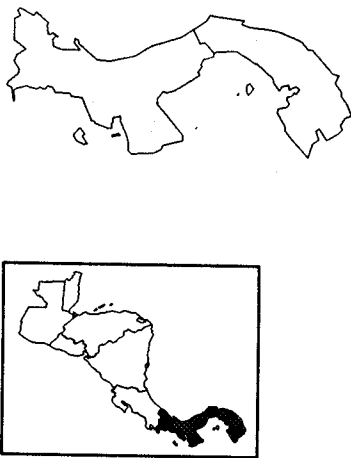
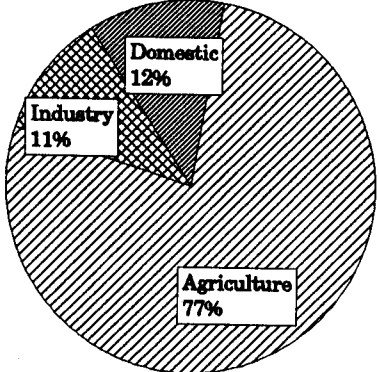
The organic law of INE has already been revised to allow the private sector to invest in the energy sector.

*(d) Other water uses*

INETER is responsible for the hydrological, hydrogeological and meteorological surveys.

MARENA is responsible for the management and control of natural resources and environmental protection.

## 31. Panama

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 20</li> <li>• 1992 ..... 32</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 62 MW</li> <li>• 1991 ..... 551 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1988:</p> <ul style="list-style-type: none"> <li>• urban water supply ... 100 %</li> <li>• rural water supply .... 66 %</li> <li>• urban sanitation ..... 100 %</li> <li>• rural sanitation ..... 68 %</li> </ul>
Population in 1993: 2 538 000	Annual internal renewable water resources: 57 260 m <sup>3</sup> /person	Total area: 75 520 km <sup>2</sup>

The Bureau of Renewable Natural Resources (Instituto Nacional de Recursos Naturales Renovables - INRENARE) is responsible for the definition, planning, organization, coordination, regulation and promotion of policies and actions related to the utilization, enhancement and development of water and soil resources and river basins in a form consistent with national development.

The government is proposing to offer private investors a share in various public companies including the National Water Works and Sewerage Services Institute (Instituto de Acueductos y Alcantarillados Nacionales - IDAAN) and the Water Resources and Electrification Institute (Instituto de Recursos Hidráulicos y Electrificación - IRHE).

### (a) *Drinking water supply and sanitation*

The Ministry of Health (Ministerio de Salud) and IDAAN are responsible for promoting and implementing drinking water supply and sanitation activities. The Ministry of Health is responsible for communities of less than 500

population, while IDAAN serves communities of over 500 population. Planning for the sector is coordinated by the Ministry of Health in collaboration with IDAAN and the Ministry of Planning and Economic Policy (Ministerio de Planificación y Política Económica - MIPPE).

In recent years, several other state bodies have begun to play an important role in financing and executing drinking water supply and sanitation works, especially, the Social Emergency Fund (Fondo de Emergencia Social).

### (b) *Irrigation and drainage*

No information is available on the institutions involved in the administration of irrigation and drainage.

### (c) *Hydroelectricity*

All activities of the electricity subsector are centralized in IRHE, a state power utility, which operates under the Ministry of Commerce and Industry (Ministerio de Comercio e Industrias).

IRHE is directed by a Board (Junta) chaired by the Minister of Commerce and Industry (Ministro de Comercio e Industrias), who is responsible for the administrative, financial and operational management of the Institute, as well as for the expansion plans which are reported to the Board for their final approval by MIPPE. The Board proposes the tariffs which are approved by the Ministry of Commerce and Industry.

The National Energy Commission (Comisión Nacional de Energía) is responsible for national energy policy.

(d) *Other water uses*

The National Environmental Commission (Comisión Nacional del Medio Ambiente) under MIPPE is in charge of protection and

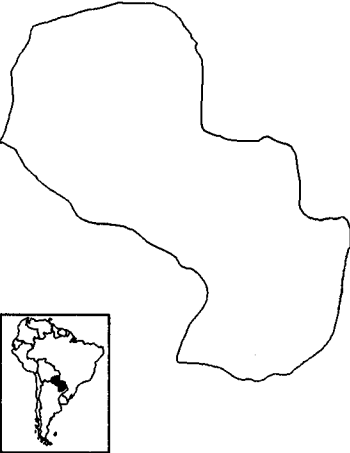
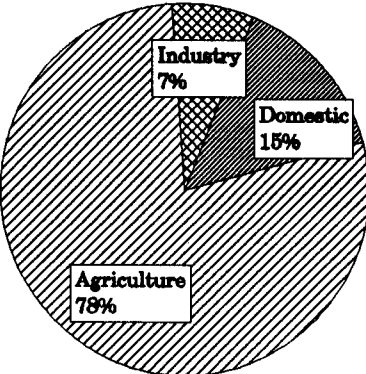
management of natural resources. The Ministry of Agricultural Development (Ministerio de Desarrollo Agropecuario - MIDA) and the Bureau of Renewable Natural Resources also have responsibilities for natural resources protection and management.

The Ministry of Health has responsibilities in the field of the environment.

Water quality standards are being drafted through the Inter-agency Committee on Water, Sanitation and the Environment (Comité Interinstitucional de Agua, Saneamiento y Medio Ambiente).

The Department of Hydrometeorology (Departamento de Hidrometeorología) of IRHE is responsible for the hydrological and meteorological networks.

## 32. Paraguay

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 40</li> <li>• 1992 ..... 67</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 45 MW</li> <li>• 1991 ..... 6 490 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1990:</p> <ul style="list-style-type: none"> <li>• urban water supply .... 61 %</li> <li>• rural water supply ..... 9 %</li> <li>• urban sanitation ..... 31 %</li> <li>• rural sanitation ..... 60 %</li> </ul>
Population in 1993: 4 701 000	Annual internal renewable water resources: 20 800 m <sup>3</sup> /person	Total area: 406 750 km <sup>2</sup>

In 1992, a Department of Water Resources was created within the Sub-Secretary for Mining and Energy (Sub-Secretaría de Estado de Minas y Energía) of the Ministry of Public Works and Communications (Ministerio de Obras Públicas y Comunicaciones - MOPC) which is expected to have a wide range of water management functions, including the maintenance of information on water resources and the undertaking of studies of hydrology, hydrogeology, urban hydrology and flood control. It will also have responsibility for planning and the coordination, compilation and organization of water resources legislation. The Department is in the process of being set up.

### (a) *Drinking water supply and sanitation*

The Technical Planning Department (Secretaría Técnica de Planificación - STP) of the Office of the President of the Republic (Presidencia de la República) has the overall responsibility for the drinking water supply and sanitation sector planning. Plans are approved by the National Council for Economic Coordination (Consejo Nacional de Coordinación Económica).

The Water and Sewage Corporation (Corporación de Obras Sanitarias - CORPOSANA), a state corporation, under the Ministry of the Interior (Ministerio del Interior) provides drinking water supply and sewerage services in communities of more than 4 000 inhabitants. It is also responsible for storm drainage, but this responsibility is being transferred to MOPC and to the municipalities.

In rural areas and communities of less than 4 000 population, services are the responsibility of the National Environmental Health Service (Servicio Nacional de Saneamiento Ambiental - SENASA) under the Ministry of Public Health and Social Welfare (Ministerio de Salud Pública y Bienestar Social). SENASA plans, sets norms, elaborates projects and constructs water supply and excreta disposal systems. Local sanitation committees (juntas locales de saneamiento) participate in construction and financing and administer the systems once built.

The Department of Water Resources for the Chaco Region (Departamento de Aguas para el Chaco) of the National Commission for the Development of the Paraguayan Chaco (Comisión Nacional de Desarrollo del Chaco Paraguayo) under the Ministry of National Defence (Ministerio de Defensa Nacional) is responsible for the drinking water supply and sanitation in the Chaco region. The Department of Water Resources for the Chaco Region also investigates water resources, particularly groundwater, in the Chaco. It drills exploration and exploitation wells, investigates superficial small-scale recharge and has a modern laboratory and a data bank.

The Ministry of Public Health and Social Welfare, through SENASA implements and supervises environmental sanitation programmes related to the supply of drinking water and waste disposal. This institution is responsible for upgrading rural housing, controlling air, water, and soil pollution, and for environmental legislation and its enforcement.

#### *(b) Irrigation and drainage*

The Ministry of Agriculture and Livestock (Ministerio de Agricultura y Ganadería - MAG) is responsible for water use in agriculture.

The Direction of Environmental Regulation (Dirección de Ordenamiento Ambiental) of the Sub-Secretary for Natural Resources and the Environment (Sub-Secretaría de Estado de Recursos Naturales y Medio Ambiente) of the Ministry has general responsibilities for the regulation, management, education and evaluation of environmental impacts. It administers the use of public waters, which are mostly used for rice cultivation under irrigation.

Locally, farmers must be organized into Public Water Committees (Consejos de Aguas Públicas). Local and regional councils serve as a link between the Direction of Environmental Regulation and the users.

The Rural Welfare Institute (Instituto de Bienestar Rural), is responsible for the colonization of new areas and settlement of small farmers.

#### *(c) Hydroelectricity*

The Sub-Secretary for Mining and Energy, MOPC proposes energy policies and regulations and identifies alternative investments.

The supply of electric power is the responsibility of the autonomous National Electricity Administration (Administración Nacional de Electricidad - ANDE) under MOPC. It carries out hydrometric measurements and hydrological studies of the rivers and sites with hydroelectric potential.

The Itaipú Binacional Authority (Brazil and Paraguay) operates the Itaipú hydroelectric facility on the Paraná River. The Yacyretá Authority (Entidad Binacional Yacyretá) (Argentina and Paraguay) manages the Yacyretá hydroelectric power plant. The governments of Argentina and Paraguay have agreed in principle to privatize the Yacyretá facility.

#### *(d) Other water uses*

MOPC is responsible for public infrastructure, including energy, mining, navigation and ports.

The proposed Law of Environmental Impact Evaluation, submitted to Congress in 1992, will regulate both the public and private sector projects.

The Sub-Secretary for Natural Resources and the Environment, MAG undertakes programmes for the protection of soils, forests, and water resources through rural development projects.

The National Committee for the Defense of Natural Resources, composed of government and non-government organizations,

coordinates environmental activities and is currently drafting a project on environmental legislation.


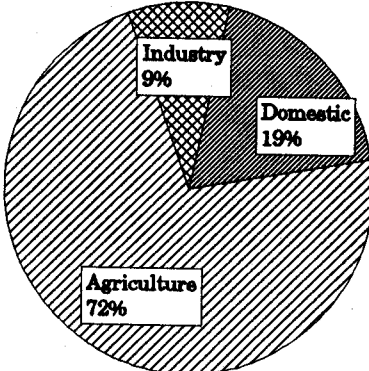
The National Committee for the Paraguay-Paraná Waterway (Comisión Nacional de la Hidrovía Paraguay-Paraná) coordinates Paraguayan participation in the development and management of navigation on the Paraná-Paraguay river system.

The Direction of Meteorology and Hydrology (Dirección de Meteorología e

Hidrología), Ministry of National Defence operates the hydrological and meteorological networks. It relies on stations operated by the National Electricity Administration, the National Navigation and Ports Administration (Administración Nacional de Navegación y Puertos - ANNP), the Itaipú Binacional, and other agencies.

ANNP manages and operates the ports and maintains the navigability of the rivers.

### 33. Peru

	Estimated sectoral water withdrawals (1987)	Water sector profile
Population in 1993: 22 889 000		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 1 106</li> <li>• 1992 ..... 1 280</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 923 MW</li> <li>• 1991 ..... 2 396 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply .... 76 %</li> <li>• rural water supply .... 24 %</li> <li>• urban sanitation ..... 60 %</li> <li>• rural sanitation ..... 17 %</li> </ul>
	Annual internal renewable water resources: 1 780 m <sup>3</sup> /person	Total area: 1 285 220 km <sup>2</sup>

The new Constitution, ratified in 1993, specifically allows for the granting of real property rights to the use of water. It also allows for the separate ownership of land and water. A new water law, currently under consideration, allows for the trading of these rights.

Under the proposed reforms, the administrative system for the water resources will consist in a National Water Council (Consejo Nacional de Aguas), Riverbasin Regional Authorities (Autoridades Regionales de Cuenca), Riverbasin Directorates (Direcciones de Cuenca), and the Public Registrar of Water Rights (Registro Público de Derechos de Agua).

The reform provides for users' organizations including Riverbasin Water Users Boards (Juntas de Usuarios de Aguas de la Cuenca), Canal Commissions (Comisiones de Canales), Groundwater Users Commissions (Comisiones de Usuarios de Aguas Subterráneas) and Drainage Commissions (Comisiones de Drenaje).

Under Decree N° 758 of 1991 the government promotes private investment infrastructure and public services. The Central Government, the Regional Governments and the Municipalities can grant concessions to juridical persons, national and foreign, for the construction, repair, conservation and operation of public services works.

#### (a) *Drinking water supply and sanitation*

Under the new General Sanitation Services Law (Ley General de Servicios de Saneamiento) (Law N° 26338) of 1994, provincial municipalities are responsible for the provision of the drinking water supply and sanitation services. They are authorized to grant concessions (derecho de explotación). The companies taking concessions may be of public, private or mixed capital and are functionally and administratively autonomous. The larger public operating companies must be structured as stock companies subject to the General Company Law (Ley General de Sociedades). The only exception to this institutional arrangement is the Lima Drinking Water and



Sewerage Company (Empresa Servicio de Agua Potable y Alcantarillado de Lima - SEDAPAL) which provides the drinking water supply and sewerage services in Lima and Callao. The concession for the operating area of SEDAPAL is being given directly and will be decided in the near future. The drinking water supply and sewerage services are expected to be transferred as a 30-year concession, renewable for another similar period.

The National Superintendency of Sanitation Works (Superintendencia Nacional de Servicios de Saneamiento) is responsible for promotion, normative and policy setting functions. It is also responsible for the coordination with the municipalities of the master plans of the operating companies to ensure that the plans comply with established standards. The Superintendency also regulates tariff setting in the sector on the basis at the minimum, the operation and maintenance costs of these services.

The municipalities approve the tariffs proposed by the private operating companies subject to the verification of the correct application of the established formula. Conflicts are resolved by the Superintendency.

The Ministry of Health (Ministerio de Salud) continues to have responsibilities in the field of environmental sanitation. It formulates policies and sets standards for drinking water quality and the protection of the environment.

#### ***(b) Irrigation and drainage***

With the promulgation of the Agricultural Investment Promotion Law (Ley de Promoción de las Inversiones en el Sector Agrario) in 1991, the responsibility for the management and administration of irrigation systems was fully transferred to the farmers. One of the key elements in this strategy is the creation of Independent Riverbasin Basin Authorities (Autoridad Autónoma de Cuenca Hidrográfica), to manage the full catchment area of a river

basin. These Authorities are responsible both for irrigation in the lower reaches and for soil and water conservation projects and forestry programmes in the headwaters.

The water users in each district must organize themselves in Irrigator Committees (Comisiones de Regantes) one for each sector or subsector and into a Council of Users (Junta de Usuarios) for the whole district. Their functions are to promote active and permanent participation of users in the operation, maintenance, development and rational use of the water and soil resources.

The Independent River Basin Authority directorate includes representatives of agricultural organizations, of the Ministry of Agriculture (as chairperson), and representatives of the Ministries of Energy and Mining (Ministerio de Energía y Minas), Transport, Communications, Housing and Construction (Ministerio de Transportes, Comunicaciones, Vivienda y Construcción) and the National Development Institute (Instituto Nacional de Desarrollo - INADE) or of the most important irrigation project located in the zone and of the respective municipalities.

The Authorities are responsible for all decisions on water and soil use and conservation in river basins where there is regulated irrigation and intensive and multi-sectoral water use. Other responsibilities include supervision of all water management related activities, the monitoring of compliance with regulations in coordination with the Ministry of Agriculture, to formulate and approve the plans for reforestation, soil conservation in the upper parts of the riverbasin, coastal defenses and other activities inherent in adequate riverbasin management and to resolve conflicts between users.

The functions of the Ministry of Agriculture (Ministerio de Agricultura) include formulating, coordinating and evaluating policies for the protection and conservation

of natural resources, including water. The Ministry has been restructured. Its plays two important roles in water management:

- First, it has responsibility for setting guidelines in research and technology transfer in renewable natural resources.
- Second, it promotes and supports agricultural development through the national research institutes including the National Institute of Natural Resources (Instituto Nacional de Recursos Naturales - INRENA) created in 1992 by Law Nº 25902.

INRENA promotes and supports the management and rational and integrated use of the renewable natural resources and the environment with a view to achieve sustainable development.

The General Directorate of Water and Soils (Dirección General de Aguas y Suelos - DGAS) proposes policies, plans and standards for the sustainable utilization of irrigation water and of soil resources, and supervises and controls their execution. DGAS regulates the operation of irrigation districts and the application of tariffs for water use. DGAS is also in charge of the National Riverbasin Management Network (Red Nacional de Manejo de Cuencas Hidrográficas - REDNAMAC).

The General Directorate for Natural Resources Studies and Projects (Dirección General de Estudios y Proyectos - DGEP) promotes and undertakes integrated studies of natural resources and promotes pre-investment studies of small irrigation projects, improvement of irrigation and drainage infrastructure, soil conservation in the areas affected by salinization and drainage problems, groundwater use, wastewater reuse, etc.

The General Directorate for the Rural Environment (Dirección General de Medio

Ambiente Rural) is in charge of the environmental impact assessment in agricultural sector as well as environmental monitoring and management oriented towards sustainable use of renewable natural resources.

The Ministry of Agriculture is also responsible for the National Programme of Riverbasin Management and Soil Conservation (Programa Nacional de Manejo de Cuencas Hidrográficas y Conservación de Suelos). It executes small irrigation works and reforestation programmes in the upper parts of the riverbasins.

The government has announced plans to privatize some irrigation projects.

#### (c) *Hydroelectricity*

The Ministry of Energy and Mining, under the Law of Electrical Concessions (Ley de Concesiones Eléctricas) of 1992, is responsible for granting concessions and authorizations. For hydro- and geothermal electricity generation, a concession is required if installed capacity exceeds 10 MW. If it is less, but exceeds 500 kilowatts only an authorization is necessary.

The generation and distribution of electricity is being privatized.

The Electricity Rates Commission (Comisión de Tarifas Eléctricas) is responsible for setting electricity tariffs according to the Law of Electrical Concessions.

The Committee for Economical Operation of the System (Comité de Operación Económica del Sistema), formed from representatives of generating companies and the grid, coordinates system operations.

#### (d) *Other water uses*

The proposed National Environmental Council (Consejo Nacional del Ambiente - CONAM) would be in charge of environmental management.

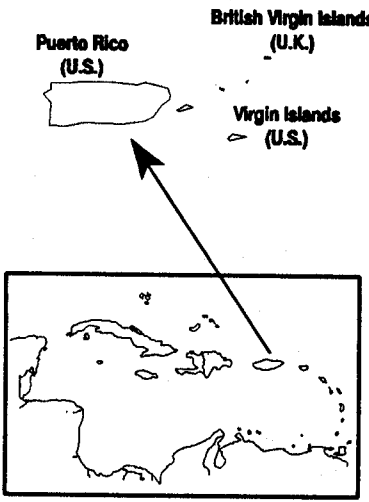
The General Directorate of Environmental Health (Dirección General de Saneamiento Ambiental - DIGESA) of the Ministry of Health manages and monitors the water quality in relation to human health.

The General Directorate of Aquaculture (Dirección General de Acuicultura) of the Ministry of Fishing (Ministerio de Pesquería) is

in charge of the promotion, normative and technical aspects and supervision of aquaculture.

The Institute for the Promotion of Water Management (Instituto de Promoción para la Gestión del Agua - IPROGA), a nonprofit civil association which promotes the improvement of water management.

## 34. Puerto Rico

	<b>Estimated sectoral water withdrawals (1987)</b>	<b>Water sector profile</b>
Population in 1993: 3 630 000	Not available	Area under irrigation (1 000 ha): • 1970 ..... 39 • 1992 ..... 39  Hydroelectric installed capacity: • 1970 ..... 95 MW • 1991 ..... 85 MW  Drinking water supply and sanitation coverage in 1992: • urban water supply ..... • rural water supply ..... • urban sanitation ..... • rural sanitation .....
	Mean annual precipitation: 1 471 mm	Total area: 8 900 km <sup>2</sup>

Puerto Rico is a commonwealth associated with the United States of America. The United States federal water management system and environmental laws apply in Puerto Rico.

Public services in Puerto Rico have been provided since the 1940's by autonomous public corporations. The coordination of their activities is accomplished by the Puerto Rico Planning Board, the Office of Management and Budget and the Government Development Bank.

### (a) *Drinking water supply and sanitation*

The Puerto Rico Aqueduct and Sewer Authority (PRASA) is the agency in charge of the design, construction, operation, and maintenance of the water supply and wastewater collection and treatment systems.

The island's government is planning to privatize PRASA, some wastewater treatment plants are already operated under concession. The government is negotiating an operation contract with a subsidiary of the French

company Compagnie Générale d'Eaux. The poor condition of the system has extended the contract negotiations.

### (b) *Irrigation and drainage*

No information is available on the institutions involved in the administration of irrigation and drainage.

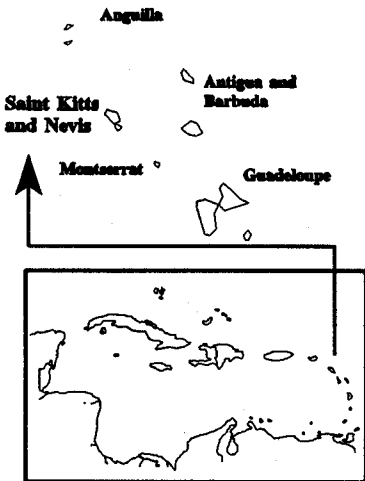
### (c) *Hydroelectricity*

The Puerto Rico Electric Power Authority (PREPA) and the Puerto Rico Water Resources Authority (PRWRA) are the main entities in the electric power sector. Co-generation with private companies is being considered.

### (d) *Other water uses*

The U.S. Environmental Protection Agency (EPA) maintains offices in Puerto Rico. The Department of Natural Resources is the commonwealth agency responsible for environmental issues.

## 35. Saint Kitts and Nevis

	Estimated sectoral water withdrawals (1987)	Water sector profile
	Not available	Area under irrigation (1 000 ha): <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1992 ..... ..</li> </ul> Hydroelectric installed capacity: <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1991 ..... ..</li> </ul> Drinking water supply and sanitation coverage in 1992: <ul style="list-style-type: none"> <li>• urban water supply ..... ..</li> <li>• rural water supply ..... ..</li> <li>• urban sanitation ..... ..</li> <li>• rural sanitation ..... ..</li> </ul>
Population in 1993: 41 000	Mean annual precipitation: 1 266 mm	Total area: 360 km <sup>2</sup>

The Ministry of Communications, Works and Public Utilities, through its Water Department, is in charge of the management, development and control of surface and groundwater resources, the provision of public water supplies and related works and facilities, as well as the collection, analysis and storage of hydrological and water quality data.

### (a) *Drinking water supply and sanitation*

The Nevis Local Council has been entrusted with the primary responsibility for the management, development and conservation of water resources in the island and for the provision and regulation of the public water supply, including the setting of charges and rates. It is also responsible for drainage and sewage disposal, for the implementation of land development schemes (including those for the provision of water supply, drainage and sewerage services), and for the maintenance of gutters, drains, sewers and sanitary facilities.

The Development and Finance Corporation provides financial and other assistance to development companies, including assistance in the provision of industrial water supplies.

The Ministry of Education, Health and Social Affairs has responsibility for the health aspects of public water supplies and for other water-related activities.

The Central Planning and Housing Authority is in charge of land development and related zoning schemes, including those which concern the provision of water supplies, drainage and sewage disposal services.

### (b) *Irrigation and drainage*

The Food and Agriculture Organization of the United Nations (FAO) does not report any land under irrigation in Saint Kitts and Nevis.

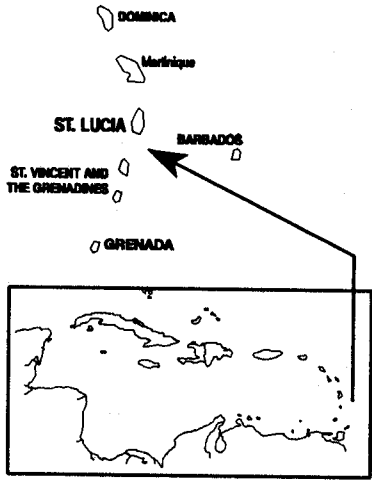
**(c) *Hydroelectricity***

The Statistical Division of the Department of Economic and Social Information and Policy Analysis of the United Nations does not report any hydroelectric generation capacity in Saint Kitts and Nevis.

**(d) *Other water uses***

The Ministry of Communications, Works and Public Utilities is responsible, through the Electricity and Cold Storage Department, for the production of ice. It is also responsible for the collection of meteorological data.

## 36. Saint Lucia

	Estimated sectoral water withdrawals (1987)	Water sector profile
	Not available	Area under irrigation (1 000 ha): <ul style="list-style-type: none"> <li>• 1970 ..... 1</li> <li>• 1992 ..... 1</li> </ul> Hydroelectric installed capacity: <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1991 ..... ..</li> </ul> Drinking water supply and sanitation coverage in 1992: <ul style="list-style-type: none"> <li>• urban water supply ..... ..</li> <li>• rural water supply ..... ..</li> <li>• urban sanitation ..... ..</li> <li>• rural sanitation ..... ..</li> </ul>
Population in 1993: 139 000	Mean annual precipitation: 2 198 mm	Total area: 620 km <sup>2</sup>

### (a) *Drinking water supply and sanitation*

The Water and Sewerage Authority, a statutory body which functions under the portfolio of the Ministry of Tourism, Mobilization and Public Services is responsible for drinking water supply for the conservation, augmentation, distribution and the proper use of water resources including preservation and protection of the watersheds and the treatment and disposal of sewage and other effluents. The Authority receives assistance in planning and aid coordination from the Central Planning Unit of the Ministry of Planning, Personnel, Establishment and Training.

The Ministry of Health is responsible for the control of water quality and of sewerage effluents.

### (b) *Irrigation and drainage*

The Ministry of Agriculture is responsible for water use in agriculture and with the matters related to watershed protection and reforestation.

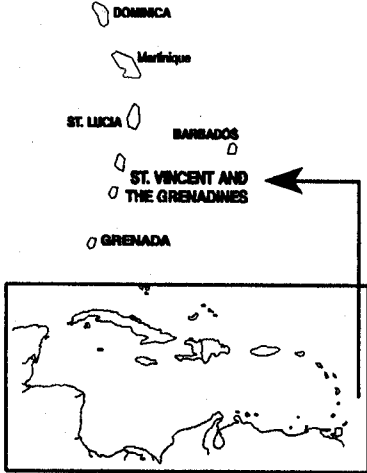
### (c) *Hydroelectricity*

The Statistical Division of the Department of Economic and Social Information and Policy Analysis of the United Nations does not report any hydroelectric generation capacity in Saint Lucia.

### (d) *Other water uses*

The Meteorological Service is concerned with meteorology.

## 37. Saint Vincent and the Grenadines

	Estimated sectoral water withdrawals (1987)	Water sector profile
	Not available	<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 1</li> <li>• 1992 ..... 1</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 2 MW</li> <li>• 1991 ..... 6 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply ..... ..</li> <li>• rural water supply ..... ..</li> <li>• urban sanitation ..... ..</li> <li>• rural sanitation ..... ..</li> </ul>
Population in 1993: 110 000	Annual internal renewable water resources: ... m <sup>3</sup> /person	Total area: 390 km <sup>2</sup>

The Central Water and Sewerage Authority is the principal government agency having advisory, executive and rule-making functions regarding the development, conservation and use of water resources. It also controls all extraction and diversion of public waters and has the authority to levy and collect water and sewerage fees as well as charges for other services. The Authority is supervised by the Minister in charge of public health, who also has direct responsibility for the protection of water resources in controlled areas and for the designation of such areas.

### (a) *Drinking water supply and sanitation*

The Central Water and Sewerage Authority provides drinking water supply and sewerage.

The regulation of sewerage works is the concurrent, and partly overlapping, responsibility of the public health authorities, of the Central Water and Sewerage Authority and of the planning authorities.

The Physical Planning and Development Board is in charge of land use planning and development control. Its regulatory responsibilities extend to the provision of water services within the framework of land development projects.

Local governments are empowered to regulate the prevention of pollution of watercourses within the local government district; the supply of water for domestic purposes, including the prevention of waste and pollution, and the levying of the relevant rates; sewage disposal, etc. In addition, local governments are responsible for the maintenance of waterworks.

### (b) *Irrigation and drainage*

The Agriculture and Cooperative Bank provides financial assistance for agricultural projects, including land drainage and irrigation. The Saint Vincent Agricultural Development Corporation executes and operates agricultural development



projects, including soil and water conservation works.

**(c) *Hydroelectricity***

The Saint Vincent Electricity Services Ltd. has an exclusive 60-year franchise for the generation, distribution and sale of electric energy in the islands of Saint Vincent and Bequia. The company has been granted by law exclusive rights to the water power potential of designated stretches of the Colonarie river and the Richmond river, and to other sites in Saint Vincent to be designated by the Government.

**(d) *Other water uses***

The Ministry of Health and the Environment is responsible for environmental management. Responsibility is dispersed among a number of government departments. To coordinate activities, the Government established an Environmental Protection Task Force, chaired

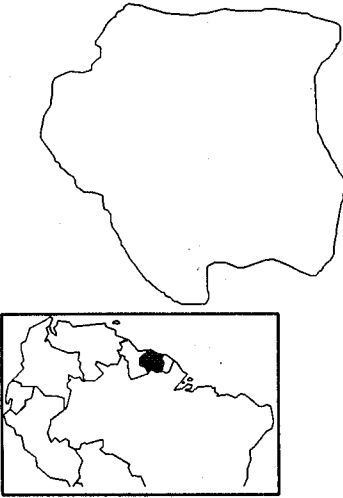
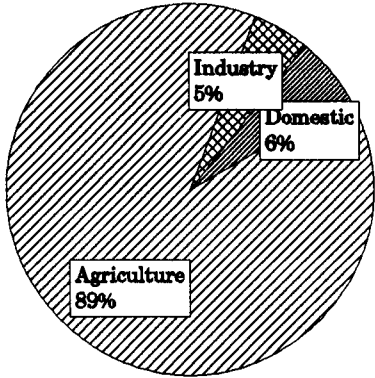
by the parliamentary secretary of the Ministry of Health and the Environment.

Preventing pollution of water resources is the concurrent, and in part overlapping, responsibility of the public health authorities, the Central Water and Sewerage Authority and local governments. A division of the Ministry of Health and the Environment oversees the management of solid and liquid wastes, the water quality, and the vector control.

The Ministry of Agriculture, Industry and Labour has responsibility for the management and protection of watersheds. It also collects rainfall data. The responsibilities of the Ministry of Communications and Works include embankment works, sea walls and related structures, and storm water drainage.

The Meteorological Office operates the meteorological network.

## 38. Suriname

	Estimated sectoral water withdrawals (1987)	Water sector profile
Population in 1993: 448 000		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 28</li> <li>• 1992 ..... 60</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... 180 MW</li> <li>• 1991 ..... 290 MW</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply ..... 78 %</li> <li>• rural water supply ..... 54 %</li> <li>• urban sanitation ..... 63 %</li> <li>• rural sanitation ..... 34 %</li> </ul>
	Annual internal renewable water resources: 456 620 m <sup>3</sup> /person	Total area: 163 270 km <sup>2</sup>

### (a) *Drinking water supply and sanitation*

Water supply systems in urban areas are operated under the supervision of the Suriname Water Company. The Water Supply Service of the Ministry of Natural Resources and Energy is responsible for water supply systems in rural areas. A number of urban and rural water systems are operated by private bodies or other government institutions.

The establishment of a Water Supply Administration to protect sources of drinking water supply is under way.

### (b) *Irrigation and drainage*

No information is available on the institutions involved in the administration of irrigation and drainage.

### (c) *Hydroelectricity*

The Electric Utility Company of Suriname (Energie Bedrijven Suriname) under the

Ministry of Natural Resources and Energy is responsible for the generation and distribution of electricity.

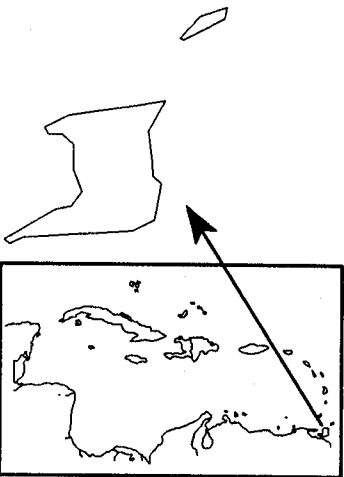
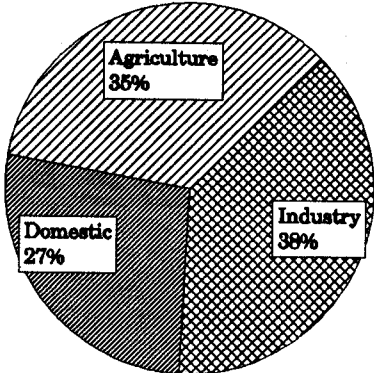
There is substantial self-generation. The largest self-producer, the Suriname Aluminium Company (SURALCO), sells electricity to the government under a long-term agreement signed in 1957 and which expires in 2045. The Government resells the energy to the Utility Company.

### (d) *Other water uses*

Various public and non-governmental organizations work in the field of environmental protection, including the Ministry of Natural Resources and Energy, the Ministry of Agriculture and Fisheries, the Ministry of Public Health, and the Ministry of Public Works, Telecommunications and Construction.

The Meteorological Service is concerned with meteorology.

## 39. Trinidad and Tobago

	Estimated sectoral water withdrawals (1987)	Water sector profile
		<p>Area under irrigation (1 000 ha):</p> <ul style="list-style-type: none"> <li>• 1970 ..... 15</li> <li>• 1992 ..... 22</li> </ul> <p>Hydroelectric installed capacity:</p> <ul style="list-style-type: none"> <li>• 1970 ..... ..</li> <li>• 1991 ..... ..</li> </ul> <p>Drinking water supply and sanitation coverage in 1992:</p> <ul style="list-style-type: none"> <li>• urban water supply ..... 83 %</li> <li>• rural water supply ..... 80 %</li> <li>• urban sanitation ..... 60 %</li> <li>• rural sanitation ..... 50 %</li> </ul>
Population in 1993: 1 281 000	Annual internal renewable water resources: 4 030 m <sup>3</sup> /person	Total area: 5 130 km <sup>2</sup>

The overall development and control of water in Trinidad and Tobago is the responsibility of the Water and Sewerage Authority (WASA).

The Water Resources Agency (WRA), a division of WASA, carries out the function of water resources management and is the main water resource data collecting organization.

WASA plans to undertake a water resources study, the objective of which is to develop a comprehensive master plan for the period 1995-2015. The master plan is to be based on the development of a detailed plan for each catchment area.

### (a) *Drinking water supply and sanitation*

WASA is responsible for the development and control of the drinking water supply and sewerage facilities in Trinidad and Tobago. Oil companies produce water to satisfy both their domestic and industrial needs.

On-site sewerage systems are under the jurisdiction of the Public Health Division of the Ministry of Health. The public health inspectors are responsible for offering guidance in the construction of pit latrines and septic tank systems.

The government has announced its intention to transfer the responsibility for the provision of the water and sewerage services to a private operator. The assets of WASA will remain with the Government and the regulatory and strategic planning functions are reserved for the State. The transfer will be carried out in two stages:

- Stage 1 (2-3 years): an interim operator will be contracted through a bidding process for the management of the service.
- Stage 2 (approximately 50 years): a concession will be granted for the management and for the financing

and implementation of a long term investment programme. The stage 1 operator will be given a preference in the concession.

**(b) *Irrigation and drainage***

The Drainage Division, Ministry of Works, Transport and Local Government has full responsibility for drainage and for major irrigation schemes. The Ministry of Food Production and Marine Exploitation is responsible for the efficient use of irrigation water on farms and minor irrigation schemes and for conservation of watersheds.

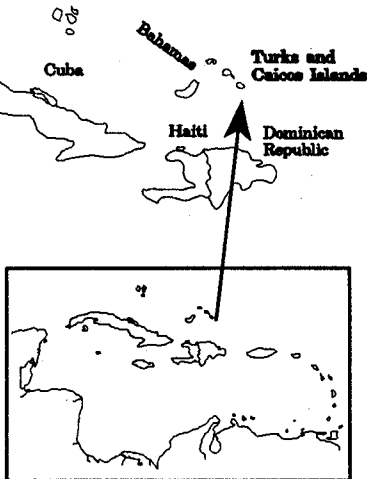
**(c) *Hydroelectricity***

The Statistical Division of the Department of Economic and Social Information and Policy Analysis of the United Nations does not report any hydroelectric generation capacity in Trinidad and Tobago.

**(d) *Other water uses***

It is proposed to establish an Environmental Management Agency to coordinate and monitor environmental protection activities, but the legislation to establish the agency is yet to be approved by Parliament. The Ministry of Planning has an environment division.

## 40. Turks and Caicos Islands

	Estimated sectoral water withdrawals (1987)	Water sector profile
	Not available	Area under irrigation (1 000 ha): <ul style="list-style-type: none"> <li>• 1970 .....</li> <li>• 1992 .....</li> </ul> Hydroelectric installed capacity: <ul style="list-style-type: none"> <li>• 1970 .....</li> <li>• 1991 .....</li> </ul> Drinking water supply and sanitation coverage in 1992: <ul style="list-style-type: none"> <li>• urban water supply .....</li> <li>• rural water supply .....</li> <li>• urban sanitation .....</li> <li>• rural sanitation .....</li> </ul>
Population in 1990: 12 000	Mean annual precipitation: 725 mm	Total area: 430 km <sup>2</sup>

### (a) *Drinking water supply and sanitation*

The Departments of Water Supply and Environmental Health monitor drinking water quality and provide advice and assistance for the construction of water supply installations and latrines.

There are no public drinking water supply and sewerage systems with house connections on the islands.

### (b) *Irrigation and drainage*

The Food and Agriculture Organization of the United Nations (FAO) does not report any land under irrigation in the Turks and Caicos Islands.


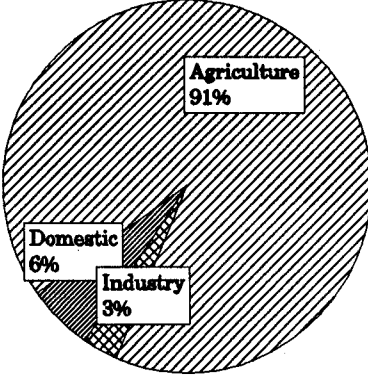
### (c) *Hydroelectricity*

The Statistical Division of the Department of Economic and Social Information and Policy Analysis of the United Nations does not report any hydroelectric generation capacity in the Turks and Caicos Islands.

### (d) *Other water uses*

No information is available on other institutions involved in water resource administration.

## 41. Uruguay

	<b>Estimated sectoral water withdrawals (1987)</b>	<b>Water sector profile</b>
Population in 1993: 3 149 000		Area under irrigation (1 000 ha): • 1970 ..... 52 • 1992 ..... 140  Hydroelectric installed capacity: • 1970 ..... 236 MW • 1991 ..... 1 196 MW  Drinking water supply and sanitation coverage in 1988: • urban water supply ... 97 % • rural water supply ..... 5 % • urban sanitation ..... 60 % • rural sanitation ..... 65 %
	Annual internal renewable water resources: 18 850 m <sup>3</sup> /person	Total area: 177 410 km <sup>2</sup>

Water resources administration is the responsibility of the Ministry of Transport and Public Works (Ministerio de Transporte y Obras Públicas - MTOP) through the National Hydrography Bureau (Dirección Nacional de Hidrografía). The Bureau issues water rights (with the prior approval of the General Directorate for Renewable Natural Resources (Dirección General de Recursos Naturales Renovables - DGRNR), Ministry of Livestock, Agriculture and Fisheries's (Ministerio de Ganadería, Agricultura y Pesca - MGAP)).

### (a) *Drinking water supply and sanitation*

The State Sanitation Works Administration (Administración Nacional de las Obras Sanitarias del Estado) (OSE), under the Ministry of Housing, Land Use and the Environment (Ministerio de Vivienda, Ordenamiento Territorial y Medio Ambiente - MVOTMA), is responsible for drinking water supply in Uruguay and sewerage outside Montevideo.

Montevideo's sewerage system is the responsibility of the Municipality.

### (b) *Irrigation and drainage*

The General Directorate for Renewable Natural Resources, MGAP is responsible for irrigation, drainage and agricultural water use.

Irrigation in Uruguay has been developed mostly by individual farmers. Collective irrigation systems usually include a small number of farmers and have no formal organization. The exception is the state-owned, but managed by private farmers, Colonia España Irrigation System, which has an Irrigation Board to operate and maintain the irrigation facilities.

The Regional Irrigation Boards (Juntas Regionales de Riego) were created in 1970 to promote better coordination between farmers and the Water Authority and to resolve conflicts that might arise in relation to water

distribution for irrigation. The Boards are formed from public delegates (including an official from MTOP who presides and a representative of MGAP), water users' representatives and representatives of non-irrigation farmers.

Water use rights applications must be presented first to the Regional Irrigation Boards and then submitted to the National Hydrography Bureau. The Boards also identify projects and promote technology for increasing water use efficiency, but their major activity is the distribution of water permits during dry periods.

#### (c) *Hydroelectricity*

The Ministry of Industry, Energy and Mining (Ministerio de Industria, Energía y Minería) formulates energy policy. Generation and distribution is in the hands of the National Administration of Electric Power Plants and Transmission (Administración Nacional de Usinas y Transmisiones Eléctricas - UTE).

The Joint Argentine/Uruguayan Technical Commission for Salto Grande (Comisión Técnica Mixta de Salto Grande) operates the Salto Grande hydroelectric power plant on the Uruguay River.

#### (d) *Other water uses*

The Office of Planning and Budget (Oficina de Planeamiento y Presupuesto - OPP), under the Presidency, is concerned with overall consideration of environmental issues as they

relate to economic policy, planning, investment priorities, technical cooperation, etc.

MVOTMA is responsible for environmental protection. This ministry is charged with coordinating, planning and evaluating environmental impact, and monitoring environmental quality.

Other ministries have attributions in environmental matters, including, the Ministry of Industry, Energy and Mining and MGAP.

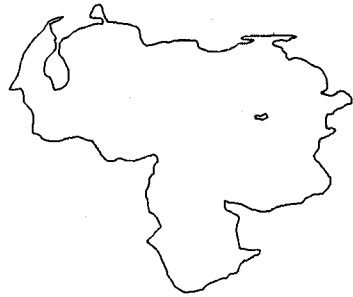

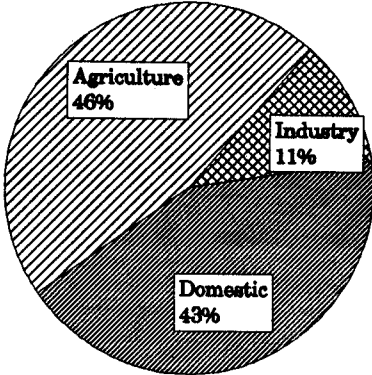
The National Environment Council, with membership from public and private organizations, serves as an advisory council on environment policy.

The control of water quality is under the jurisdiction of the National Environment Bureau (Dirección Nacional de Medio Ambiente), MVOTMA. Responsibility for the management of environmental issues associated with the agricultural sector is assigned to DGRNR.

The National Hydrography Bureau is responsible for groundwater management. The National Bureau of Mining and Geology (Dirección Nacional de Minería y Geología - DINAMIGE), Ministry of Industry, Energy and Mining, is responsible for the groundwater survey.

The Ministry of National Defence (Ministerio de Defensa Nacional - MDN) operates the meteorological services.

## 42. Venezuela

 	<b>Estimated sectoral water withdrawals (1987)</b> 	<b>Water sector profile</b> Area under irrigation (1 000 ha): <ul style="list-style-type: none"> <li>• 1970 ..... 182</li> <li>• 1992 ..... 190</li> </ul> Hydroelectric installed capacity: <ul style="list-style-type: none"> <li>• 1970 ..... 908 MW</li> <li>• 1991 ..... 11 965 MW</li> </ul> Drinking water supply and sanitation coverage in 1992: <ul style="list-style-type: none"> <li>• urban water supply .... 68 %</li> <li>• rural water supply ..... 67 %</li> <li>• urban sanitation ..... 55 %</li> <li>• rural sanitation ..... 59 %</li> </ul>
Population in 1993: 20 909 000	Annual internal renewable water resources: 42 410 m <sup>3</sup> /person	Total area: 912 050 km <sup>2</sup>

Venezuela is a federal state. Its Constitution divides the government into a three-tiered framework of national, state and local authorities. The central government is in charge of the majority of public services and public works related to water resources.

Water resource management is centralized in the Ministry of the Environment and Renewable Natural Resources (Ministerio del Ambiente y de los Recursos Naturales Renovables - MARNR).

MARNR is currently reorganizing its administrative structure. Two new services have been created for the Conservation, Administration and Rational Use of Water Resources (Servicio Autónomo para la Conservación, Administración y Racional Aprovechamiento de los Recursos Hidráulicos), responsible for the conservation, use and development of water resources, including the granting of water use concessions, and for Soils and Riverbasin Conservation (Servicio Autónomo de Conservación de Suelos y Cuencas Hidrográficas), responsible for the planning, organization, coordination, management and promotion of conservation

and management policies and programmes for soils and riverbasins.

The Government has recently promulgated a Concession Law for National Infrastructure which permits local and foreign investors to build and operate large infrastructure projects.

### (a) *Drinking water supply and sanitation*

MARNR oversees the drinking water supply and sanitation sector. Responsibility for the drinking water supply and sanitation services is decentralized to the municipalities.

The sector has undergone a reform process. The Venezuelan Water Company (Compañía Anónima Hidrológica Venezolana - HIDROVEN), a holding company with normative and regulatory functions, is charged with setting policy and providing major technical support to ten regional water companies, which are commonly referred to as "Hidros". The regional companies are charged with the supervisory and technical control functions, the production of drinking water, and the billing and collection policies. They also



provide financial support to municipal systems, and promote municipal participation in the management of drinking water supply services and the creation of the "operator companies". In the interim, they are responsible for the operation and maintenance of systems, the construction and rehabilitation of infrastructure, and commercial aspects of system operation. In many cases, operation and maintenance are contracted out to private companies.

Intention is that the municipalities will provide services through independent operators, which may be of public, private or mixed capital. Municipalities can contract under the modality of their choice the technical personnel to operate and maintain the systems. Operators have responsibility for various aspects of system management, including the operation and maintenance of drinking water supply and sewerage networks, system safeguard and custody, reading meters, new connections, etc. They also provide human resources to operate the equipment.

The Ministry of Health and Social Assistance (Ministerio de Sanidad y Asistencia Social) is responsible for water supply and sanitation in rural areas. The regional development corporations also carry out drinking water supply and sanitation projects.

#### *(b) Irrigation and drainage*

Responsibility for irrigation is shared between the Ministry of Agriculture and Livestock Production, which supervises, monitors and maintains public irrigation works, and MARNR.

The construction and management of large multiple-purpose dams with possible irrigation use is the responsibility of MARNR. The Ministry of Agriculture and Livestock Production appraises the designs, approves the projects and supervises irrigation construction.

Traditionally, most projects located in the Andean region have been administered by

Water Users' Committees. The establishment of Water Users's Associations in all irrigation projects has been proposed.

#### *(c) Hydroelectricity*

The Ministry of Energy and Mining (Ministerio de Energía y Minas) formulates policies for the development and control of the energy sector. In conjunction with the Central Coordinating and Planning Office it is also concerned with energy planning.

There are several public and private electricity utilities. Hydroelectric power generation is concentrated mainly on the Caroní river.

The Interconnected Systems Operation office (Oficina de Operación de Sistemas Interconectados - OPSIS), made up of the companies participating in the interconnected system, coordinates the operations and planning of the system, manages load dispatch and has supervisory functions.

In 1992, the Commission for Regulating Electrical Energy Commission (Comisión Reguladora de Energía Eléctrica) and the Foundation for the Development of the Electrical Sector (Fundación para el Desarrollo del Sector Eléctrico) were created.

#### *(d) Other water uses*

Responsibility for environmental policy belongs primarily to MARNR.

The Environmental Criminal Law (Ley Penal del Ambiente) of 1992 designates as offenses actions which transgress regulations related to the conservation, protection and improvement of the environment, establishing corresponding penal sanctions. It also establishes preventive, restitution and reparation measures where relevant. MARNR is responsible for its execution.