United Nations
Educational, Scientific and
Cultural Organization

International Hydrological Programme

ORGANIZATION OF AMERICAN STATES

# UNESCO/OAS ISARM AMERICAS PROGRAM
# TRANSBOUNDARY AQUIFERS OF THE AMERICAS

# LEGAL AND INSTITUTIONAL FRAMEWORK IN THE MANAGEMENT OF THE TRANSBOUNDARY AQUIFER SYSTEMS OF THE AMERICAS

**Edited by Nelson da Franca Ribeiro dos Anjos, Raya Marina Stephan, María Concepción Donoso, Ariel González, Lilian del Castillo-Laborde, Michela Miletto, Alice Aureli and Lyda Ugas, with information on the participant Member States provided by the National Coordinators**

**Montevideo/Washington DC**

Published in 2008 by the International Hydrological Programme (IHP) at the Regional Bureau for Science in Latin America and the Caribbean of the United Nations Educational, Scientific and Cultural Organization (UNESCO), and the Department for Sustainable Development (DSD) of the Organization of American States (OAS).
ISARM Americas Series, N° 2
ISBN




UNESCO, 2008. Legal and Institutional Framework in the Management of the Transboundary Aquifer Systems in the Americas, ISARM Americas Series N° 2.

Within availability limits, free copies of this publication can be requested to:

Programa Hidrológico Internacional para América Latina y el Caribe (PHI-LAC)
Oficina Regional de Ciencia para América Latina y el Caribe
UNESCO
Dr. Luis P. Piera 1992, 2º piso
11200 Montevideo, Uruguay
Tel.: + 598 2 413 2075
Fax: + 598 2 413 2094
E-mail: phi@unesco.org.uy
http://www.unesco.org.uy/phi

United Nations
Educational, Scientific and
Cultural Organization

International Hydrological Programme

ORGANIZATION OF AMERICAN STATES

# UNESCO/OAS ISARM AMERICAS PROGRAM
# TRANSBOUNDARY AQUIFERS OF THE AMERICAS

# LEGAL AND INSTITUTIONAL FRAMEWORK IN THE MANAGEMENT OF THE TRANSBOUNDARY AQUIFER SYSTEMS OF THE AMERICAS

**Edited by Nelson da Franca Ribeiro dos Anjos, Raya Marina Stephan, María Concepción Donoso, Ariel González , Lilian del Castillo-Laborde, Michela Miletto, Alice Aureli and Lyda Ugas, with information on the participant Member States provided by the National Coordinators**

**United Nations Educational, Scientific and Cultural Organization – UNESCO**

**Andras Szollögy Nagy**
**Director, Water Sciences Division**

**Alice Aureli**
**Hydrogeologist, International Hydrological Programme - IHP**

**María Concepción Donoso**
**Regional Hydrologist, Regional Office for Science for Latin America and the Caribbean**

**Shammy Puri**
**Consultant for UNESCO IHP**
**Coordinator of the ISARM Global Program**
**Chairman of the Transboundary Aquifer Commission of AIH**

**Organization of American States – OAS**

**Thomas Scott Vaughan**
**Director, Department of Sustainable Development – DSD/OAS**

**Jorge Rucks**
**Head, Geographical Area Latin America – DSD/OAS**

**Michela Miletto**
**Groundwater Specialist – DSD/OAS**
**Operational Coordinator of the UNESCO/OAS ISARM Americas Program**

**Lydia Ugas C.**
**Technical Project Assistant – DSD/OAS**

**General Coordinator of the UNESCO/OAS ISARM Americas Program**

**Nelson da Franca Ribeiro dos Anjos**
**Senior Specialist in Water Resources**

**National Coordinators**

**ARGENTINA**
**Ofelia Tujchneider – UNL/CONICET**

**BELIZE**
**Ramón Frutos – BNMS**

**BOLIVIA**
**Zoilo Moncada - SERGEOTECMIN**

**BRAZIL**
**Júlio Thadeu Silva Kettelhut –SRHU/MMA**

**CANADA**
**Alfonso Rivera – NRCan/GSC**

**CHILE**
**Rodrigo Weisner Lazo - DGA**

**COLOMBIA**
**Eduardo Zamudio Huertas – IDEAM**

**COSTA RICA**
**Rodrigo Calvo Porras – ICE**

**DOMINICAN REPUBLIC**
**Héctor Rodríguez Pimentel - INDRHI**

**ECUADOR**
**Napoleón Burbano Ortiz – INAMHI**

**EL SALVADOR**
**Ana Deisy López – SNET**

**GUATEMALA**
**Fulgencio Garavito – INSIVUMEH**

**GUYANA**
**Dilip Jaigopaul - Hydromet**

**HAITI**
**Astrel Joseph - Ministère de l'Environnement**

**HONDURAS**
**Kenneth Rivera – DGRH/SERNA**

**MEXICO**
**Rubén Chávez Guillén – CONAGUA**

**NICARAGUA**
**Silvia Elena Martínez España – DRHC/MARENA**

**PANAMA**
**Hilda Candanedo – ANAM**

**PARAGUAY**
**Ana María Castillo – DRH/VMME/MOPC**

**PERU**
**Edwin Zenteno Tupiño – INRENA**

**SURINAME**
**Moekiran A. Amatali – HRD**

**UNITED STATES OF AMERICA**
**Jim Stefanov – USGS**

**URUGUAY**
**Edi Juri - DNH**

**VENEZUELA**
**Fernando Decarli – DHMO/DGCH/MINAMB**

## FOREWORD

The global Program "Internationally Shared Aquifer Resources Management – ISARM" was launched during the 14th Session of the Intergovernmental Council of the International Hydrological Programme (IHP) of the United Nations Educational, Scientific and Cultural Organization (UNESCO), in June, 2000, in cooperation with other international organizations, including the Food and Agriculture Organization of the United Nations (FAO), the United Nations Economic Commission for Europe (UNECE), the United Nations Economic and Social Commission for Western Asia (UNESCWA), and the International Association of Hydrogeologists (IAH).

The program is aimed to promote the knowledge on transboundary water resources and cooperation among the countries that share the same resource, in order to reach consensus in the legal, institutional, socioeconomic, scientific, and environmental aspects. Another important target of the ISARM Program is that of identifying case studies of relevant interest for the Member States.

The UNESCO/OAS ISARM Americas Program is the regional initiative of the UNESCO-IHP ISARM Program that is being implemented at a worldwide level. Its coordination is a joint responsibility of the International Hydrological Programme for Latin America and the Caribbean of UNESCO (IHP-LAC) and the Department of Sustainable Development – formerly Office for Sustainable Development and the Environment-- of the Organization of American States (DSD/OAS).

The goals of the UNESCO/OAS ISARM Americas Programme comprise the development of an inventory of transboundary aquifers of the Americas, including a compilation of the hydrogeological features and present use of such shared resources and awareness efforts regarding the legal and institutional aspects related to the transboundary groundwaters in the participant nations.

Since the start of the activities, in 2003, five Coordination Workshops have been held: the first one in Montevideo, Uruguay, September 24-25, 2003; the second one in El Paso, United States of America, November 10-12, 2004; the third one in São Paulo, Brazil, from November 30 to December 2, 2005; the fourth one in San Salvador, El Salvador, November 20-22, 2006, and the fifth one in Montreal, Canada, September 17-21, 2007.

Thanks to the contribution of the National Coordinators of ISARM Americas, who represent the 24 groundwater-sharing countries of the American Hemisphere, the Program has identified 68 transboundary aquifers, 29 of which in South America, 18 in Central America, 17 in North America, and 4 in the Caribbean.

During the Second Workshop of the UNESCO/OAS ISARM Americas Programme, held in El Paso, Texas, in 2004, the representatives of the Member States requested that the legal and institutional aspects were specifically considered by the Program. Among their recommendations, the participating representatives of the Member States indicated the need to:

- take into consideration examples and experiences already existing in other countries on groundwater laws, regulations, and agreements;
- support information-sharing on legal and institutional aspects, and
- strengthen groundwater-related institutions in the countries.

During the Third Coordination Workshop, held in São Paulo, Brazil, in 2005, upon conclusion of Phase I "Inventory of the Transboundary Aquifers of the Americas", the representatives of the Member States agreed to start Phase II, "Legal and Institutional Aspects of the Groundwaters in the Americas", in 2006, which should include a diagnosis of the existing aquifer-related legal and institutional framework.

In order to respond to such request, a questionnaire was structured by a group of legal experts coordinated by Raya Stephan (UNESCO-IHP), with the participation of Claudia de Windt (DSD/OAS), Stefano Burchi and Kerstin Mechlem (FAO), Marcella Nanni (Water Legislation Specialist), Gabriel Eckstein (TTU, Texas, USA), Patricia Abad (IDEA, Paraguay), and Lilian del Castillo-Laborde (University of Buenos Aires, Argentina).

The objective of the questionnaire consisted of gathering the legal and institutional information available in the countries of the Americas on groundwater resources and transboundary aquifers. The questionnaire was circulated in 2006, and was completed with very detailed information by almost all of the ISARM Americas Programme participants. The information was subsequently analyzed by the group of experts and presented at the Fourth Workshop, in El Salvador, in 2006. During this event, a synthesis was presented on the water resources legislation and the institutional frameworks of the Member States participating in the UNESCO/OAS ISARM Americas Program.

In conjunction with the above, the countries already having joint legal mechanisms, international agreements and/or cooperation frameworks, were identified. During the Workshop in El Salvador, it was observed that the countries of the region have surface water and groundwater laws, and in general the institutional frameworks are largely complex, often with conflicting roles and overlapping responsibilities.

During the Fifth Workshop, in Montreal, in 2007, the above-referred information available on legal and institutional aspects was thoroughly reviewed, and its inclusion in the second publication of the ISARM Americas program was again recommended. The Table of Contents of the publication was also approved. Furthermore, the National Coordinators decided that this book should be targeted to national-level decision-makers, international organizations, multilateral cooperation agencies, donors, and universities. Following the guidelines approved during this event, the contents of the publications were circulated for revision and endorsement by the National Coordinators.

Accordingly, this book focuses on the integration of the information included in the first volume of the UNESCO/OAS ISARM Americas Programme, "Transboundary Aquifers in the Americas. Preliminary Assessment", with the legal and institutional aspects related to transboundary aquifer resources in the Americas.

# UNESCO/OAS ISARM AMERICAS PROGRAM
# TRANSBOUNDARY AQUIFERS OF THE AMERICAS

# LEGAL AND INSTITUTIONAL FRAMEWORK IN THE MANAGEMENT OF THE TRANSBOUNDARY AQUIFER SYSTEMS OF THE AMERICAS

## Table of Contents

## ACKNOWLEDGEMENTS

This publication is the outcome of the cooperation between the International Hydrological Programme of UNESCO and the Department of Sustainable Development of OAS.

UNESCO and OAS extend their very special thanks to the National Coordinators of the ISARM Americas Programme for their work during the development of the document, and to the institutions that provided the information for the putting together of the information templates and the maps.

Similarly, the institutions and persons who facilitated the implementation of the Program's five coordination workshops (Montevideo, 2003; El Paso, 2004; São Paulo, 2005; San Salvador, 2006, and Montreal, 2007) are acknowledged.

Finally, UNESCO and OAS recognize the work of those who cooperated in the edition and revision of this publication

# 1. TRANSBOUNDARY AQUIFER SYSTEMS OF THE AMERICAS

## 1.1. Actions undertaken

As an outcome of the first five years (2003-2007) of the UNESCO/OAS ISARM Americas Program (Transboundary Systems of the Americas), the 24 countries of the region that share transboundary aquifers:

- chose their National Coordinators and established a communication network between them and the participating institutions;

- prepared an inventory of the aquifer systems identified, which, by the end of 2006 reached the significant number of 68 systems, including 17 in North America, 4 in the Caribbean, 18 in Central America, and 29 in South America, the respective information of these systems was published in 2007.

- decided to develop an inventory and analysis of the legal and institutional frameworks of countries that share transboundary aquifers in the Americas, condensed in this book, being published in 2008.

The inventory of the identified transboundary systems, although not totally completed provides a sound basis to address some of the most significant issues affecting sustainable environmental management and the need for broader studies aimed at increasing the understanding of the systems.

The development of the inventory of the transboundary systems of the Americas as a step toward the assessment of groundwater water resources in the region showed the capacity and interest of the aquifer-sharing countries to work together –not only when facing pressing needs—and cooperate in advancing the pursuit of a larger development program.

The availability of the information provided by the developed inventory allows the countries to prioritize the level of attentions and investment that needs to be implemented in order to ensure environmental sustainability through the sound management of their water resources.

The countries of the Hemisphere are increasingly taking into account scientific progress in the development of their regulation frameworks and water resources management strategies, which reflects their wish to consistently and holistically address groundwater-related issues.

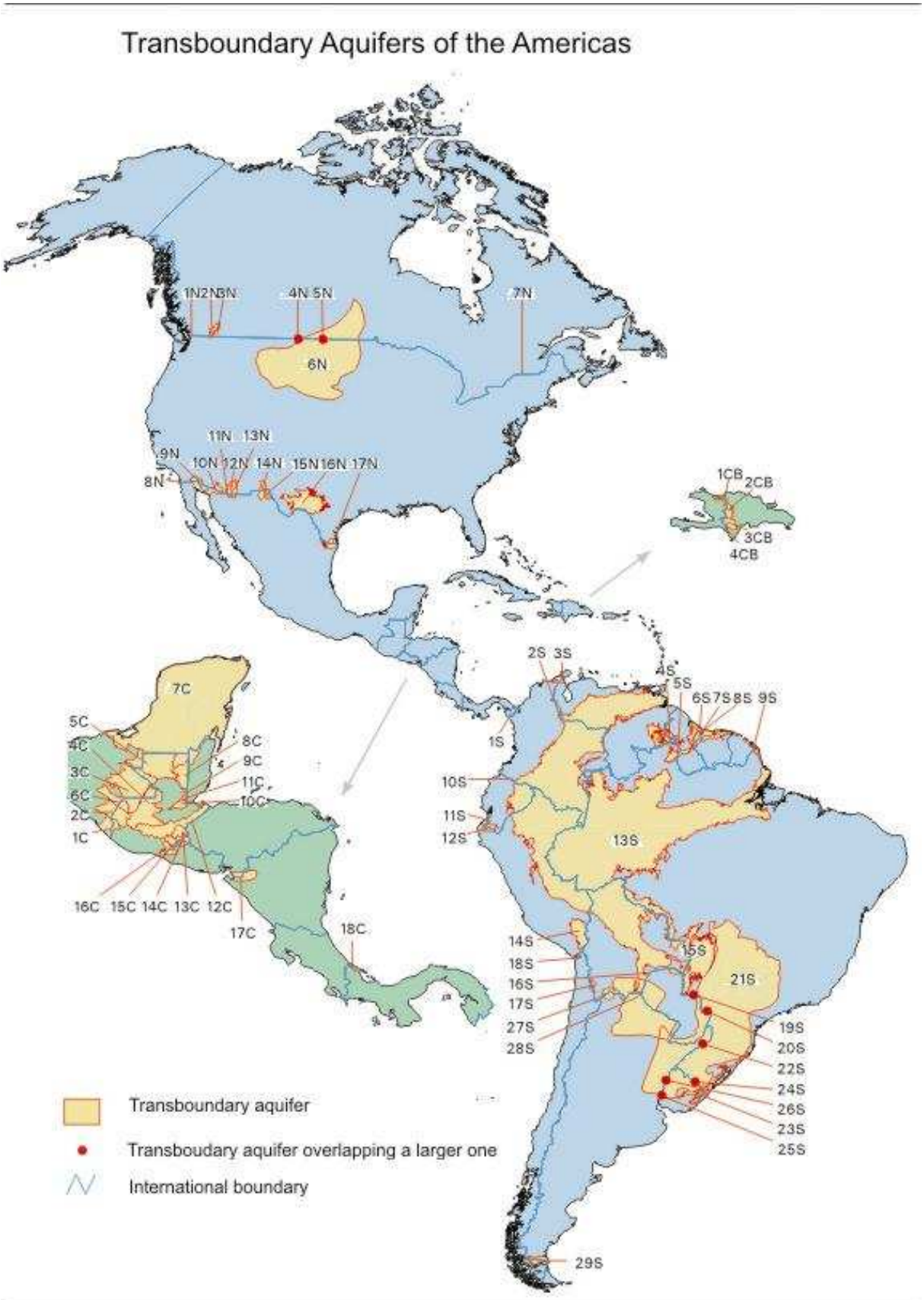
This challenge is even more serious in view of the absence of an international legal framework specifically related to transboundary aquifers. Despite such absence, during the last few years, the international community has paid more attention to transboundary groundwater resources (World Summit on Sustainable Development, Johannesburg, 2002; Third World Water Forum, Kyoto, 2003; Fourth World Water Forum, Mexico City, 2006).

In this context, and as a result of the process followed in the framework of the ISARM Americas Programme, transboundary aquifers represent an opportunity for regional integration and cooperation among water users in the Americas.

## 1.2. Transboundary Aquifer Systems identified by the end of 2006

| | | | | | |
|---|---|---|---|---|---|
| **NORTH AMERICA** | | | | | |
| 1N | Abbotsford-Sumas | Canada-USA | 9N | Cuenca Baja del Río Colorado | Mexico-USA |
| 2N | Okanagan-Osoyoos | Canada-USA | 10N | Sonoyta-Pápagos | Mexico -USA |
| 3N | Grand Forks | Canada-USA | 11N | Nogales | Mexico -USA |
| 4N | Poplar | Canada-USA | 12N | Santa Cruz | Mexico -USA |
| 5N | Estevan | Canada-USA | 13N | San Pedro | Mexico -USA |
| 6N | Northern Great Plains | Canada-USA | 14N | Conejos Médanos-Bolsón de la Mesilla | Mexico -USA |
| 7N | Châteauguay | Canada-USA | 15N | Bolsón del Hueco-Valle de Juarez | Mexico -USA |
| 8N | San Diego -Tijuana | Mexico-USA | 16N | Edwards-Trinity-El Burro | Mexico -USA |
| | | | 17N | Cuenca Baja del Río Bravo/Grande | Mexico –USA |
| **THE CARIBBEAN** | | | | | |
| 1CB | Massacre | Haiti-Dominican Rep. | 3CB | Los Lagos | Haiti -Dominican Rep. |
| 2CB | Artibonito | Haiti -Dominican Rep. | 4CB | Pedernales | Haiti -Dominican Rep. |
| **CENTRAL AMERICA** | | | | | |
| 1C | Soconusco-Suchiate/Coatán | Guatemala- Mexico | 10C | Sarstún | Guatemala-Belize |
| 2C | Chicomuselo-Cuilco/Selegua | Guatemala- Mexico | 11C | Temash | Guatemala-Belize |
| 3C | Ocosingo-Usumacinta-Pocóm-Ixcán | Guatemala- Mexico | 12C | Motagua | Guatemala-Honduras |
| 4C | Márques de Comillas-Chixoy/Xaclbal | Guatemala- Mexico | 13C | Chiquimula-Copán Ruinas | Guatemala-Honduras |
| 5C | Boca del Cerro-San Pedro | Guatemala- Mexico | 14C | Esquipulas-Ocotepeque-Citalá | Guatemala-Honduras-El Salvador |
| 6C | Trinitaria-Nentón | Guatemala- Mexico | 15C | Ostúa-Metapán | El Salvador-Guatemala |
| 7C | Península de Yucatán-Candelaria-Hondo | Guatemala- Mexico – Belize | 16C | Río Paz | El Salvador-Guatemala |
| 8C | Mopán-Belize | Guatemala-Belize | 17C | Estero Real-Río Negro | Honduras-Nicaragua |
| 9C | Pusila-Moho | Guatemala-Belize | 18C | Sixaola | Costa Rica-PANAMA |
| **SOUTH AMERICA** | | | | | |
| 1S | El Choco-Darién | Colombia-Panama | 16S | Agua Dulce | Bolivia-Paraguay |
| 2S | Táchira-Pamplonita | Colombia-Venezuela | 17S | Ollagüe-Pastos Grandes | Bolivia-Chile |
| 3S | La Guajira | Colombia-Venezuela | 18S | Concordia /Escritos-Caplina | Chile-Peru |
| 4S | Grupo Roraima | Brazil-Guyana-Venezuela | 19S | Aquidauana-Aquidabán | Brazil-Paraguay |
| 5S | Boa Vista-Serra do Tucano-North Savanna | Brazil-Guyana | 20S | Caiuá/Bauru-Acaray | Brazil-Paraguay |
| 6S | Zanderij | Guyana-Surinam | 21S | Guaraní | Argentina-Brazil-Paraguay-Uruguay |
| 7S | Coesewijne | Guyana-Suriname | 22S | Serra Geral | Argentina-Brazil-Paraguay-Uruguay |
| 8S | A-sand/B-sand | Guyana-Suriname | 23S | Litoráneo-Chuy | Brazil-Uruguay |
| 9S | Costeiro | Brazil-French Guiana | 24S | Permo-Carbonífero | Brazil-Uruguay |
| 10S | Tulcán-Ipiales | Colombia-Ecuador | 25S | Litoral-Cretácico | Argentina-Uruguay |
| 11S | Zarumilla | Ecuador-Peru | 26S | Salto-Salto Chico | Argentina-Uruguay |
| 12S | Puyango-Tumbes-Catamayo- Chira | Ecuador-Peru | 27S | Puneños | Argentina-Bolivia |
| 13S | Amazonas | Bolivia-Brazil-Colombia-Ecuador-Peru-Venezuela | 28S | Yrendá-Toba –Tarijeño | Argentina-Bolivia-Paraguay |
| 14S | Titicaca | Bolivia-Peru | 29S | El Cóndor-Cañadón del Cóndor | Argentina-Chile |
| 15S | Pantanal | Bolivia-Brazil-Paraguay | | | |

## 1.3. Location of the Transboundary Aquifer Systems



## 2. INTERNATIONAL LAW APPLICABLE TO TRANSBOUNDARY AQUIFER SYSTEMS: A FAST AND PROMISING EVOLUTION[1]

### 2.1. Background

Since its inception, International Law has been concerned, to a great extent, with the legal regime of the spatial realms of the States –particularly the land territories of such entities. In fact, for a number of years a comprehensive set of rules and case law has been developed on the delimitation and allocation of such spatial spheres.

In contrast, such regulations make all the more visible the limited attention paid to the subsoil by International Law up to recent times. The subsoil was traditionally considered as a subject matter of the national rights of each State. These were, in fact, keen custodians of the resources –especially oil and gas reserves- of the subsoil, in particular in the case of transboundary resources, i.e. when such resources are located in the territories of two or more States.

Hence, the possibilities of defining a legal framework for such transboundary resources were conditioned by national sensibilities when the framework was defined so as to resolve issues of ownership or management of the resource. *Contrario sensu*, the viability of the regulation was enhanced when it specifically targeted the protection of the resource, beyond its geographic location (whoever its owner).

In such context it is not surprising that one of the primary basic features of the legal regulation, at an international level, of one of the transboundary resources more valued by the international community –the so-called "transboundary system" (henceforth, TAS)—is the emphasis in the preservation of the system's water resource. In turn, such "preservationist approach" influenced the aforementioned regulation to follow closely the evolution of the so-called Environmental International Law, which began in the early 90's.

The first product of such development –the 1972 UN Declaration on the Human Environment—does not specifically mention the TAS. However, it sets the principle that a State, as a counterpart of its sovereign rights on its share of the transboundary natural resources located in its territory, must prevent its activities on the resource from damaging the environment of other States.

Twenty years later, the Rio Declaration of Environment and Development confirmed the effectiveness of such principle, and enhanced it in aspects such as prior consultations on activities that could result in transboundary damages, and appropriate compensation to any affected parties. In the same order of ideas, Chapter 18 of the Agenda 21, also adopted in the framework of the Conference that produced the 1992 Declaration, gives the States whose territories are crossed by a TAS initiative to ascertain the characteristics of the~~ir~~ water resources contained in the TAS and foster preservation programs for such resources.

By the time of the adoption of the 2002 Johannesburg Declaration, the principle of avoiding transboundary impacts was consolidated, and no further reiteration was needed. As to TAS, the Action Plan attached to the Declaration confines itself to stating the general obligation to protect the water resource, inter alia when it is part of an aquifer.

[1] By Ariel W. González. The author is solely responsible for the information and opinions included in this text.

Another basic feature of the legal regulation of TAS is its specificity. In fact, the first examples of international rules on water resources, which began to be developed by mid-20th century, either concern the regulation of international river water uses – the case of the so-called "Helsinki rules" , as adopted by the International Law Association in 1966 – or refer to such resource in general terms –for instance, the conclusions stemming from the UN Conference on Water, held in Mar del Plata in 1977.

However, as the international community recognizes the relevance of TAS –a process that was started during the early nineties, legal instruments are gradually being promoted. Without disregarding the links that might exist between a TAS and surface waters, these instruments tend to specifically regulate the TAS.

Again, it is in the realm of the International Law Association where the first symptoms of this autonomous treatment were perceived. In 1986 the Association supplemented the Helsinki Rules with the "Seoul Rules on International Groundwaters". In 2004, it further adopted the "Berlin Rules on the Water Resource" which, besides updating the Helsinki Rules, include a specific chapter on aquifers, where the principles stated in the Rules of Seoul became operational. In the same sense, the evolution of the process started in Mar del Plata in 1977 for water resources at large led in 2002, in the same city, to a "Declaration on Groundwater and Human Development".

In the intergovernmental field, when drafting the text that would become the 1997 UN Convention on the Law of the Non-Navigational Uses of International Water Courses, the UN International Law Commission (ILC) included a separate "Resolution on transboundary groundwaters". While inviting the States to take into account the principles of the 1997 Convention in the regulation of the so-called "transboundary groundwaters", this Resolution recognizes the need for an autonomous approach to such regulations.

## 2.2. Draft Articles on the Law of Transboundary Aquifers

The background of the definition of the abovementioned two features mentioned in the regulations of a TAS –emphasis on preservation and specificity—proved particularly relevant when the ILC started to reflect on the codification of the law applicable to shared resources, in 2002, and adopted, upon first reading, during its 58th session (2006), draft articles on the Law of transboundary aquifers.

From the work developed by the Commission the following criteria or principles on TAS regulation can be derived, as orientation for the countries of the Americas in whose territories is located a TAS and which are interested in such regulations:

TAS regulations should be addressed in a holistic manner, by conceiving such resource as part of an ecosystem including soil, air, and eventually surface water. This notwithstanding, from a strategic standpoint it could be convenient to begin by addressing issues related to TAS waters quality.

TAS regulations should duly take into account the specific features of such system.

TAS regulations should accurately define the limits of the system and identify the recharge and discharge areas, when appropriate.

The guiding principle of TAS regulations should be the obligation of the State in whose territory such system is located, or the State where a recharge/discharge area is located, of refraining to cause or tolerate significant damages to any other State in whose territory the TAS is also located.

Another mayor guiding element should be the precautionary approach, which could be formulated here as follows: lack of scientific knowledge about ~~on~~ the impact of an activity on the TAS does not *per se* confer the right to perform such activity.

Moreover, and notwithstanding the sovereign rights of each State in whose territory a TAS is located, the regulations of such system should include provisions that promote its equitable and sensible use, particularly aimed at ensuring its effective operation or, when appropriate, avoiding the depletion of the resource water it includes.

To adequately implement the three aforementioned tenets, the TAS regulations should include provisions on cooperation –including scientific and technical cooperation with the developing States- and regular exchange of data and information among the States in whose territory a TAS is located, as well as provisions concerning TAS monitoring, and prevention, reduction and control of contamination, with particular attention to its ecosystems.

TAS regulations should not include provisions that impair or relativize the sovereign rights of a State on the part of the TAS located within its territory –in particular as regards the management of such part- unless such State explicitly accepts such limitations.

## 2.3. Importance for the ISARM Americas Programme

As regards the process for the development of a Law on Transboundary Aquifer Systems-TAS- during its 59th session (2007) the ILC recommended that the review of the draft articles adopted on first reading be addressed in an autonomous manner relative to the general legal set of issues of shared resources.

Naturally, an effective regulation of a TAS could not disregard the conclusions stemming from a comparative review of the legislations of the Member States of the region applicable in or linked to the matter. For the Americas, such conclusions are guided by the responses of the Member States of ISARM Americas to the questionnaires provided, which will be categorized, schematized, and analyzed in a further section of this book.

As apparent from the preceding considerations, regulation of TAS reflects a fast and promising evolution, and the subject has been addressed at various levels during the last twenty years.

It is up to the Member States participating in the ISARM Americas Programme to ensure an ongoing continuation of this evolution in the region. A particularly important element for such purpose is to develop in each Member State both national and local regulations specifically applicable to a Transboundary Aquifer System – TAS – that implements the relevant International Law provisions or is consistent with them.

## 3. LEGAL AND INSTITUTIONAL FRAMEWORK OF THE COUNTRIES OF THE AMERICAS RELEVANT TO THE TRANSBOUNDARY AQUIFER SYSTEMS

This chapter contains the core of this volume. It presents, in a concise and systematic manner, the international agreements on transboundary aquifers, as well as the national legislations and local regulations in force in the countries of the Americas for the aquifers located in their respective territories.

The information included in the following pages has been provided by the National Coordinators of the Member States in response to the questionnaires developed by the UNESCO/OAS ISARM Americas Programme for the second phase of the project. The questionnaires were sent to the National Coordinators, who in 2006 took care of the necessary consultations, the gathering of the information and the transcription of the data included in the responses sent.

The basis taken for the development of the questionnaire was the questionnaire sent to the Governments in 2004 by the International Law Commission (ILC) of the United Nations in pursuance of the codification of the international rules applicable to the aquifers located in the territories of two or more States.

The international regime of the aquifers is one of the subjects considered by the ILC within the wider matter of the 'Shared Natural Resources' (UN A/CN.4/555), which also includes the regime of the gas- and oil deposits located in the territories of two or more States.

The goal of the questionnaire developed by the International Law Commission consisted of ascertaining the viewpoints and practices of the governments with respect to the regime of the aquifers going beyond national frontiers; hence, it included specific questions on existing agreements concerning such resource.

Added to such questions, the ISARM Americas questionnaire included consultations on the national legislations establishing the regime of surface and groundwater resources. It also requested information on the institutions that participate in the management of transboundary water resources and the bodies with national and local jurisdiction on water resources, both general in scope and specific for groundwaters.

For a precise evaluation of the legal and institutional aspects of the transboundary aquifers, one should not disregard the importance of national legislations establishing the legal regime of water and the role assigned to the institutions having jurisdiction in each country.

Transboundary water resources are a part of the water resources of two or more countries; hence, they are regulated by the legal regimes in force in each of such countries. Any international regimes coexist with the domestic rules in force, and must be harmonized with the latter.

In the American region, legal rules and national and local institutions on waters do not always include specific provisions on groundwater. The legal regime of the latter is often included in the codes and in waters laws general in scope. Therefore, one should rely on the implementation of such legislation or other relevant rules.

Knowledge of the national legislation is thus pertinent for national aquifers and also for transboundary aquifers, given their relevance for the water policies of each nation.

The importance of the national legislation is also highlighted by the fact that lack of specific regulations cannot be considered as lack of legal regulations. Therefore, when the aquifers and their waters do not have rules of their own, other rules, also applicable, are to be relied on, since no gaps can exist in the legal sphere.

The absence of rule gaps allows the interpreter of the law to complete with supplemental rules the lack of specific legislation, so as to solve unforeseen, unregulated situations. The interpreter uses general rules through a process of development of standards where the rule applicable to the specific case is thus identified.

Therefore, if a particular matter has not been not regulated –such as the regime of effluent discharge in a given water body, or the protection arrangements for water quality of an aquifer-- one should rely on the higher rule on water quality, or, if such rule does not exist, on the rule applicable to water uses and, using a broader approach, on the Civil Law rules on damages and liability, and on the guidelines stemming from the constitutional rules and the general principles of law.

A similar situation arises in International Law when shared resources do not have specific regulations. When no agreements have been adopted to regulate a particular aquifer one should rely on general rules on shared natural resources. Finally, national and international law focus on the general principles of law common to both sets of norms.

The interaction between domestic law and international law is increasingly dynamic. Hence, understanding the domestic legislation of the countries is increasingly necessary. Such relevance is more pronounced in the international sphere, and the study of the legal and institutional framework of transboundary aquifers requires both information on existing agreements and knowledge of the domestic legislations.

Enforcement of the international rules, in turn, requires the aid of national legislations, since the agreements can only be implemented through domestic regulations. Without the latter, the rules adopted at the international level are unenforceable. National legislations, therefore, must be consistent with the international commitments assumed; in turn, the countries would hardly sign international agreements contrary to the leading principles of their domestic legislation.

In order to summarize and systematize the information gathered through the questionnaires a model abstract was developed and used as a basis for an abstract for each country.

The information included in the abstracts stems from the responses received in the questionnaires, which were also developed through consultations with the relevant national institutions, as organized by the National Coordinators. Once completed, the abstracts were resent to the National Coordinators for review and final approval.

The results of such exercise are transcribed in the following pages and are a substantial contribution to the assessment of the legal and institutional status of the transboundary aquifers in the Americas.

## 3.1. NORTH AMERICA

### CANADA – LEGAL AND INSTITUTIONAL ASPECTS

#### I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

- **At the federal level**, the agreements with the United States on transboundary and boundary waters are as follows:

- **Treaty on boundary waters and issues arising along the United States-Canada border, 1909**: sets the principles and mechanisms to help resolve disputes and prevent new disputes, particularly with respect to water quantity and quality along the Canada-USA border
- **-** http://www.ijc.org/en/background/treat_trait.htm

- **Agreement on water quality of the Great Lakes, 1972, renewed in 1978, protocol in 1987:** states the commitment of each country to restore and maintain the chemical, physical, and biological integrity of the ecosystem of the Great Lakes basin and includes several objectives and guidelines to reach such goals - http://www.ijc.org/en/background/treat_trait.htm

Such agreements do not specifically regulate aquifers, but the governments and the International Joint Commission are stepping up their activities regarding aquifers and groundwater.

- **At the provincial level**, the agreement on **"Great Lakes-Sustainable Water Resources of the Saint Lawrence River Basin", December 13, 2005, among the Great Lakes States and Ontario and Quebec.** This agreement, according to its own language, is subordinated to the 1909 Boundary Waters treaty. Its main objectives are those of:

- Protecting, conserving and restoring the waters of the Great Lakes-Saint Lawrence River Basin;
- Fostering the cooperation among the parties to assess proposals for water development;
- Facilitating data sharing and enhancing scientific information for decision making
- Promoting adaptative management for conservation and management of the basin waters, considering and providing arrangements to overcome scientific knowledge uncertainties and their evolution.

In this agreement "waters", by definition, include groundwater.

- **Other agreements on surface water bodies:**

- **Treaty on deviation of the Niagara River, 1950**
  http://www.niagarafrontier.com/riverdiversion.html.
- **Treaty on cooperative development of water resources of the Columbia River basin, 11961, protocol en 1964.**
  http://water.cbt.org/texts/ColumbiaRiverTreatyBrochure.pdf
- **Skagit River Treaty, 1984**
- http://www.lexum.umontreal.ca/ca_us/en/cts.1984.16.en.html
- **Water Supply and Flood Control in the Souris River Basin, 1989**
- http://www.lexum.umontreal.ca/ca_us/en/cts.1989.36.en.html

**2. National Level**

*Legislative Level*

**At the federal level:** The Government (the Ministry of the Environment) has the control of water under the **Department of the Environment Act (1985).**

The **Canada Waters Act (1985)** authorizes agreements with the provinces to design areas for the management of water quality and delimitate floodable plains and endangered coasts, for flood and erosion control.

**Other Acts:**

- International Rivers Improvement Act, 1985
- Environmental Protection Act, 1999, regarding pollution prevention and environment and human health protection to contribute to sustainable development.
- Environment Evaluation Act, June 23, 1992. It establishes a federal environmental assessment process.
- Yukon Waters Act, on water resources in the Territory of Yukon.

**Political and institutional frameworks:**

- **Federal Water Policy - 1985**
- **Canadian Federal Guidelines for Fresh Water Quality, 1978,** issued by the Ministry of Health and National Welfare
- **Action Plan jointly adopted by Health Canada and Indian and Northern Affairs in 2006**, on access to safe drinking water

*At provincial level*
Only the provinces on the border with the United States are mentioned below.

### British Columbia: B.C. Ministry of Environment

Water rights and legislation (http://www.env.gov.bc.ca/wsd/water_rights/legislation.html)

- Waters Act, 1996
  - Water Regulation
  - Groundwater Protection Regulation
  - Sensitive Streams Designation and Licensing Regulation
  - Dam Safety Regulation
- Water Protection Act
- Water Utilities Act
- Environmental Assessment Act
- Drinking water protection Act
  - Drinking water protection Regulation

### Alberta: Alberta Environment

Policy: Water for life (http://www.waterforlife.gov.ab.ca)
Water rights and legislation (http://www3.gov.ab.ca/env/water/Legislation/WaterAct.html)

- Waters Act
- Environmental Protection and Enhancement Act

### Saskatchewan: Saskatchewan Watershed Authority

Water rights and legislation (http://www.swa.ca/AboutUs/Legislation.asp), 2005

- Conservation and Development Act

    - Conservation and Development Regulations
- Saskatchewan Watershed Authority Act
    - Drainage Control Regulations
    - Groundwater Regulations
    - Reservoir Development Area Regulations
- Water Power Act
- Watershed Associations Act
- Act Respecting the Management and Protection of the Environment
- Water regulations htransboundary***p://www.qp.gov.sk.ca/documents/english/Regulations/Regulations/e10-21r1.pdf>.***

**Manitoba: Manitoba Water Stewardship**

Policy: Implementation of Manitoba's Water Policies
http://www.gov.mb.ca/waterstewardship/licensing/policy.html)
Water rights and legislation (http://www.gov.mb.ca/waterstewardship/licensing/acts.html)

- Drinking Water Safety Act
- Groundwater and Water Well Act
    - Water Well Regulations
- Water Commission Act
- Water Power Act (see regulations on the web)
- Water Resources Administration Act (see regulations on the web)
- Water Protection Act (see regulations on the web)
- Water Resources Conservation and Protection Act
- Water Rights Act (see regulations on the web)
- Manitoba Water Services Board Act
- Water Supply Commissions Act

**Ontario: Ministry of the Environment**

Water rights and legislation (http://www.ene.gov.on.ca/envision/water/sdwa/legislation.htm, http://www.ene.gov.on.ca/water.htm#cwa)

- Safe Drinking Waters Act
    - Drinking Water Systems Regulation
- Ontario Water Resources Act
    - Ontario's Wells Regulation
- Environmental Protection Act
- Environmental Bill of Rights Act
- Clean Water Act

**Quebec: Ministère de Développement durable, Environnment et Parcs**

Policy:

- Quebec Water Policy (http://www.mddep.gouv.qc.ca/eau/politique/index-en.htm)
- Protection Policy (http://www.mddep.gouv.qc.ca/eau/rives/index.htm)

Water rights and legislation:

- Regulation respecting the quality of drinking water (http://www.mddep.gouv.qc.ca/eau/potable/brochure-en/index.htm)

- Groundwater Catchment Regulation (http://www.mddep.gouv.qc.ca/eau/souterraines/index-en.htm)
- Loi sur la qualité de l'environnement (http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=2&file=/Q_2/Q2.htm)

**New Brunswick: Ministry of the Environment**

Water rights and legislation (http://www.gnb.ca/0009/0355/0005/0029-e.asp)

- Clean Water Act, 1989
  - Drinking water Regulation
  - Water Well Regulation
- Clean Environment Act
  - Environmental Impact Assessment Regulation
  - Water Quality Regulation

**Yukon: Ministry of the Environment – Water Resources Section**

Water rights and legislation
(http://www.environmentyukon.gov.yk.ca/epa/waterresources.html)

- Waters Act Yukon, 1992

**Provisions on groundwater development in the provinces:**

- Ontario and Maritimes: Riparian rights
- British Columbia, Alberta, Saskatchewan and Manitoba : A system also known as FITFIR or "first-in-time, first-in -right"
- Quebec: Civil Code
- Yukon, Nunavut and Northwest Territories: Public management approach

## II. INSTITUTIONAL FRAMEWORK

### 1. Binational Institutions

- **Poplar River Bilateral Monitoring Committee (1980)** composed of technical representatives from the governments of Canada, the United States, Saskatchewan and Montana. It has been responsible for the exchange of monitoring data and information collected in Canada and the United States, at or near the international boundary.

- In 1992, the British Columbia/Washington Environmental Cooperation Council created the **Abbotsford-Sumas Aquifer International Task Force** to make recommendations to the Council on both water quality and water resource management issues on both sides of the border. The Task Force established a water rights memorandum of agreement to provide for consultation and information sharing between provincial and state institutions on water resource allocation where such allocation has the potential to significantly impact water quantity and quality across the border.

### 2. National Institutions

**At the Federal level:** 20 federal departments are involved in water management. The five main Departments are those for the Environment, Natural Resources, Agriculture and Agri-food, Health, and Fisheries and Oceans.

**Interdepartmental Committee on Water:** Focal point for policy coordination among federal departments and institutions.

At the **federal-provincial-territorial level**: federal-provincial coordinating mechanisms such as the forum named **Water Advisory Committee of the Canadian Council of Resource and Environment Ministers (CCREM);** consultations on one or more issues relative to waters, or intergovernmental agreements for cooperation among the provinces.

## UNITED STATES OF AMERICA – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

**1. Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

**USA-Canada cooperation on transboundary waters** stems from the following agreements:

**Treaty on boundary waters and issues arising along the USA-Canada border, 1909:** http://www.ijc.org/en/background/treat_trait.htm

**Agreements on water quality of the Great Lakes, 1972, renewed in 1978, protocol in 1987** http://www.ijc.org/en/background/treat_trait.htm

Such agreements do not specifically regulate aquifers, but the governments and the **International Joint Commission** are stepping up their activities regarding aquifers and groundwaters.

**Other USA-Canada agreements on surface waters:**

- **Convention, Protocol to regulate the level of Lake Woods, 1925**
- **Convention on Emergency Regulation of the Level of Lake Rainy and Other Boundary Waters in the Lake Rainy Basin, 1938**
- **Treaty on diversion of the Niagara River, 1950** http://www.niagarafrontier.com/riverdiversion.html
- **Treaty on cooperative development of water resources of the Columbia River basin, 1961, protocol in 1964** http://water.cbt.org/texts/ColumbiaRiverTreatyBrochure.pdf
- **Skagit River Treaty, 1984** http://www.lexum.umontreal.ca/ca_us/en/cts.1984.16.en.html
- **Agreement on Water Supply and Flood Control in the Souris River Basin, 1989** http://www.lexum.umontreal.ca/ca_us/en/cts.1989.36.en.html

**At state level**

- At state level, agreement on "Great Lakes- Sustainable Water Resources of the San Lorenzo River Basin", December 13, 2005, between the Great Lakes States and Ontario and Quebec (http://www.mnr.gov.on.ca/mnr/water/greatlakes/Agreement.pdf).
  This agreement, according to its own language, is subordinate to the **1909 Boundary Water** Treaty, its main objectives being those of:
  - Promoting, conserving, and restoring the waters of the Great Lakes-San Lorenzo River Basin;
  - Promoting cooperation between the parties to assess proposals for water development;
  - Facilitating data sharing and enhancing scientific information for decision-making:
  - Promoting an adaptative management for conservation and management of the basin waters, considering and providing arrangements to overcome uncertainties on scientific knowledge and its evolution.

In this agreement "waters", by definition, include groundwaters.

**United States-Mexico cooperation on transboundary waters:**

Such cooperation started with the **May 21, 1906 Convention on Equitable Distribution of the Waters of the Grande River.** Other surface waters treaties were subsequently signed, mainly the **Treaty on Utilization of the Waters of the Colorado and Tijuana Rivers and the Grande River (1944).** All such treaties are available in www.ibwc.state.gov/Treaties_Minutes/treaties.html

Minutes of the **International Boundary and Water Commission (IBWC)**, where transboundary groundwaters are mentioned, namely:

- **Minute No. 242 –** Permanent and definitive solution to the international issue of Colorado River salinization, 1973
- **Minute No. 289 –** Water quality observation along the United States-Mexico border, 1992.

**(All such minutes are available in** www.ibwc.state.gov/Treaties_Minutes/minutes.html)

"Common Report by Senior Engineers on Joint Monitoring of Groundwater Quality to Establish the Presence of Anthropogenic Contaminants in the Transboundary Aquifer in the Nogales, Sonora - Nogales, Arizona Area", signed in El Paso, Texas, on 25th January, 1996. Based on Minute No. 289 and this Common Report a binational groundwater monitoring effort was started in the alluvial aquifer of the Los Nogales stream, in the Nogales, Sonora - Nogales, Arizona area.
(Final report, August, 2001, http://www.sre.gob.mx/cila/MonAgSubNog.pdf ).

Joint Report by the IBWC Senior Engineers on information-sharing and mathematical modeling in the aquifer of El Paso, Texas, and Ciudad Juarez, Chihuahua area (December 2, 1997) – an example of technical cooperation in a transboundary aquifer.

**Local cooperation**

Memorandum of Understanding between the Water and Sanitation Municipal Council of Juarez, Chihuahua (JMAS) and the El Paso Utility (PSP) of the City of El Paso, Texas– an example of technical cooperation in a transboundary aquifer.

**2. National Level**

***Legislative Level***

**At the federal level**

USA-Mexico Transboundary Aquifer Assessment Act, adopted on 22nd December, 2006 – it directs the USA Department of the Interior to cooperate with the U.S. States of Arizona, New Mexico, and Texas, along the USA-Mexico border, and with other relevant entities, towards systematic implementation of a program for hydrogeological characterization, mapping and modeling on priority transboundary aquifers.

**At state level**

Rights to use ground water are regulated by states through application of Common Law, state statutes and regulations, or judicial precedents.
The states generally follow any of the following Common Law doctrines, with special features in each state:

- **The rule of absolute ownership:** the owner of the land overlying an aquifer has an unlimited right to use ground water. Groundwaters are considered to be part of the land owned.
- **The rule of reasonable use:** Use of groundwaters by the owner of the land must be "reasonable" and groundwater must be used for purposes beneficial to the land itself.
- **The rule of prior appropriation** gives priority to the users of groundwaters that use such waters for beneficial uses and precede other uses in time.
- **The doctrine of correlative rights** gives each owner of the overlying land a common right to reasonable, beneficial use of the waters of the basin in such land.
- **Compilation of extra contractual liability:** this doctrine combines the rule of absolute ownership (inexistence of liability) and the rule of reasonable use.

The following table only includes the laws and institutions of the states of the USA bordering Canada or Mexico.

| State | Common Law doctrine | Legislation on groundwaters |
|---|---|---|
| **Alaska** | | Water Use Law, AS 46.15: permit system |
| **Arizona** | Reasonable use rule. Mining and extraction of groundwater is limited to a rate that restores the aquifer level needed for economically feasible extraction. | Title 45 of Arizona Revised Legislation regulates waters and includes Chapter 2 of Groundwater Code http://www.azleg.state.az.us/ArizonaRevisedStatutes.asp?Title=45<br>• If water is included in an active management area, the rules on permits and administration connected with active management apply.<br>• If the area belongs to a non-expansion irrigation area, (a) the specific rules connected with a basin organized by the law apply, (b) irrigation is prohibited in any rule-designated area, unless such area had been irrigated during the 5-year period prior to the adoption of the rule.<br>• All of the areas (active management, non-expansive irrigation, or unregulated irrigation ones) have set restrictions to transfers among sub-basins and basins.<br>• When groundwaters form a subsurface stream flowing into a surface current, the former is considered to be part of the latter, and the prior appropriation doctrine applies.<br>• Any other groundwater is subject to the reasonable use rule. |
| **California** | Doctrine of correlative rights. The rule of "prior appropriation" applies when there is a surplus of water exceeding the needs of the overlying land owners. | The Code of Waters of California -http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=wat&codebody=&hits=20 includes a significant part on subsurface water resources. The right on such waters has been developed, to a large extent, by the Judiciary. In California, counties regulate groundwaters. |
| **Idaho** | Rule of prior appropriation. The Judiciary has confirmed the right to limit availability of water for extraction to the annual recharge rate and have issued indictments against new wells exceeding a reasonable foreseen future recharge rate. | Title 42 of Idaho Legislation – Irrigation and Drainage Rights and Land Reclamation<br>http://www3 . state.id.us/idstat/TOC/42FTOC.html<br>The prior appropriation doctrine applies to groundwater to an extent that it does not prevent full economic development of such resource. The State of Idaho exempts household use of water from the requirement of obtaining permits. |
| **Maine** | Rule of absolute ownership | Title 38 "Waters and Navigation", Chapter 3 "Water Protection and Improvement", Article 1 B "Groundwater Protection System".<br>http://janus.state.me.us/legis/statutes/38/Title38ch3sec0.html |
| **Michigan** | Rule of reasonable use | Natural resources and environment protection law (Law 451/1994): it replaced the Common Law system on the rights of the riparian owner by a legal system of permits for certain groundwater uses. |

| | | |
|---|---|---|
| | | http://www.legislature.mi.gov/documents/mcl/pdf/mcl-chap324.pdf, parts 13, 17 and 31 |
| **Minnesota** | «doctrine of correlative rights » | http://www.revisor.leg.state.mn.us/revisor/pages/statute/statute_Chapter.php?year=2006&start=103A&close=114B&history=&border=0<br>Minnesota legislation regulates water allotment by setting six priorities (from highest to lowest):<br>• Fresh- and municipal supply and power production meeting the following requirements for contingency planning:;<br>• Consumptive use of water under 10,000 gallons a day;<br>• Agricultural irrigation and product processing involving water consumption under 10,000 gallons a day<br>• Power production exceeding emergency planning needs;<br>• Non-agricultural water uses not connected with electricity, over 10,000 gallons a day<br>• Potential uses |
| **Montana** | Prior appropriation with legal regime on critical areas to design areas where new pumping can be banned and the existing pumping can be restricted, to preserve a reasonable groundwater volume. | Montana applies a legal regime of management of groundwater controlled areas, as well as a system of appropriation permits in noncontrolled areas, for uses of over 35 gallons per minute or over 10 acre-feet a year. The Code of Montana includes a Title on Water use. Title 85, Use of Water, Chapter 2, Part 5, includes rules on ground waters; please see:<br>http://leg.state.mt.us/css/mtcode_const/laws.asp |
| **New Hampshire** | Rule of reasonable use | New Hampshire Legislation includes a Title on Water Management and Protection, with a specific chapter on Groundwater Protection<br>http://www.gencourt.state.nh.us/rsa/html/NHTOC/NHTOC-L-485-C.htm<br>New Hampshire applies a reasonability criterion in a very wide context for the determination of the scope of the property rights of an owner. This "reasonability" concept includes the ownership rights of the land owners on groundwaters. |
| **New Mexico** | Doctrine of « prior appropriation » combined with a legal regime on critical areas where new pumping can be banned and existing pumping can be restricted to preserve a reasonable volume of groundwaters. Groundwater mining and extraction is limited to a rate that restores the aquifer level needed for economically feasible extraction. | Under the Waters Law, which includes a specific Article on ground waters, all subsoil waters of the State of New Mexico are considered public waters and are subjected to appropriation for beneficial uses. This regime recognizes all existing rights to beneficial use of such waters.<br>http://nxt.ella.net/NXT/gateway.dll?f=templates$fn=default.htm$vid=nm:all |

| | | |
|---|---|---|
| **New York** | Reasonable use rule | "Sole-Source" Aquifer Protection Law, regulating land use in sole-source aquifer counties and a permit system in other places. http://dec. state.ny.us/website/regs/part601.html. The 1989 Water Conservation and Management Act sets additional requirements to water users in the Great Lakes Basin. http://www.dec.ny.gov/lands/25670.html . |
| **North Dakota** | « Prior appropriation » rule | The state defines beneficial use as the basis, measure and limit of the right to use water in the state. The use of water must serve the best interests of the state population. Household uses, as well as cattle-, fish-, wild animal- and plant-watering uses, under 12 ½ acre-feet are exempt from permit requirements. However, the individual who makes the appropriation may request a permit to clearly establish priority use. http://www.legis.nd.gov/cencode/t61c04.pdf |
| **Ohio** | Compilation of extra contractual liability. Ohio applies a reasonable use system, with certain modifications. | The state defines beneficial use as the basis, measure and limit of the right to use water in the state. The use of water must serve the best interests of the state population. Household uses, as well as cattle-, fish-, wild animal- and plant- watering uses, under 12 ½ acre-feet are exempt from permit requirements. However, the individual who makes the appropriation may request a permit to clearly establish priority use. http://www.dnr.state.oh.us/water/orclaw/groundwater_law_main.htm |
| **Pennsylvania** | Pennsylvania enforces a reasonable use system when conflicts arise among groundwater users. | Water allotment permits are required to use spring waters and surface fountain waters; not for most household wells. Water Rights Law of June 24th, 1939 (P.L. 842, No. 365) 32 P.S. Section 631-641. |
| **Texas** | Absolute ownership rule. | Water Code - http://tlo2.tlc.state.tx.us/statutes/wa.toc.htm |
| **Vermont** | Correlative rights. | Vermont Legislation, Title 10: Conservation and Development, Chapter 48: Groundwater Protection: The State of Vermont must protect its water resources so as to maintain high-quality fresh water, and manage its groundwater water resources so as to minimize risks of degradation of groundwater quality, by limiting human activities entailing unreasonable risks, while balancing state groundwater policies with the need to maintain and promote a healthy and prosperous agricultural community. http://www.leg.state.vt.us/statutes/sections.cfm?Title=10&Chapter=048<br><br>Environmental protection rules:<br>Chapter 12: Groundwater regime and strategy (2005)<br>http://www.vermontdrinkingwater.org/GWPRS/GWPRS2005.pdf<br>Chapter 21 : Water Supply Regime<br>http://www.vermontdrinkingwater.org/wsrule/WSFinalRuleJune192003.pdf |
| **Washington** | Prior appropriation with legal regime on critical areas where new extraction activities can be banned and existing pumping can be | Washington State enforces an appropriation regime with special rules for groundwater. In addition to the appropriation system, Washington has established a groundwater management area system with legal controls and additional regulations.<br>Water Code - http://apps.leg.wa.gov/RCW/default.aspx?cite=90.03 |

| | | |
|---|---|---|
| | restricted so as to preserve an acceptable groundwater volume. | |
| **Wisconsin** | Wisconsin adopted the Compilation extra contractual liability system. | The State of Wisconsin has a new law establishing a mandatory permit- and information system for large capacity wells (pumping rate above 100,000 gallons a day), which requires notification to a state institution of all construction works for new wells, whatever their capacity; establishes two groundwater management zones –one in the Southeastern region of Wisconsin, and the other one in the Lower Fox River, and creates a Groundwater Advisory Committee to review the new regulations and recommend any changes.<br>Since 1974, Wisconsin is using the "reasonable use" doctrine to resolve disputes among groundwater extractors or alleged polluters. Water Protection Law (Law 310 of Wisconsin, 2003, April, 2004)<br>http://www.dnr.state.wi.us/org/water/dwg/ and Wells Law (Wisconsin Legislation, Sections 281.17 and 281.35). |

## II. INSTITUTIONAL FRAMEWORK

### 1. Binational Institutions

**Canada and the United States**

- **The International Joint Commission,** an independent binational institution, was established in the framework of the Boundary Water Treaty of 1909 to help prevent and resolve disputes on use and quality of waters at the Canada-USA border.
- The **Poplar River Bilateral Monitoring Committee** (1980) composed of technical representatives from the governments of Canada, the United States, Saskatchewan and Montana has been responsible for the exchange of monitoring data and information collected in Canada and the United States, at or near the international boundary.
- In 1992, the **British Columbia/Washington Environmental Cooperation Council** created the Abbotsford-Sumas Aquifer International Task Force to make recommendations to the Council on both water quality and water resource management issues on both sides of the border. The Task Force has established a water rights memorandum of agreement to provide for consultation and information sharing between provincial and state institutions on water resource allocation where such allocation has the potential to significantly impact water quantity and quality across the border.

**Mexico and the United States**

The **International Borders and Waters Commission** was created to provide binational solutions to issues arising during the implementation of USA-Mexico treaties regarding, inter alia, quantity- and quality problems along the border.
No transboundary water resources responsibilities were specifically entrusted to the IBWC, but in a number of minutes and papers the Commission has addressed issues involving such resources.

## 2. National institutions

| State | Institutions |
|---|---|
| **Alaska** | The Alaska Department of Natural Resources (ADNR) is responsible for administrating the Water Use Act and determining water rights. http://www.dnr.state.ak.us/. The Alaska Department of Environmental Conservation's (DEC) Division of Environmental Health is responsible for drinking water, and the Department's Division of Water is responsible for municipal water, non-point pollution and water quality standards programs. |
| **Arizona** | Department of Water Resources of Arizona |
| **California** | Local institutions / the counties manage groundwaters. Special legislative districts create groundwater regulation institutions in specific basins. |
| **Idaho** | Department of Water Resources of Idaho |
| **Maine** | Department of Conservation of Maine |
| **Michigan** | Department of Natural Resources |
| **Minnesota** | Department of Natural Resources |
| **Montana** | Department of Natural Resources |
| **New Hampshire** | Department of Environmental Services of New Hampshire |
| **New Mexico** | Office of the State's Engineer for the State of New Mexico |
| **New York** | Department of Environmental Conservation of the State of New York |
| **North Dakota** | Water Commission of the State of North Dakota |
| **Ohio** | Department of Natural Resources |
| **Pennsylvania** | Basin Management Office of the Environmental Protection Department; Department of Environmental Conservation and Resources |
| **Texas** | Groundwater Conservation Districts (GCDs) (96)<br>Supervision entrusted to the Texas W Des. Council |
| **Vermont** | Department of Environmental Conservation of Vermont |
| **Washington** | Department of Ecology of the State of Washington |
| **Wisconsin** | State Natural Resources Department |

## I. LEGAL FRAMEWORK

1. **Transboundary Level** (There are numerous Mexico-United States of America treaties and agreement acts on rivers and dams)

**Transboundary waters cooperation between Mexico and the United States of America.**

Such cooperation started with the **Convention for the Equitable Distribution of the Waters of the Grande River (Water Treaty for the Valle of Juarez), dated May 21st, 1906.** Other surface water treaties were since signed, such as the **Treaty on International Water Distribution between the United States of Mexico and the United States of America (or Water Treaty) (1944)**. These treaties are available in the following web page: www.sre.gob.mx/cila/.

Minutes of the **International Boundary and Water Commission (IBWC)**, where transboundary groundwaters are mentioned, namely:

- **Minute No. 242 –**Permanent and definitive solution to the international issue of Colorado River salinization, 1973
- **Minute No. 289 –** Water quality observation along the United States-Mexico border, 1992.
- (All such minutes are available in www.ibwc.state.gov/Treaties_Minutes/minutes.html)

"Common Report by Senior Engineers on Joint Monitoring of Groundwater Quality to Establish the Presence of Anthropogenic Contaminants in the Transboundary Aquifer in the Nogales, Sonora - Nogales, Arizona Area", signed in El Paso, Texas, on 25th January, 1996.

Based on Minute No. 289 and this Common Report, a binational groundwater monitoring effort was started in the alluvial aquifer of Los Nogales stream, in the Nogales, Sonora - Nogales, Arizona area. (Final report, August, 2001, http://www.sre.gob.mx/cila/MonAgSubNog.pdf ).

Joint Report by the IBWC Senior Engineers on information sharing and mathematical modeling in the aquifer of the El Paso, Texas, and Ciudad Juarez, Chihuahua area (December 2, 1997) – an example of technical cooperation in a transboundary aquifer.

As to the Southern border of Mexico, only one water-related agreement has been issued by the Mexico-Belize CILA (Spanish acronym for International Borders and Waters Commission):

- **Minute No. 2 –** Start of the diagnosis technical works for water sustainable management in the Hondo River International Basin, Mexico-Belize, to year 2025, 2005 (http://www.sre.gob.mx/cilasur/Assets/Images/ActasBelize/acta2mb.pdf)

In connection with cooperation with Guatemala, there is only the **Treaty for the Strengthening of the Mexico-Guatemala International Commission on Borders and Waters (July 17th, 1990).**

**Local cooperation**

Memorandum of Understanding between the Water and Sanitation Municipal Council of Juarez, Chihuahua (JMAS) and the El Paso Utility (PSP) of the City of El Paso, Texas– an example of technical cooperation in a transboundary aquifer.

**2. National Level**

***At the constitutional level***

The Political Constitution of the United States of Mexico (1917), paragraph 5, Article 27, provides that the Nation has ownership rights on subsoil natural resources. Groundwater may be brought to the surface unless a prohibition, reserve or regulation is established, by reasons of public interest.

***Legislative Level***

**The National Waters Act (LAN) and its Regulations (April 24, 2004)** provide (Article 18):

- "National subsoil waters can be freely extracted through artificial works, without concession or assignment, unless the Federal Executive Power establishes regulated areas…, prohibition areas, or reserve areas".
- Once an aquifer is subject to regulations (prohibition, rule, or reserve) the stakeholders must request the Water Authority an authorization for the water volume they require, and a permit for the catching works.
- The National Waters Act verifies, promotes and supports participation by the users of the national waters and the society at large in water resources management through Basin Councils and Groundwater Technical Committees (COTAS).

## II. INSTITUTIONAL FRAMEWORK

**1. Binational Institutions**

The **International Borders and Waters Commission (CILA)** is an international institution comprising a Mexican section and a section for each of the neighboring countries: the United States of America, Guatemala, and Belize. It develops, enforces and monitors international border- and water treaties between Mexico and each of such countries.

For transboundary aquifers, the CILA mediates for mutual consultations, information-sharing, binational studies, and conflict-resolution.

There are three international commissions (CILA); each of them is independent from the other ones:

- The Mexico-United States of America International Borders and Waters Commission.
- The Mexico-Guatemala International Borders and Waters Commission.
- The Mexico-Belize International Borders and Waters Commission.

**2. National Institutions**

The **Water National Commission (CONAGUA)**, a semiautonomous institution under the Secretariat for the Environment and National Resources (SEMARNAT), is the authority in Hydraulic Affairs and the highest-ranking entity in technical, ruling and consultative matters in the Federation, in the area of integrated management of water resources.

**Sub-national institutions and their roles on groundwaters**

CONAGUA is structured in three levels for the performance of its duties:

ii. The **Central, or National Level.** CONAGUA's central structure involves eight Units or General Subdirectorates.

iii. **The Regional Level** includes 13 Regional Management Offices, or Hydrological-Administrative units (Basin Institutions), which approximately correspond to the large hydrological basins. The Regional Manager (General Director of the Basin Institution) represents the Director General of CONAGUA and has analogous responsibilities within

his/her jurisdiction.

iv. The **State Level**, represented by 20 State Management Offices reporting to the corresponding Regional Management Offices.

**Within CONAGUA, groundwater management responsibilities have been distributed into three Central Units:**

- The General Technical Subdirectorate, through its Groundwater Management Office, for the development of the regulations on the technical management aspects (monitoring, exploration, assessment studies, technical papers and opinions, management plans, arrangement projects), advice to state regional units, validation and integration of technical information obtained by such units.
- The General Subdirectorate for Water Administration, responsible for addressing the management administrative aspects (permits, concession titles, public registry of rights, sanctions, charges…).
- The General Legal Subdirectorate, for the legal aspects (LAN enforcement).

**In the area of groundwaters, CONAGUA implements a broad management process:**

- Users' regularization (titling),
- Development of the Water Rights Public Registry (REPDA),
- Formal definition of management units (aquifers),
- Updated studies for quantification of renewable volumes
- Water quality, water availability determination and official publication,
- Development of the aquifers management plans,
- Development of aquifers management projects.

**Inter-regional aquifers:** Central level jurisdiction.

**Inter-state aquifers:** Regional jurisdiction.

In all cases, resource management is performed through the respective Regional Management Offices (Basin Institutions), Basin Councils, and Groundwater Technical Committees, where the aquifer-sharing entities are represented.

**Basin Councils:** Coordination and concertation among CONAGUA, the public bodies (at federal, state and city levels), water users, and the organized society. Such entities provide support, consultation, and advice for program-development and implementation of actions towards water administration and the development of the hydraulic infrastructure.

**COTAS**: Council-.assisting bodies. Their memberships include representatives of users of water from a specific aquifer, government institutions and any other society sectors with jurisdiction or interests in the management of the aquifer. The COTAS cooperate with CONAGUA in the formulation, implementation, and monitoring of programs and actions towards aquifer preservation.

Prepared with the cooperation of Rubén Chávez Guillén, Víctor Manuel C. Arcos, Roberto A. Sención Aceves, Angélica Molina Maldonado, and María Mireya Figueroa de Jesús – CONAGUA

## 3.2. THE CARIBBEAN

## HAITI – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

**1 Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

Article 10 of the Peace, Perpetual Friendship, and Arbitration Treaty (1929) provides for the ban of works in transboundary rivers that impair their flow or volume.

**2. National Level**

***Legislative Level***

**Act of June 12, 1974, regulating the use of deep groundwaters and entrusting the Department of Agriculture and Natural Resources and Rural Development with the control of their development.**

A remarkable provision, in the area of groundwater allocation, is Article 2 of the June 12, 1974 Act:

- The number of wells in a community, a rural section, or a hydrographic basin will be limited, as necessary, by DARNDR.
- DARNDR will also establish the requirements to be met by the beneficiaries of deep wells, so as to prevent water waste, and contamination of the aquifer layers.

As to water resources use, the authorization for their development depends on the purposes of the authorization applicant, public interest, and the existing facilities (Art. 2 of the June 12, 1974 Act).

This act is not being effectively enforced.

### II. INSTITUTIONAL FRAMEWORK

**1. National Institutions**

- **The Ministry of Agriculture, Natural Resources and Rural Development (MARNDR**), which monitors numerous development agencies and ensures the management of many irrigation systems throughout the country through its irrigation service, is responsible for the monitoring of groundwater development (Art. 2 of the June 12, 1974 Act).

- **The Ministry of Public Works, Transport and Communications (MPTC)** deals with the preparation works for drinking water supply, sanitation, and hydroelectric generation. It supervises the autonomous institutions – CANEP (Metropolitan Autonomous Drinking water Central), and SNEP (National Drinking water Service).

- **The Ministry of Public Health and Population Matters**, which includes a Public Hygiene Directorate (DHP), is responsible, inter alia, of public hygiene monitoring and water quality control actions.

- **The Ministry of Planning and External Cooperation** is responsible for the development and implementation of a national planning policy dealing, inter alia, with water resources.

- **The Ministry of the Environment** deals with all of the nation's natural resources, including water.

**Technical Cooperation:**

Prompted by international organizations, Haitian and Dominican experts have developed binational projects expected to have institutional impacts. This is apparent from the preliminary Report "Strategic and long-lasting use of binational transboundary waters of the Hispaniola Island: The intermountainous Artibonite aquifer and the coastal Massacre aquifer – Republic of Haiti, Dominican Republic: Preparatory phase for the medium-scale project", GEF-UNEP-OAS-UNESCO, University of Quisqueya/Water and Environment Quality Laboratory.

## DOMINICAN REPUBLIC – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

The existing agreements with Haiti set certain proportions for equitable use of transboundary waters, as well as restrictions to waters or water transfer from hydrographic basins that «dry up » the river bed or affect the water volume for either country. Special provisions regulate the distribution of the volume of the Artibonite and Libon rivers in equal proportions.

Article 10 of the Peace, Perpetual Friendship and Arbitration Treaty signed with Haiti on February 20, 1992 bans any works affecting the flows or the existing waterway of the transboundary rivers (Article 10). This prohibition does not apply to equitable irrigation or industry use of water by either State in its own territory.

**2. National Level**

*Legislative Level*

- **Act No. 5852 (29.3.62), on Land Waters and Public Waters Distribution**, regarding the process for obtaining river water use permits, rights and duties of water users, fee payments, defense measures and works against floods, and other powers of the authorities.

- **Act No. 62 (17.8.2000) – General Act on the Environment and Natural Resources.** It includes general provisions on all natural resources, including water, and sets principles on evaluation, water, soil and contamination control, waste waters use, and environmental management.

- **Act No. 487 (15.10.69) on Control of Development and Conservation of Groundwater**. Sets user rights and obligations, including drilling activities. The Act defines regular and deep wells, gives priority to water for household uses; sets the regime for water permits and rights, well-drilling permits, violations and sanctions.

**Regulatory level**

- **Regulation No. 2889 (20.5.77) of Act No. 487/1969, as modified in August, 200, and July, 2004.** It entrusts the State Secretariat for the Environment and Natural Resources the management of groundwater and surface waters; provides for groundwater protection. It applies to all natural or legal persons and to consumption and discharge (which requires a permit). Regulates groundwater development concessions and permits.

- **Environmental Rules on Groundwater Quality and Subsoil Discharges**. Promulgated by State Secretariat for the Environment and Natural Resources in July, 1004, for the protection, conservation and qualitative improvement of water bodies –particularly subsoil ones. Sets limitations to discharges.

### II. INSTITUTIONAL FRAMEWORK

**1. National institutions**

- **National Institute for Hydraulic Resources (INDRHI)**, established by Act No. 6 (8.9.65) – An institution responsible for regulation, development of infrastructure, and irrigation systems management.

- Irrigation subsector: INDRHI (with users' participation – Act No. 5852/1962).

- Water supply and sanitation subsector: National Drinking water and Sanitation Institute, under the Public Health Secretariat. It operates throughout the country, with the exception of 5 cities having their own systems (Santo Domingo, Santiago Moca, Puerto Plata, and La Romana).

Prepared with the cooperation of Héctor Rodríguez Pimentel, José Raúl Pérez Duray, and Héctor Rodriguez M. – INDRHI

## 3.3. CENTRAL AMERICA

### BELIZE – LEGAL AND INSTITUTIONAL ASPECTS

## I. LEGAL FRAMEWORK

**1. Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

For the border with Mexico, the International Borders and Waters Commission **(CILA) between Mexico and Belize** has adopted a Minute on transboundary waters:

- **Minute No. 2**: start of technical works for a diagnosis for sustainable management of the waters of the Hondo River international basin, up to 2025; 2005.

- The Central American Integration System SICA (http://www.sica.int/) has a **Regional Committee for Hydraulic Resources (SICA/CRRH)**, which has advanced various initiatives for cooperation among the Member States. Water management is one of the issues addressed.

- The Mexican Cooperation Program for Central American Development has a **Mesoamerican Basins Group,** which meets once a year to analyze management issues and best practices in the watersheds sphere.

**2. National Level**

***Constitutional Level***

In 2001, the House of Representatives adopted the **Water Sector Act**, which was ratified by the Senate. The main purpose of such Act was to facilitate drinking water services privatization in the municipalities.

The Water Sector Act of 2001 includes a provision to protect water accumulation areas for groundwater recharge and catchment of waters from surface sources.

## II. INSTITUTIONAL FRAMEWORK

**1. National institutions**

No government institution has been established in Belize for water resource management. Nonetheless, provisions/recommendations have been included in the draft text of the National Policy for Water Resources and in the bill for the establishment of a national water commission. This bill on integrated management of water resources was prepared by the **National Pro-tempore Water Commission** (**NPTWC**) in May, 2006, and has not yet been considered by the House of Representatives. The term of existence of the NPTWC has already expired.

## GUATEMALA – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

**Treaty for the Strengthening of the International Borders and Waters Commission between Mexico and Guatemala (July 17, 1990).**

**Treaty for the implementation of the Trifinio Plan (El Salvador, Guatemala, Honduras) (October 31, 1997).** The Treaty:

- Sets the limits of the Trifinio Region and defines it as an "indivisible ecological unit".
- Creates the Trinational Commission for the Trifinio Plan.
- Creates the legal and institutional framework to propel Trinational initiatives.
- Creates the Consultative Committee as a citizens' consultative body of the Commission.
- Once the CTPT was established, the decision was adopted, to implement larger-scale Trinational initiatives, such as the Trinational Program for the Sustainable Development of the Upper Basin of the Lempa River, and the Integrated Management Plan for the Trinational Protected Area of Montecristi. With IAEA support information is being developed on the transboundary aquifers (Groundwater Reserves)

**2. National Level**

***Constitutional Level***

The **Political Constitution of the Republic of Guatemala** includes the following provisions in connection to waters: Title II-Human Rights; Chapter II-Social Rights

- Article 97: The State, the Municipalities…will sanction all rules necessary to ensure reasonable use and development of fauna, flora, and waters, and prevent their depredation.
- Article 119: The State has the basic obligation of adopting the measures necessary for the efficient conservation, development and exploitation of the natural resources
- Article 121: surface- and groundwaters are State-owned goods.

***Legislative Level***

**No general waters law exists.**

**Environmental Protection and Improvement Act (Decree n° 68-86)**

Main objectives (as to water):

- Integral use and rational management of basins and water systems (Article 12)
- Maintenance of water volumes for human use and essential activities
- Water quality evaluation
- Control to avoid environmental degradation from water development and use (Article 15)

## II. INSTITUTIONAL FRAMEWORK

### 1. Binational and Trinational institutions

**MEXICO-Guatemala International Borders and Waters Commission (CILA):**

- The Commission role will consist of advising both countries' governments on border- and international river waters issues (Article V).
- The Commission's jurisdiction will include the international rivers between both countries and the land border line (Article IX)
- (Treaty for the Strengthening of the Mexico-Guatemala International Borders and Waters Commission, 1990).

**Trinational Commission for the Trifinio Plan:**

- The Commmission monitors the implementation and ongoing updating of the Trifinio Plan. It is the higher-level trinational regional authority. Has administrative and financial powers, its own juridical personality, and a Trinational Executive Secretariat (Article 5).
- Treaty for the Implementation of theTrifinio Plan (El Salvador, Guatemala, Honduras) (October 31, 1997).
- Implementation of the Trinational Program for Sustainable Development of the Upper Basin of the Lempa River.

### 2. National institutions

**Ministry of the Environment and Natural Resources:** The aquifer management issue has not yet been addressed; activities are almost entirely confined to surface waters.

**INSIVUMEH** is the institution of the Government of Guatemala responsible for the evaluation and quantification of the water resources in the country.

## I. LEGAL FRAMEWORK

2. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

**Treaty for the implementation of the Trifinio Plan (El Salvador, Guatemala, Honduras) (October 31, 1997).** The Treaty:

- Sets the limits of the Trifinio Region and defines it as an "indivisible ecological unit".
- Creates the Trinational Commission for the Trifinio Plan.
- Creates the legal and institutional framework to propel Trinational initiatives.
- Creates the Consultative Committee as a citizens' consultative body of the Commission.
- Once the CTPT was established, the decision was adopted, to implement larger-scale Trinational initiatives, such as the Trinational Program for the Sustainable Development of the Upper Basin of the Lempa River, and the Integrated Management Plan for the Trinational Protected Area of Montecristi. Information on the transboundary aquifers (Groundwater Reserves)is being developed with IAEA support.

### 2. National Level

*Legislative Level*

- **General Waters Act of 1927,** and **Water and Sanitation Subsectorial Act,** 2003, on care of aquifer waters.
- **National Waters Development Act and its regulations, 1927.**
- **Drinking Waters and Sanitation Framework Act, 2003.**
- **Hydrographic Basins Network Act and its regulations.**

Water for human consumption is the fundamental priority of both acts. The second priority of the General Act is water for railroad uses (no longer in existence) and irrigation. This act does not have an integrated focus.

A bill on General Waters Act has been submitted to the Congress.

## II. INSTITUTIONAL FRAMEWORK

### 1. Binational and Trinational institutions

**Trinational Commission for the Trifinio Plan** among Guatemala, Honduras and El Salvador in the Lempa River basin.

### 2. National institutions

The **Secretariat for Natural Resources and the Environment (SERNA)** is the leading water affairs entity. Through its General Directorate for Water Resources, SERNA issues contractual permits for national waters development. Its Contaminant Research and Control center participates in the area of contaminants.

The **Secretariat for Agriculture and Livestock** manages the irrigation component.

The **National Water and Sanitation Service** manages the drinking water and sanitation component.

## COSTA RICA – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

**1. Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

**An OAS-fostered Management Project for the San Juan River Basin is being addressed with the Government of Nicaragua**. There is also an **agreement with the Republic of Panama: the** IADB-GEF **Ecosystems Integrated Management-Binational Basin of the Sixaola River**; the objective of this agreement is to strengthen the binational institutional framework for the integrated management of the basin and to improve the technical capabilities required from the institutions, indigenous organizations and civil society organizations involved.

**2. National Level**

***Constitutional Level***

No explicit constitutional rule defines the Nation's waters as public goods; however, such principle stems from the joint interpretation of Articles 6, 122 subparagraph 14 of the **Political Constitution**, Article 8 of the **Code of Mining**, and Articles 2, 4 and 17 of the **Waters Act**, and Article 50 of the **Environment Organic Act.**

Taken together, all such rules define as a public good all surface waters and groundwaters, territorial waters, and the forces derived from them, as well as the power to protect, maintain and develop such resource. Besides, the Constitution recognizes the right to a healthy, ecologically balanced environment.

***Legislative Level***

The **Waters Act No. 276, of August 26, 1942**, is the senior regulatory framework of the water resources. Its purpose is to regulate use and differentiate the ownership rights for the various types of water development, public or private.

For waters included in the sphere of public ownership the concession system is established for the first time; rules and use priorities were defined for public waters. The Act attempted to establish ruling institutions for the management of this resource, entrusting the National Electricity Institution (SNE) with the regulation of public waters. A Waters Department was created under such Institution. Use priorities were developed to adapt them to the current conditions and economic needs and the existing technology. Regulation of the water resources is being initiated for hydroelectric production purposes. The Act attempted to include penalties, sanctions, offences and misdemeanors for inadequate use of the resource. Those were timid efforts, since water development had priority on water conservation.

There are now about 120 laws and executive decrees authorizing different institutions to perform functions or activities connected with water resource managment. There is no clear vision of the ruling principles of integrated management of such resources. A bill has been submitted for a new water resource regulation (http://www.drh.go.cr)

**Other relevant acts on groundwaters**

**Article 2 of Act No. 5516, May 2, 1974 (Gaceta 99, May 28, 1974)**, including amendments to the Waters Act, mandates the Ministry of the Environment and Energy to maintain a registry of the individuals or corporations dealing with drilling projects for groundwater extraction. Registration will be required to obtain a license.

*Regulatory level*

The **Rules on Drilling and Groundwater Development, of May 26, 1998,** require a drilling permit and limit well-drilling activities in --

- State-declared protection- and aquifer reserve areas.
- Areas under conditions of vulnerability to contamination and risk of overexploitation relative to the maximum capacity of the aquifer.
- Areas susceptible to salt intrusion, contamination or other factors which, according to the opinions of the Ministry of the Environment and Energy (MINAE), the National Groundwater, Irrigation and Drainage Service (SENARA), and the Costa Rican Institute of Aqueducts and Sewerage (A y A) on matters included in their jurisdictions, affect the aquifer and prevent its development.
- Areas of interference with other wells, streams, rivers, or water nascents.

Under the Rules, groundwater development projects require drilling permits from the MINAE Waters Director. Under the Waters Act No. 276/1942, the owner of the well must guarantee the success of the drilling project and request a water development concession.

## II. INSTITUTIONAL FRAMEWORK

### 1. National institutions

**The main institutions involved in groundwater management are:**

- The **Ministry of the Environment and Energy (MINAE);**
- The **National Service of Groundwater, Irrigation and Drainage (SENARA),** in the research area**;**
- And the **Costa Rican Institute of Aqueducts and Sewerage (A y A)**, as the institution responsible for urban water supply throughout the country.

Under Act No. 276, of August 27, 1942, Articles 17, 21, 27, 46, 56, 176 and 178, the **MINAE** is the ruling institution for water resources. It makes decisions and adopts resolutions on ownership, development, use, management and surveillance of such resources, and manages the National Water and River Bed Development Registry.

Under SENARA Act No. 6877, of August 18, 1983, Article 3, subparagraphs ch) and e), **SENARA** is to research, protect and promote the use of the water resources of the Nation, and pursue, coordinate, foster and update hydrological, hydrogeological, agrological and other research activities considered necessary in the hydrographic basins. SENARA mantains an Archive for National Wells. Article 3, subparagraphs h) and i) of the Law makes SENARA responsible for the enforcement of the legislative provisions in this area. Its decisions on drilling and water development, maintenance and protection activities performed by government institutions and the private sector are definitive and compulsory. SENARA provides technical advice and services to government institutions and the private sector.

Under Art. 2-f of the Act Establishing the **A y A**, No. 2726, April 4, 1961, as amended, A y A must develop, use, regulate or monitor all public-dominion waters indispensable for the enforcement of the provisions of such Act.

## EL SALVADOR – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

**Trifinio Plan Treaty, for the Implementation of the Trifinio Plan (El Salvador, Guatemala, Honduras) (October 31, 1997)** http://www.sica.int/trifinio/ctpt/marco_j.aspx?IdEnt=140

The objective of the Trifinio Plan is Central American integration and integral, harmonic, and balanced development of the border area of the three nations. Very recently the program started to address the issue of the aquifers, but groundwater resources are being subject only to preliminary research studies. In the framework of the Trifinio Plan water resources projects are being pursued, such as:

- Promotion of Management of Water as a Regional Public Good in the Upper Basin of the Lempa River, in the Trifinio Region.
- Project on Sustainable Development of the Environment and Water Resources in the Upper Basin of the Lempa River.
- Program on Institutional Strengthening of the Citizen Participation Organizations of the Trinational Commission of the Trifinio Plan
  http://www.sica.int/busqueda/busqueda_basica.aspx?IdCat=23&IdMod=4&IdEnt=140
- **Memorandum of Understanding between the Hydrology and Meteorology services for the Lempa River international basin, El Salvador, Honduras and Guatemala (July, 2003).** Objective: strengthening cooperation actions among the Hydrology and Meteorology Institutes of the participant nations, and facilitating the activities leading to enhance and give continuity to sound operation of the basin's Hydrometeorologic Forecasting System.
- **Letter of Understanding on interinstitutional coordination and cooperation to promote the sustainable development of the binational basin of the Güija Lake (Guatemala-El Salvador), March 24, 2006:** "The objective of this letter of understanding consists of fostering sustainable transboundary development of the binational basin of the Güija Lake through the strengthening of coordination mechanisms that help harmonize joint actions aimed at promoting the development of natural and cultural resources".

**2. National Level**

***Legislative Level***

**Preliminary Waters Act Bill** (being revised), submitted by the Ministry of the Environment.

- These are the Basic Principles of this preliminary bill:

  - Integral Management of Water Resources;
  - Focus on basins as the basis for integral water management;
  - Equality;
  - Access and Responsibility: Access to water resources is a fundamental right of every human being; conservation of such resources is a shared responsibility of the State and the society at large**;**
  - Strategic Resource: The resource water is to be recognized as a vital, finite, and vulnerable good. Its interrelation with the social, economic and environmental areas turns it into a resource indispensable for the sustainable development of the country;
  - Water Sustainability: The present needs of the population are to be met by conserving the quality and volume of water resources for the benefit of present and future generations, while maintaining the stability of the ecosystems;

- Recognition of Water Values: Water has social, economic, environmental, and cultural values that have to be acknowledged.
- Polluter-Payer.
- Equity: Adequate allocation of the water resources to the members of the society according to their needs, availability of such resource, and social conditions;
- Priority of water use for human consumption: Meeting human needs is to be the fundamental focus of water uses.

**National Water Supply and Sanitation Administration Act (ANDA) (Decree-Law N° 341. October 17, 1961:** D.0. N° 191, Volume 193, October 19, 1961; amended eight times. There also exist other decrees on drinking water services provision, as well as several municipal regulations on the provision of such services. Article 2 of the A.N.D.A. aims at providing and helping provide the inhabitants of the Republic with water supply and sanitation services through planning,, financing,, implementation, operation, maintenance, management, and development of necessary or convenient works.

**Irrigation and Drainage Act of the Ministry of Agriculture and Livestock (MAG) (D.L. N° 153, November 11, 1970;** D.O. N° 213, Volume 229, November 23, 1970: reformed three times). This act regulates the conservation, development and distribution of the water resources existing in the national territory for irrigation and drainage purposes, as well as the construction, conservation, and management of the relevant works and construction projects, so as to increase production, including agricultural production, by means of the rational use of soil- and water resources (Article 1). This Act declares hydraulic resources –defined as surface waters and groundwaters— to be national goods. Water for human consumption is priroritary (Article 4).

**Lempa RiverHydroelectric Executive Commission Act (CEL) (D.L. N° 137, September 27, 1948;** Amendments: (14) D.L. Nº 45, June 30, 1994, published in the D.O. Nº 148, Volume 324, August 15, 1994). The objective of the Commission consists of developing, conserving, managing and using the energy resources and sources of El Salvador under this Act, other acts, regulations, and general scope provisions applicable in this realm.

**Environment Act (April 24, 1998;** Reformed: D.L. N° 581, October 15, 2001; D.O. N° 353, October 31, 2001). Article 70 sets the following principles for waters:

- Water management will be performed in conditions that priorize human consumption, setting a balance with the other natural resources;
- Water ecosystems management must be performed taking into account the interrelation of their elements and the necessary balance with other systems;
- Actions will be promoted to ensure that the hydrological cycle equilibrium will not be adversely modified in terms of productivity, ecosystem equilibrium, conservation of the environment, quality of life, and conservation of the climatic regime;
- Water volume and quality is to be ensured through a system that regulates the different uses of the resource;
- Measures will be implemented for the protection of the water resources from the effects of contamination.

Article 71 specifically deals with aquifers, and provides that "[t]he Ministry will identify the aquifer recharge areas and promote actions allowing for its recovery and protection".

***Regulatory level***

The **Environment Act is based on regulatory provisions allowing for its development and facilitation; namely:**

- **General Regulations of the Environment Act.**
  - Object (Art. 1): The object of these General Regulations is to develop the rules and provisions included in the Environment Act, to which it is attached as its main implementation instrument.
  - Reformed: D.L. N° 581, October 18, 2001; D.O. N° 206, Volume N° 353, October 21, 2001.

- **Special Regulations on Waste Waters.**
  - Object (Art. 1): The object of these Regulations is to prevent waste waters from modifying the receiving media, so as to contribute to recovery, protection, and sustainable recovery of the water resources from the effects of contamination.
  - D.L. N° 39, May 31, 2000; D.O. N° 101, Volume N° 347, June 1, 2000).

- **Special Regulations on Environmental Quality Technical Rules.**
  - Object (Art. 1): The object of these Regulations is to determine the guidelines or action lines for the implementation of environmental quality in the receiving media, and the mechanisms for the enforcement of such rules regarding the atmosphere, water, soil and biodiversity protection.
  - D.L. N° 40, May 31, 2000; D.O. N° 101, Volume N° 347, June 1,2000.

- **Environmental Act Regulations** (Reformed: D.L. N° 581, October 18, 2001; D.O. N°, Volume N° 353, October 31, 2001) Art. 97: Use and development of national water resources is subject to the issuance of environmental permits according to Arts. 62, and 63 of the Act". Article 63 provides that the MARN (Ministry of the Environment and Natural Resources) will require, as a previous step for the issuance of the permit, the concession granted by the relevant authority.

## II. INSTITUTIONAL FRAMEWORK

### 1. Binational and Trinational institutions

**Trinational Commission for the Trifinio Plan**: Monitors the implementation and ongoing updating of the Trifinio Plan. (Treaty on the Implementation of the Trifinio Plan) (El Salvador, Guatemala, Honduras (October 31, 1997).

### 2. National institutions

Under the Environmental Law and Regulations, the **MARN** has the following powers on Water Resources protection:

**MARN – Environmental quality supervision of water bodies:**

- Inventory of emissions and receiving media (Art. 46) **;**
- Water Resource Protection (Article 48 Environment Act) **;**
- Supervision, including supervision performed by the SNET's Hydrological Service (Art. 49) **;**
- Protection of the coastal-maritime medium (Art. 51) **;**
- Inclusion of natural resources in the national accounts (Art. 61) **;**
- Management and use of waters and water ecosystems (Art. 70) **;**
- Recharge areas protection (Art. 71) **;**
- Management and protection of the coastal-maritime resources (Art. 72) **;**
- Coastal-maritime resources management policy (art. 73) **;**
- The Territorial Studies National Service, under the MARN, is solely responsible for performing regional and national research studies and monitoring activities on surface and groundwater resources.

**MSPAS (Ministry of Public Health and Social Assistance) – Water for Human Consumption – Drinking water**

- Water for human consumption – Surveillance of health quality of such waters; development of rules on surveillance and supervision of their enforcement. (Arts. 63 and 64).
- Waste Waters
  - Control of construction, installation and operation of pools, maritime-, lake- and river beaches and spas, as well as thermal and medicinal running water public baths (Art. 66 CdeS).
  - Operation permits.
  - Primary systems building control and verification.

**ANDA (National Water Supply and Sanitation Administration)**

- Systems owned or administered by ANDA. They only apply to such systems.
  - Construction works connected with drinking water study, research, conduction, extraction, storage and distribution (Art. 3, ANDA Act).
  - Acquisition, use, and treatment of surface waters or groundwaters, and contamination monitoring thereof.
  - Quality control of discharges to ANDA's sewerage network.
  - Construction and management of treatment systems owned by ANDA.
  - Development of treatment plans for waste waters discharged in the sewerage network owned or administered by ANDA..

**MAG (Ministry of Agriculture and Livestock)**

- **Irrigation Waters** - Water quality (Arts. 1 and 100, Irrigation Act)
- **Water contamination**
- Permits and concessions (Arts. 10 and 20-28).

**Water Resources Protection Executive Committee**

- Its membership includes institutions such as MAG, ANDA, MSPAS, MOP, OEDA - Decree 50 - Rules on Water Quality, Discharge Control and Protection Areas.
- Many of the environmental powers conferred to the CEPRHI by this Decree are considered to have reverted to the Environmental Act, effective on a date posterior to that of the Decree.

The Municipalities have issued local statutes in their jurisdictions. The communities create development associations for drinking water system management and other purposes; some municipalities have joined in micro-regions for shared drinking water and sanitation system administration and environmental management of municipal areas.

## NICARAGUA – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

Two agreements on surface water bodies are in force:

- **Technical Cooperation Agreement between the Government of Nicaragua and the Government of Costa Rica on the San Juan River Basin, October 19, 1994.**
- **Technical Cooperation Agreement between the Government of Nicaragua and the Government of Honduras on the Negro River.**

**2. National Level**

***Legislative Level***

The **National Waters Act**, passed by the National Assembly on 15th May, 2007, has not been promulgated. This Act creates the framework for the management, conservation, development, use, sustainable and equitable beneficial use and preservation of water resources (including surface, subsoil, and waste waters), and the protection of all other natural resources, ecosystems and the environment, and establishes and regulates integral management of water resources from hydrogeographic and hydrogeological basins, sub-basins and micro-basins.

Other relevant acts on groundwaters:

**Act on Drilling Permits and National Wells Registry (Gaceta Diario Oficial, 16.VII.1969)**, establishing the drilling permit system for wells built with mechanical equipment.

***Regulatory level***

**Decree No. 107 – 2001 – National Policy on Water Resources.**

- Art. 5 subparagraph c) provides for integrated planning and management of water resources, considering groundwater and surface waters, and volume and quality of such waters as a single attribute.
- Art. 8 subparagraph 4) recognizes the fact that the availability of a water resource knowledge basis is a precondition for integrated management of the resource, and the State will promote the evaluation, including surface waters and groundwaters temporal and spatial availability in adequate quality and volume, through a comparison with the existing demand.

### II. INSTITUTIONAL FRAMEWORK

**1 National institutions**

The institutional water management framework is governed by **Act No. 290, on Executive Power Organization and Responsibilities and Procedures,** published on 3.VI.1998 in the *Diario Oficial La Gaceta*. The following institutions are involved in water resources issues:

- **Ministry of the Environment and Natural Resources (MARENA)**, responsible for developing, proposing and leading the national policies on the environment and sustainable use of natural resources. Under the Ministry's Natural Resources and Biodiversity Directorate is the Water Resources and Basins Directorate, which:

- Promotes and fosters technical and legal normative instruments, procedures, plans and programs for sustainable use and preservation of the quality of the water resources in order to achieve equilibrium with economic-social development;
- Develops programs for the development of protection areas, prohibition areas, and protection rounds, so as to preserve water quality;
- Develops water pollution diagnosis programs;
- Promotes Integrated Management of national and transboundary water resources through conventions and national and international agreements to develop the strategic projects of the National Water Resources Action Plan (PNRH).

- **Nicaraguan Water Supply and Sanitary Sewerage (INAA)**, responsible for regulation, control and standardization of the drinking water and sanitary sewerage sector.

- **Nicaraguan Sanitary Sewerage Company (ENACAL)**, responsible for the services of drinking water, and collection, treatment, and disposal of waste waters.

- **Nicaraguan Institute for Territorial Studies (INETER)**, responsible for the research, inventory, and evaluation of the national resources and the implementation of the territorial ordering studies at national and regional levels.

## PANAMA – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

**There is a joint project with the Government of Costa Rica, for the Sixaola River.**

On 1st November, 2006 bilateral negotiations were started between the Republic of Panama and the Republic of Costa Rica for the project of Integrated Ecosystem Management in the Binational Basin of the Sixaola River.

The program will be implemented in a binational basin characterized by both its plentiful natural wealth and limitations stemming from its high vulnerability. Therefore, the initiative responds to three basic elements mutually agreed by Costa Rica and Panama through a broad consultation and concertation process. Such elements are: a strategy for the development of the basin with a binational approach; an indicative plan for functional territorial ordering, and a development scenario selected by both countries.

The current stage involves the signature of Negotiation Minutes to reach an agreement on the terms and conditions of the binational arrangement.

**2. National Level**

***Constitutional Level***

The **Political Constitution of** Panama includes a number of provisions on this matter:

- Chapter 7 –Ecologic Regime.

  - Article 120. The State will regulate, monitor, and implement the opportune actions to ensure rational use and development of the land, river, and marine fauna, as well as forests, lands and waters, to prevent depredation and ensure preservation, renovation and permanence of such resources.

- Title I Chapter 1 State Goods and Rights.

  - Article 258. The following goods belong to the State and are public use goods, and may not be appropriated by private parties: the territorial sea and the lake- and river waters; lands and waters allocated for public services and all types of communications; lands and waters allocated, or State-allocated, to public services of irrigation, hydroelectric production, drainage and water supply, and all other goods defined as public use goods by the Law.

  - Article 259. Concessions for the development of the soil, subsoil, or forests and for use of water, communication- or transport media, and other public service business will be governed by the principles of social welfare and public interest.

***Legislative Level***

**Law Decree N° 35 – September 22, 1966**

- **Article 1**° Regulates the utilization of the State's waters, which are to be developed in the social interest. Utmost public welfare will thus guide water use, conservation and management.

- **Article 2°** - All river, lake, sea, subsoil, and atmospheric waters included in the continental and island territory, the subsoil, the submarine continental platform, the territorial sea and the air space of the Republic are goods belonging to the public property of the State and are subjected to free and common use under this Decree Law.

Other relevant acts in the groundwater sphere:

- **Act Nº 41 General Environment Act, July 1, 1998**
  **ChapterV1. Water Resources.**

  **- Article 81** Water, in all of its states, is a public-domain good. Social interest requires its appropriate conservation and use. Water uses are contingent to the availability of the resource and the real needs of their purpose.

  **- Article 82.** Water resource users must perform the works needed for their conservation under the environmental management plan and the relevant concession contract.

  **- Article 83.** The Environmental National Authority will develop basin management special programs when their level of deterioration or strategic conservation needs justify decentralized management of their water resources by local authorities and users.

- **Act Nº 24, June, 1995, on Wildlife.** Article 65: Whoever poisons, pollutes, corrupts, deviates or drains waters of lakes or rivers, or continental or island waters with the purpose of refishing, hunting, gathering or extracting wildlife species will be subject to prison for a term of 6 months to 2 years and a 180-365 days fine.

- **Executive Decree 70, July 27, 1973,** "Regulates Granting of Water Permits and Concessions and determines the integration and functioning of the Water Resources Consultative Council", (G.O. 17,428, September 11, 1973).

All individuals or organizations dedicated to groundwater extraction with research or development purposes must register in a special registry of the Waters Department. A license will document such registration. (Article 9 paragraph b)
The interested parties must request an exploration permit for each drilling operation (Article 9 paragraph c).

- **Act Nº 44, August 5, 2002–Establishing the Special Administrative Regime for the management, protection and conservation of hydrographic basins of Panama (G.O. 24,613, August 8, 2002)**

The objective of this Act is to establish a national administrative regime for the management, protection and conservation of the hydrographic basins (Article 1). An hydrographic basin is defined as an area with adequately defined physical, biological and geographic features where human beings interact and superficial waters and groundwaters flow to a natural network through… (Article 2 §1).

***Regulatory level***

- Dgnti-Copanit Technical Regulation 24-1999. Water, reuse of treated waste waters.
- Dgnti-Copanit Technical Regulation 35 - 2000 Water, Liquid effluents direct discharge in surface and groundwater bodies and masses.
- Dgnti-Copanit Technical Regulation 47-2000. Water, provisions on mud use and final disposal.
- Executive Decree 70, July, 1973 - Regulates granting of water concessions.
- Executive Decree 55, June, 1973- Regulates water rights of way.
- Executive Decree 70, July, 1973, regarding, inter alia, groundwater concessions. This is the only decree on groundwaters.

## II. INSTITUTIONAL FRAMEWORK

### 1. National institutions

The only institution responsible under the law for both superficial and ground waters is the **National Environmental Authority.**

The **National Environmental Authority** is the State's ruling entity for natural resources and environment conservation, development, use and management.

Its structure includes:

The **Hydrographic Basin Integrated Management Directorate**, which includes the **Water Concessions and Permits Section**, responsible for granting exploration drill permits, maintaining the hydrogeological registers for the wells drilled, connecting, supervising and monitoring superficial waters and groundwaters, as well as recording the data from the hydrometeorological stations of the Institution.

Other institutions perform activities connected with water, particularly with groundwaters; namely:

- The **Ministry of Health (MINSA),** with a department for drilling wells for fresh water supply to rural communities.

- The **National Water and Sanitation Institute (IDAAN)** has an Underground Source department dedicated to drilling wells to provide water to urban communities lacking potabilizing plants.

- The **Ministry of Agricultural Development (MIDA)** has a department dedicated to drilling wells for agricultural and livestock purposes.

## 3.4. SOUTH AMERICA

### ARGENTINA – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

International agreements on superficial water resources and international water ways limits relevant to Argentina.

- **Treaty of the Uruguay River (1961) Argentina- Uruguay.**
- **Treaty of the La Plata Basin (1969) Argentina - Bolivia - Brazil - Paraguay – Uruguay**, and various treaties on the Plata Basin water ways.
- **Treaty of the La Plata River and its Maritime Front (1973) Argentina – Uruguay.**
- **Statute of the Uruguay River (1975) Argentina – Uruguay.**
- **Additional Specific Protocol on Shared Water Resources (1991) Argentina - Chile.**
- **Draft Declaration on Basic Principles and Action Lines for the Guaraní Aquifer System, approved by the Senior Project Direction Council, 3rd Meeting, June 24-25, 2004, Brasilia**, and final version of the Guarani Aquifer Draft Agreement Project, December, 2005.

**2. National Level**

*Constitutional Level*

**Article 41 of the National Constitution**, as amended in 1994:
The Nation shall regulate the rational use of natural resources, the preservation of the natural heritage and regulate and reinforce the minimum environmental protection standards, and the provinces those necessary to reinforce them.

**Article 124 of the National Constitution**: The provinces have the original domain over the natural resources existing in their territory.

*Legislative Level*

**Civil Code:** Article 2340, subparagraph 3: Groundwaters are public goods, notwithstanding the regular exercise, by the landowner, of his right of extracting groundwaters to the extent of his interest and abiding by the relevant regulations.

**Provincial Water Codes:** They regulate both superficial waters and groundwaters.
Other relevant acts on groundwaters:

- **Act No. 25668 (28.XI.2002)**. (National) environmental management system. It establishes the environmental minimum prior conditions for water preservation, development and rational use.

**Provincial Acts:**

- **Province of Buenos Aires** - Water Code (Act Nº 12.257, 9.XII.1998). Provides for groundwater use for irrigation purposes (Article 59), and the extraction and exploration rights by the landowner (Articles 82 and 83, respectively).

- **Province of Mendoza –** Act Nº 4.035 (18.VII.1974) Groundwater Legal Regime – 44 articles regulating all aspects of groundwater.
- **Province of Santa Cruz:** Act Nº 4148–Water Code,
- **Province of Entre Rios -** Act Nº 9.172/98 and Implementing Decree nº 7.547/99, Use and development of groundwater and surface waters for economic productive goals in the provincial territory. -Decree 3413/98 on thermal waters.

***Regulatory level***

**National Executive Power Decree 776/92. Establishment of the Water Contamination Affairs Directorate. 12.V.92.**

**Resolution of the Natural Resources and Human Environment Subsecretariat (SRN and AH) Nº 242/93** on industrial or special spills covered by D. 674/89 containing ecotoxic substances.

## II. INSTITUTIONAL FRAMEWORK

### 1. National institutions

- **Water Resources Subsecretariat (SRH)**, under the Public Works Subsecretariat of the Ministry of Federal Planning, Public Investments and Services. It develops and implements the national water policy, the regulatory framework for management, programs, and management actions and infrastructure development. The Subsecretariat for the Environment and Sustainable Development, with jurisdiction on natural resources, is responsible for certain aspects of water quality.

- **National Water and Environment Institute (INA)**, originally National Water Science and Techniques Institute, Act Nº 20.126, a decentralized institution of the Water Resources Assistant Vice Ministry, with control functions on water contamination.

- **Regional Groundwater Center (CRAS**), an INA instrumentality with headquarters in San Juan. Performs studies and projects on groundwater resources assessment, development, and preservation.

Prepared with the cooperation of Ofélia Tujchneider, Viviana Rodriguez and Verónica Musacchio – UNL/CONICET

## BOLIVIA – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

**Treaty of La Plata Basin of 1969 (23/IV/69) Argentina - Bolivia - Brazil - Paraguay – Uruguay,** aimed to enabling harmonic and balanced development and exploitation of the natural resources of the region and ensure their preservation through rational use of such resources.

**Concertations and meetings in the framework of the ISARM program among the countries and with the OAS and the UNESCO** for the study of the following transboundary aquifers:

- Amazonas and Pantanal Aquifers (Bolivia-Brazil)
- Titicaca aquifer (Bolivia-Peru)
- Agua Dulce (Bolivia-Paraguay)
- Ollagüe Pastos Grandes (Bolivia-Chile)
- Puneños (Bolivia-Argentina)

Along with Peru, Bolivia works in the Titicaca Lake aquifer through the **Titicaca Lake Authority (ALT).**

As regards the Yrendá Toba Tarijeño Aquifer (Bolivia-Argentina-Paraguay), in September, 2001 the three countries developed a project proposal for the GFE within the **Framework Program for the Plate Basin (CIC/UNEP/OAS**) to deepen the knowledge of and promote joint management focused on desertification and adaptation to climatic change.

An **Agreement** was recently entered into in Argentina among Argentina, Bolivia, and Paraguay, **on the Pilcomayo River basin**. (The European Economic Community has been working since November 20, 2000 in the project of the Trinational Commission for the development of the Pilcomayo River).

In (June 15) 1993, Bolivia and Peru signed an agreement (**"Global Binational Director Plan for flood protection-prevention and development of the water resources of the Titicaca Lake, the Desaguadero River, the Poopó Lake and the Coipasa salt field")**, whereby a decision was made to conduct the actions, programs and projects, and sanction the rules for the arrangement, management, monitoring, and protection of the basin of the TDPS (Titicaca Lake, the Desaguadero River, the Poopó Lake and the Coipasa salt field) water system basin.

**2. National Level**

***Constitutional Level***

**Act Nº 2650, April 13, 2004 – Political Constitution of the State (CPE) of Bolivia, as reformulated. Article 136.**

- The original State domain includes, along with the goods the Law defines as such, the soil and subsoil, with all of their natural wealth, lake, river and medicinal waters, as well as the physical elements and forces susceptible of being developed.
- The Law will set the conditions for such domain rights, as well as the conditions for concession and assignment of same to private parties.

**Article 137º.** The goods belonging to the National patrimony are inviolable public property. All inhabitants of the national territory must respect and protect such property.

*Legislative Level.*

**Waters Law** in force (elevated to the rank of Law on 28th November, 1906), **Waters Regulations.** Last century legislation considered only the Western society of people with European last names, in a Victorian, discriminatory society. Under such circumstances, members of the original society were not considered citizens of this country, and the provisions of this Act are often inapplicable, due to the constant, radical political and social changes occurred during the 101-year period elapsed since the date the Act was issued.

**Law No. 2878, October 8, 2004 – Law of Promotion and Support for the Irrigation Sector for Agricultural, Livestock and Forest Production.**

**Article 21°. (Rights of Use and Development of Water Resources for Irrigation Purposes).** Registration and permits for use and development of water resources for irrigation waters will be issued and cancelled by the Water Resources Authority. Pending the creation of such Authority, the National Irrigation Service (SENARI) will grant and withdraw such permits under the regulation. The following provisions are forms of recognition and granting of water use rights for irrigation under Articles 171 of the Political Constitution of the State and 50 of Act Nº 2066 on Drinking water and Sanitation Services:

**Supreme Decree Nº 28818, August 2, 2006, implementing Act Nº 2878, Recognition and Granting of Use and Development Rights on Water Resources for Irrigation.**

**Environment Act Nº 1333, dated April 27, 1992**, and its Regulations, Supreme Decree Nº 24176, December 8, 1995 "Regulations of the Environment Act".

**Act Nº 2066, April 11, 2000 – Provision and Use of Drinking Water and Sanitation Services – Chapter III – Licenses and Registration – Article 50 On Water Sources.**

Use and development of water sources for the provision of drinking water by indigenous and originary peoples, peasant communities, and peasant associations, organizations and unions are recognized, respected and protected under Article 171 of the Political Constitution of the State. The Water Resources Authority will grant a legal document guaranteeing such rights while caring for rational use of the resource water.

*Regulatory level*

- **General Regulations on Environmental Management –** as modified by S.D. 26705, dated July 10, 2002

- **Regulations on Water Pollution 24176, December 8, 1995** – Rules and regulates Natural Resources generally, in its Title IV - On Natural Resources generally, Chapter II, On the Resource Water, Articles 36, 37, 38 and 39.

**Supreme Decree Nº 24782, July 31, 1997** – Environmental Regulations on Mining Activities – Chapter II – On Groundwater: **Articles 28, 29, and 30.**

## II. INSTITUTIONAL FRAMEWORK

### 1. National institutions

According to Art. 4 of Act No. 3351, February 21, 2006, the Ministry of Waters is the organization responsible for planning and enforcing, assessing and monitoring the policies and plans on drinking water and basic sanitation services, irrigation, and management of basins, border and transboundary

waters, as well as the development of all uses of water, in coordination with the Ministries of Foreign Affairs and Cult and Development Planning.

**Under the Executive Power Organization Act, Nº 3351, February 21, 2006, Article 4,** the Ministries of State will have the following specific responsibilities:

**Ministry of Mining and Metallurgy** – Support, supervise and monitor the operation of the National Geology and Technical Mining Service (SERGEOTECMIN).

Regulations of the Executive Power Organization Act, Supreme Decree No 28631, March 8, 2006: Chapter XIII: Ministry of Mining and Metallurgy: Article 77°. (Supervised or Subordinate Institutions). The following institutions are subject to organic and administrative monitoring or supervision by the Ministry of Mining and Metallurgy:

Decentralized Public Institution

National Geology and Technical Mining **(SERGEOTECMIN).**

The Geology and Technical Mining (SERGEOTECMIN) of Bolivia has the following Institutional Mission under Ministerial Resolution 024/2004, April 1, 2004: "Developing the national geological map, performing scientific and technological research activities in the areas of Geology, Mining and Hydrogeology, and activities regarding the environmental impact of mining-metallurgic projects, as well as contributing to the development of mining activities through technical support for mining administrative processes, development and updating of the national mining cadastre, mining registry management, and fiscalization of payment of mining permits.

## BRAZIL – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

The analysis submitted is not comprehensive – the information has been updated to June, 2007.

**1. Transboundary level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

No agreements and groundwater-specific mechanisms are in force. Various mechanisms are linked to water resources; however, they do not include the specific aspects needed to cover groundwaters.

**Cooperation Treaty for a Study on Water Power Use of the Acaray and Monday Rivers (20/01/1956)**, between Brazil and Paraguay.

**1969 La Plata Basin Treaty (23/04/69) - Argentina-Bolivia-Brazil-Paraguay-Uruguay**, allowing for an harmonic and balanced development and exploitation of the region's natural resources and ensuring their preservation through rational use of same.

**Brazil-Paraguay Treaty on Shared Sovereign Rights from Salto Grande de Sete Quedas or Guariá to Foz de Iguaçu (26/04/73)** on hydroelectric development of the water resources of the Parana River, jointly owned by both countries, from Salto Grande de Sete Quedas or Guariá to Foz de Iguaçu.

Uruguay-Brazil **Cooperation Treaty on Natural Resources Exploitation and Development of the Merim Lake Basin and Protocol for the Exploitation of the Water Resources of the Border Section of Yaguarón River**, 17/2/78, Annex to Decree 81,351.

**1978 Amazonic Cooperation Treaty (30/07/78) among Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela**, ratified in Brazil through Decree Nº 85.050, 18/8/1990. It fosters the harmonic development of the Amazonic territories, including preservation of the environment, conservation and rational use of natural resources, and scientific research and information sharing among the member countries.

**Brazil-Argentina Treaty on the Exploitation of the Shared Water Resources of the Border Sections of the Uruguay River and its tributary, the Pepirí-Guazú River (17/5/80),** including hydroelectric resources; improvement of the navigability conditions of the Uruguay River in such sections, mitigation of the effects of unusually high water levels, and rational water-consumptive uses.

**Brazil-Uruguay Cooperation Treaty on the Exploitation of the Natural Resources and Development of the Cuareim River Basin (11/3/91),** whereby such countries committed themselves to reach and expand cooperation for the development of the Cuareim (Quaraí) River. Other objectives include improved social and economic status for the inhabitants of the basin; equitable and safe use of water for household, urban, agricultural, and industrial uses; water courses regulation and control of high water levels; solutions to problems stemming from inadequate use of water; production, distributions and use of hydroelectricity and other forms of generation of energy; expanded navigational and other transport- and communication means; development of specific projects of mutual interest; management, adequate use, recovery, and conservation of water resources, considering their characteristics.

**Brazil-Uruguay Chuí Treaty, signed on 11/3/1991**. This treaty establishes a cooperation arrangement in the area of water resources, supplementing a previous agreement on basic technical and scientific cooperation.

**MERCOSUR Framework Agreement on the Environment (22/06/01) - Argentina, Brazil, Paraguay, and Uruguay**, promulgated in Brazil through Decree n° 5.208, on 17/12/2004. The

Agreement promotes cooperation for the protection of the environment and sustainable use of natural resources in order to improve living standards and sustainable development.

**Brazil-Paraguay Cooperation Agreement on Sustainable Development and Integrated Management of the Apa River Hydrographic Basin 11/9/2006). The Agreement's objective consists of fostering sustainable development and integrated management of border water resources.**

Other bilateral agreements were signed between:

- **Brazil and Uruguay: Friendship, Cooperation and Trade Treaty** (12/6/75), **Scientific and Technical Basic Cooperation Agreement** (12/6/75), **Agreement on Fisheries and Living Resources Preservation** of 1969, **Agreement Regarding River- and Lake Transport** (Rivera, 12/06/1975).

- **Brazil and Argentina: Scientific and Technological Agreement.** Concluded in Buenos Aires on 17th May, 1980 (entered into force on 18/02/82).

- **Brazil and Colombia: Agreement on the Conservation of the Flora and Fauna of the Amazonic Territories**, promulgated by Brazil on 12/7/06.

**2. National Level**

***Constitutional Level***

The **Federal Constitution of 1988** (05/10/88) determines that the water resources belong to the public domain and include two domain areas: water bodies belonging to the Federation (covering more than one State) and both states (rivers and groundwaters). The Constitution institutes the National Water Resources Management System and introduced the notion of water management, including for groundwater resources, and the protection of the environment. Groundwater management has been entrusted to the States (Article 26, para. 1).

***Legislative Level***

Law **9.433, 08/01/97, or Waters Law**, instituted the National Water Resources Policy (PNRH) and the National Water Resources Management System, its basic principles stating that:

- Water is a public domain resource
- It is a limited natural resource possessing economic value
- Human use and animal settlement are prioritary
- Management must provide for multiple uses of water
- The gydrographic basin is the planning territorial unit
- Its management must be decentralized and participative

The Law highlights preeminent uses, regulates scarcity situations and delimitates types of use of water bodies and the integration of water resources management with environmental management. As to water charges, the Law promotes balance between supply and demand and users harmonization, fostering social cost redistribution and improved effluent quality.

Authorization or concession water use mechanism (Act Nº 9.433/97), Resolution CNRH Nº 16, 8/5/2001), setting general criteria for the allocation of water resources use rights, and Act Nº 9984, July 17, 2000, providing for the establishment of the National Water Institution-ANA, a Federal institution responsible for the implementation of the Water Resource National Policy and the coordination of the National Water Resource Management System, as well as other decisions by the CNRH and State laws). The objective is quantitative and qualitative water use control.

At the Federal level there is only one **Mineral Water Code** regulating exploration for mineral waters, and thermal, potable and spa waters; the Union's jurisdiction is confined to the setting of action

guidelines. This objective is mainly pursued by Resolution nº 9 (21/06/00), instituting the Groundwater Technical Chamber, Resolution nº 15 (11/01/01) establishing general guidelines of groundwater management; Resolution nº 22 (24/05/02), establishing guidelines for the insertion of groundwater in the Instrument Water Resources Plans approved in the realm of the National Water Resources Council-CNRH.

In turn, **groundwaters belong to the domain of the states[2]. States such as Pará, Mato Grosso, São Paulo, Minas Gerais and Goias have enacted specific laws.** In the **State of Pará**, Act No. 6.105, 14/01/98, provides for conservation and protection of groundwater deposits, through the ability to establish protection areas, restrictions on volumes developed, distance between wells, requirements for well licensing and cadastre, monitoring mechanisms including requirements for groundwater concessions, and potential concessions suspension or termination, and administrative sanctions if unfulfilled. Worth mentioning is also Act Nº 5.630, 20/12/90, which establishes rules for water bodies preservation, mainly in their nascents.

Act Nº 8097, 24/03/04, of the State of **Mato Grosso**, sets groundwater quantity and quality protection and control rules through the establishment of protection areas; development of groundwater use studies, research, projects and works; concessions, cadastre, monitoring, infractions, and sanctions.

In the State of **São Paulo,** Act Nº 6134, 02/06/88, implemented by Decree Nº 32.955/91, provides for the preservation of natural groundwater deposits. The Act includes provisions on groundwater interconnection to superficial waters and the establishment of restricted-use areas.

Act Nº 1371, 11/12/2000, substituted by Act 14596, 23/01/03, of the State of **Minas Gerais,** regulates groundwater management, protection and conservation. This piece of legislation defines the following items regarding groundwater management: use evaluation and planning, allocation and monitoring and enforcement of conservation measures for groundwater conservation.

In the State of **Goiás**, Act Nº 13583, 11/01/00, provides for the State's groundwater deposit conservation and environmental protection. It sets the basic tenets of interconnection with surface waters, the establishment of use-restricted areas, and a standing environmental protection program.

The legislation of other States, such as **Amazonas and Paraná**, includes specific chapters on groundwater management and protection.

In the **State of Amazonas**, Act 2712, 28/12/01, institutes the State Water Resource Policy, creates the State Water Resource Management System and sets other provisions in a specific Chapter on groundwater. Its foundations include groundwater interconnection with surface waters. The Act provides for the establishment of a standing program on restricted-use areas conservation and protection, along with provisions on use-rights concessions, suspension or termination cases, environmental licenses, and development of hydrogeological studies.

In the State of **Paraná,** Act Nº 12.726, 26/11/99, institutes the Amazonas Water Resources Management State System and sets up other provisions. The Act includes a specific chapter on groundwater. Its foundations include groundwater interconnection with surface waters. The Act provides for the establishment of a standing program on conservation and protection, defines the responsibilities of a managing body, establishes restricted-use areas and regulates the cadastre of wells and right-of-use concessions.

**A number of States have regulated the allocation of groundwater authorizations:**

In the **State of Minas Gerais**, Order Nº 390, 11/08/05, of the Secretariat for the Environment and Sustainable Development (SEMAD) sets rules for the integration of the processes of environmental authorization for the operation, environmental licensing, water resources use rights and forest exploration authorizations.

[2] The States being considered here are those with potencial transboundary aquifers.

Other States, including Pará, Mato Grosso, Rio Grande do Sul, São Paulo, Minas Gerais, and Goiás have set provisions for protection of wells and pollution prevention.

In the **State of Pará**, Act Nº 6.105, 14/01/98, provides for the possibility of establishing protection areas, restrictions on volumes extracted, distance between wells. Act Nº 5.630, 20/12/90, sets rules on water body preservation through ciliar plantations, and prohibits solid- and liquid dumping from potentially-contaminant business activities.

Act Nº 8.097, 24/03/04, of the **State of Mato Grosso**, provides for the establishment of protection areas, as well as the enforcement of the mechanism for license-granting, monitoring and imposition of penalties for groundwater use contraventions.

In the **State of Río Grande do Sul**, Decree Nº 42.047, 26/12/2002, which implements Act Nº 10.350, 30/12/94 (instituting the Water Resource Management State System), mentions amendments on groundwater- and aquifer management and conservation.

In the State **of São Paulo**, Act Nº 6.134, 02/06/88, sets rules on protection of groundwater quality through the establishment of protection areas and the development of hydrogeological studies to avoid contamination. Decree Nº 32.955/91 defines the responsibilities of each institution in groundwater management issues, creates quality prevention mechanisms through the establishment of protection-, restriction- and control areas, criteria for the allocation, cadastre, monitoring and licensing decisions, and the related sanctions, and determines the development of hydrogeological studies, pollution-prevention measures (operation and maintenance of regular, abandoned and artesian wells, drilling, sounding, or works) and for artificial recharge authorizations.

Act Nº 13.771, 11/12/2000, as amended by Act 14.596, 23/01/03, of the **State of Minas Gerais,** defines the responsibilities of the groundwater management body, and institutes quality defense protection and control mechanisms through the establishment of protection-, restriction- and control areas, and allocation, cadastre, monitoring, contraventions, and the related sanctions.

In the State **of Goiás**, Act Nº 13.583, 11/01/00, introduces basic provisions on well-drilling, licensing and granting of water resources use rights, and the appropriate administrative sanctions, both in well monitoring and cadastre.

Environmental management and/or protection laws and regulations are available in the site of the **Ministry of the Environment** (www.mma.gov.br), Water Resources.

***Regulatory level***

**Decrees specifically related to groundwaters, and other potentially relevant Decrees.**

In the State **of São Paulo**, Act Nº 6.134, 02/06/88, is regulated by Decree Nº 32.955/91, which defines as an integral part of groundwater management the use, assessment and planning of such waters, permit granting and monitoring activities, and enforcement of groundwater conservation measures.

In the State **of Río Grande do Sul**, Decree Nº 42.047, 26/12/2002, defines as an integral part of groundwater management the use assessment and planning of such waters, permit granting and monitoring, and enforcement of groundwater conservation measures. The explicit foundation of this Decree is groundwater interconnection with superficial waters. The Decree defines the management responsibilities of each institution, such as reviewing the conditions for the award of the concession, sanctions for failure to fulfill the conditions, development of the cadastre and basic hydrogeological studies, pollution-prevention measures (operation and maintenance of regular, abandoned and artesian wells, drilling, sounding, or works) and the establishment of restricted-use areas.

## II. INSTITUTIONAL FRAMEWORK

### 1. Binational Institutions and other institutions

**Brazil-Uruguay Mixed Commission:** It was established through the exchange of communications which constituted an Agreement signed on 26/04/63 between Brazil and Uruguay. The Agreement creates the **Brazil-Uruguay Mixed Commission for the Development of the Merim Lake (SB/CLM). On the Brazilian side, the domestic regime is regulated by Decree nº 4.258, June 4, 2002.**

The **Brazil-Paraguay 2006 Agreement on the Apa River** establishes a **mixed commission** responsible for identifying initiatives and projects of bilateral interest.

In the sphere of the **La Plata River Basin**, the Plate River Treaty instituted the **Inter-Governmental Committee of the La Plata River Basin, in 1969.** In general terms, the Committee functions are defined by Art. III of the Treaty, where it is "recognized as the standing body of the Basin, responsible for promoting, coordinating and monitoring multinational actions aimed at the integrated development of the Plata River Basin, and for the technical and financial aid it organizes with the support of the international organizations it deems appropriate, and for the implementation of the decisions adopted by the Foreign Relations Ministers."

### 2. National institutions

Decree Nº 6.101, 26/04/07, confers the **Water Resources and Urban Environment Secretariat of the Ministry of the Environment** the responsibility for developing the Environmental Policy on Water Resources and Urban Environment, and the follow-up and control of its implementation. In addition, it coordinates the development of groundwater plans, programs, and projects, and monitors the development of their actions, abiding by the principle of integrated management of water resources and transboundary water management.

The Water Resources and Urban Environment Secretariat of the Ministry of the Environment is responsible for the follow-up of the groundwater management programs, international projects, and actions. To be highlighted are the Project for the Environmental Protection and Sustainable Development of the Guaraní Aquifer System, and the ISARM Americas Program.

The **Water Resources National Council**, established by the Waters Law (Chapter II) and regulated by Decree Nº 4.613 (11/3/2003), is the top instance of the Water Resource Management National System.

The Council comprises representatives of:

- The Ministries and Secretariats
- The State Water Resources Councils
- The users sectors
- The civil organizations

Its responsibilities (Article 35, Law 9.433, 8/1/1997) include those of:

- Establishing supplementary guidelines for the implementation of the Water Resource National Policy,
- Arbitrating the conflicts between Water Resource State Councils and issuing final administrative decisions thereon,
- Discussing projects for the development of water resources with impacts beyond the territories of 2 states.
- Analyzing proposals for legislative amendments relevant for water resources.

The **National Water Institution (ANA),** created by the Law of 17/7/2000, is the Federal institution responsible for the implementation of the Water Resource National Policy.

The **Basin Committees**

The **Basin Committees**, established by the Waters Act (Chapter III), consist of representatives of:

- the Federal Government
- the States and the Federal District
- the municipalities whose territory covers the whole or part of the basin
- the users
- civil entities operating in the basin.

Their main responsibilities are those of:

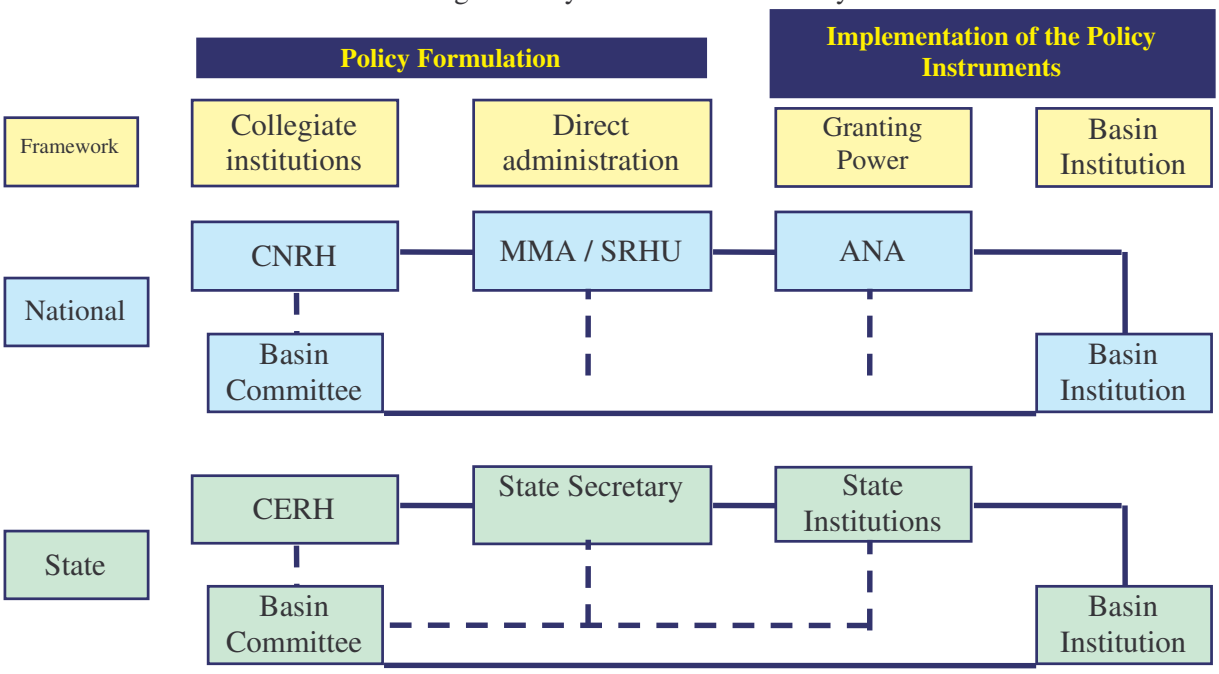
- promoting debates on water resources-related issues and articulating the actions of the participating entities.
- arbitrating water resources-related issues conflicts and issuing first-instance administrative decisions thereon.
- Approve basin water resources plans.

**Sub-national level institutions: their groundwater-connected function**

At state level, the work related to management of rivers belonging to the domain of either the States or the Federal District (those rivers which do not flow beyond state borders) and groundwaters, as well as water resources plans, programs and management projects is performed by the Environment and/or Water Resources State Secretaries and Science and Technology Planning.

**Water-Resource State Councils:** They are created by state acts and their responsibilities are basically those concerning formulation of the water resources policy and conflict arbitration, as well as definition of principles and guidelines for the State Policy on Hydrographic Basin Plans and the State Water Resource Plan; approval of the Water-Resource State Plan; establishment of criteria and general rules for the allocation of use rights on water resources, and apply charges for water resources use rights.

The National Water Resource Management System can be summarily described as follows:




Prepared with the cooperation of Júlio Thadeu Silva Kettelhut, Adriana Niemeyer Piers Ferreira, Claudia Ferreira Lima and Fabrício Bueno da Fonseca Cardoso – SRHU/MMA

## CHILE – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

**"Additional Specific Protocol on Shared Water Resources between the Republic of Chile and the Republic of Argentina, signed in Buenos Aires on 2nd August, 1991".**

- Art 1 reads: "The parties agree that the actions and programs related to the development of the shared water resources will be pursued according to the concept of integral management of the hydrographic basins.
- No water resources development activities performed in the territory of one of the Parties sharing a common basin may damage the water resources shared, the common basin, or the environment.
- In turn, Art. 5 reads: "The shared water resources development actions and programs will be pursued in a coordinated or joint basis through General Use Plans".

**2. National Level**

***Legislative Level***

Chile has a **Water Code (Decree with legislative force No 1.122, August 13, 1981**, published in the *Diario Oficial de la República de* Chile, 29.10.1981). This Code legislates on the nation's water resources.

The Water Code is inserted in a framework of market economic principles; water is a public use national good and the private entities are granted development rights on such resource.

***Regulatory level***

**Resolution DGA** Nº **341/2005** regulates groundwater exploration and exploration in the Country.

### II. INSTITUTIONAL FRAMEWORK

**1. National institutions**

The **Waters General Directorate (Ministry of Public Works)** is the governing body in the area of Chilean terrestrial waters (both superficial water and groundwater s). It is responsible for the allocation of water rights in Chile.

Both the **Water Code** and the groundwater **exploration and exploitation rules** are available in the web page of the Waters General Directorate: www.dga.cl

Prepared with the cooperation of Rodrigo Weisner Lazo, Jaime Muñoz Rodrigues – DGA, José Francisco Muñoz P. – UCC and James McPhee Torres – UC

## I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

**Colombia has a specific agreement with the Bolivarian Republic of Venezuela on integral development of the water resources of the Catatumbo River Binational Basin.** The Agreement was signed in 1982 with the participation of the OAS.

### 2. National Level

*Constitutional Level*

The **Political Constitution of 1991** includes a number of provisions in this respect. Remark that these are the Constitutional provisions relative to waters.

*Legislative Level*

The **Code of Renewable Natural Resources and Environment Protection (Decree 2811, December 11, 1974)** regulates the management of the renewable natural resources, including waters. Indicate in a few words the fundamental principles of this Code as to natural resources in general, and waters, including groundwaters, in particular.

**Decree 1594/1984, that provides for the use of water and liquid effluents**, and addresses the issue of discharge of sanitary-relevant substances according to the use of the water resource.

*Regulatory level*

**Resolution issued in May, 2006 by the Ministry of the Environment, Housing and Territorial Development on the estimation of the Scarcity Index for groundwaters** – a methodology created by the IDEAM.

## II. INSTITUTIONAL FRAMEWORK

### 1. National institutions

The **Ministry of the Environment, Housing and Territorial Development** is advised by 5 scientific research institutes: **IDEAM, INVEMAR, SINCHI, IIAP, and Von Humboldt Institute,** IDEAM being the only one with national coverage and full public law status.

Law 99, December 22, 1993, creates the Ministry of the Environment, reorganizes the Public Sector responsible for the management and conservation of the environment and the renewable natural resources, organizes the Environmental National System, SINA, and includes other provisions. The Law creates the IDEAM and the INVEMAR, subsequently organized and established by Decree 1277/1994, and Decree 1276/1994, respectively. Both institutions give technical-scientific support to such Ministry and the entities of the Environmental National System – SINA. Within their jurisdiction they must define the studies, research efforts, inventories and appropriate information follow-up and management actions needed as fundamentals for decision-making in the area of environmental policies, and lay the bases for the implementation of the rules, directives and regulations for territorial ordering and the management, use and development of renewable natural resources.

Law 99/1993 transferred from INGEOMINAS to IDEAM the groundwaters measurement and study functions.

Management of the water resources has been entrusted to the environmental authorities, namely the regional autonomous Corporations or the Administrative Environmental Management Departments, which are local-level entities. At the national level, the Ministry of the Environment, Housing, and Territorial Development issues the policies for the management of the groundwater and superficial waters resources.

Under the Law 99/1993, the Regional Autonomous Corporations have the duty and responsibility to manage the renewable natural resources, including the groundwater resources.

There are other environmental authorities, such as the **Environment Management Administrative Departments – DAGMA -**, being created when a city has over 1 million inhabitants. Once such level is reached, the DAGMAs become responsible for the management of the renewable natural resources and monitor the uses of the water resources at a local level.

Each local entity sets the additional specific requirements for groundwater development it deems appropriate.

**The IDEAM is responsible for the implementation of the hydrological networks for surface waters and groundwaters, and for developing the studies on modelling and contamination prevention.**

Surface- and groundwater development is subjected to the rules of the **Hydrographic Basin Ordination Plan**. In other words, the resource is developed as established by the Ordination Plan of the Basin where the aquifer is located. Such Plan is defined by the National Government Decree 1729/2004, and provides for citizen participation in water management (involving users and other stakeholders).

## I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

**Ecuador has signed the following agreements with neighboring countries for the development of binational basins:**

**Amazonic Cooperation Agreement**, with Colombia. The Amazonic Cooperation Treaty (ACT) was signed in Brasilia, Brazil, on 3rd July, 1978, by the 8 Amazonic countries: Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela. This is a legal instrument of technical nature designed to promote the harmonic and integrated development of the basin, to support a model for regional economic complementation targeting better life standards for its inhabitants and rational conservation and use of their resources.

**Bilateral cooperation agreements** were signed in order to establish a number of mechanisms for the implementation of border actions. Under the Amazonic Cooperation Agreement signed between the Governments of Colombia and Ecuador in March, 1979, followed by the February, 1985 Rumichaca Declaration --which laid the basis for the development of binational integrated studies, where both Governments confirmed their commitment to foster cooperation to trigger actions towards integrated development of their border areas—terms of reference were approved for the drafting of the **Ordination and Management Plan for the San Miguel and Putumayo Rivers Basins.** This Program includes an action proposal towards sustainable development of the border region, covering part of the Putumayo Department in Colombia, and the Sucumbíos Province and part of the Napo Province in Ecuador.

**Ecuadorian-Colombian Neighborhood Commission, established in 1989**. Within the framework of the integration efforts and in fulfillment of the commitments assumed in the June 20, 1989 Presidential Declaration the Ecuadorian-Colombian Neighborhood and Integration Commission. (CVICE).

The Ecuadorian-Colombian Neighborhood and Integration Commission (CVICE) is a bilateral mechanism of political and representative nature with a mandate to foster integration, cooperation and development, with emphasis in the Border Integration Area.

The Neighborhood and Integration Commission was restructured on 28th November, 2002, for enhanced dynamism and functionality.

In such framework the **Subcommittee of Binational Hydrographic Basins, the Environment and Geothermia** was established, with the mandate of formulating, implementing and monitoring the ordination plans of the Mira, Mataje, and Carchi Guaytara Binational Basins.

**Hydrological-Isotopical Characterization Studies of the area of the Aquifer of the Zarmilla River, and Water Quality Monitoring in the Puyango-Tumbes River Basin, with Peru**, in the framework of the Regional Project RLA/08/031 on Sustainable Management of Groundwater in Latin America (OIEA), with the coordination of the Applications Directorate of the Peruvian Institute for Nuclear Energy – IPEN - and the Ecuadorian Atomic Energy Commission – CEEA.

**Catamayo-Chira Binational Project with Peru:** Final Project document, developed by the Management Unit of the Catamayo Chira Management Unit, signed in Lima by the Spanish Ambassador and the Peruvian Ministry of Foreign Affairs on 23rd January, 2001, and by the Spanish Ambassador and the Ministry of Foreign Affairs, in Quito, on 19th February, 2001: development of the Ordination, Management and Development of the Catamayo Chira Basin with the support of the Spanish Institution for International Cooperation.

**Project on Integrated and Sustainable Management of Transboundary Water Resources in the Amazonas River Basin. Participating countries: Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, Venezuela.** Objective: strengthening the institutional framework for coordinated

planning and implementation of the activities of protection and sustainable management of the soil and the water resources in the Amazonas River basin, faced to impacts of anthropic actions amd climatic changes in the basin.

**2. National Level**

***Legislative Level***

The **Waters Law** was issued through the Supreme Decree N° 369, May 18, 1972, published in the Official Registry N° 69 on 30th May, 1972.

The provisions of groundwater development and concession are included in Title VIII, Arts. 43-47: they allow the National Water Resources Council to grant developing rights, perform drilling or extraction works, monitor the extraction and development methods, grant drilling licenses and request groundwater prospection, and drilling information

***Regulatory level***

**Regulations of the Waters Law, issued through Supreme Decree N° 40, January 18,** 1973, published in the Official Registry N° 233, January 26, 1973. Arts. 120-124 of Chapter XXXIII regulate exploration, drilling, development and use of groundwaters.

## II. INSTITUTIONAL FRAMEWORK

**1. Binational Institutions**

The **Ecuadorian-Colombian Neighborhood and Integration Commission** (CVICE) is a bilateral political and representative mechanism. Its function consists of fostering integration, cooperation and binational development, with emphasis in the Border Integration Area.

The Ecuadorian-Colombian Neighborhood and Integration Commission (CVICE) consists of an Ecuadorian National Chapter and a Colombian National Chapter, and six Binational subcommissions. Within this context the **Subcommittee on Binational Hydrographic Basins, the Environment and Geothermia of the Mira-Mataje and Carchi-Guaytara binational basins** were created.

**2. National institutions**

The **National Water Resources Council** is a public-law entity ascribed to the Ministry of Agriculture and Livestock (MAG), an entity possessing juridical personality and administrative and financial autonomy, is the ruling institution on water matters at the national level. It was created through Executive Decree N° 2224, October 25, 1994, ratified by Executive Decree N° 871, and published on the Supplement of the Official Registry N ° 177, on 25th September, 2003.

Other entities:

- Regional Development Corporations (CRDs)
- Provincial Councils
- Ministry of the Environment (MA)
- National Meteorology and Hydrology Institute (INAMHI)

The **Waters Consultative Council** is the top administrative institution responsible for the enforcement of the Waters Law, and operates together with the CNRH General Secretariat. It decides on appellations of decisions regarding conflicts on water concession rights allocations.

**Water Institutions (AGAs) – CNRH** territorial bodies responsible for the administrative and judicial first instance procedures on issues relative to water development rights, water rights, users' organization, groundwater development, infrastructure works, reports for mining development

concessions, etc. The national territory has been distributed into 11 AGAs; since the jurisdiction of each of the latter covers a province, it does not coincide with the hydrographic basin.

**Regional Development Corporations (CRDs).** The Executive Decree that created the CN defined the CRDs as public institutions responsible for water resources management. Presently there are nine CRDs:

**Provincial Councils –** Autonomous sectional governments existing in each of the 22 provinces. They promote and implement works of provincial scope in the areas of roads, the environment, irrigation, and basin management.

**Ministry of the Environment –** It exercises the national authority in the environmental sphere and regulates, coordinates the Environmental Management National Decentralized System. In connection with water quality it has the mandate of "coordinating with the relevant institutions the issuance of technical rules, manuals and general environmental protection parameters."

**National Meteorology and Hydrology Institute (INAMHI) –** Ascribed to the Ministry of Energy and Mines, the INAMHI is the institution that rules, coordinates and standardizes all matters concerning meteorology and hydrology. Its specific functions involve planning, rule drafting, establishing, operating and maintaining the hydrometeorologic infrastructure, and developing studies and research activities in this field.

Prepared with the cooperation of Napoleón Burbano Ortiz - INAMHI

## PARAGUAY – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

**Memorandum of Understanding between the Republic of Paraguay and the General Secretariat of the Organization of American States for the Implementation of the Project "Environmental Protection and Sustainable Development of the Guarani Aquifer System"**, signed in Washington on 13th January, 2003.

**Cooperation Treaties**

- **Treaty of the La Plata River Basin**, subscribed in 1969 by the Governments of Argentina, Bolivia, Brazil , Paraguay and Uruguay. In the framework of such Treaty the following instruments were negotiated and agreed upon with the bordering countries:

  - Agreement on River Transportation on the Paraguay – Paraná Hydroway (Pto. Cáceres – Nva. Palmira) Law 269/93.
  - Agreement for the establishment of the Trinational Commission for the Development of the Pilcomayo River Basin (Law 580/95).
  - Agreement with the Republic of Argentina on Conservation and Development of the Fishery Resources in the Border Segments of the Paraná and Paraguay Rivers (Law 1074/96),
  - Agreement for the Conservation of the Water Fauna in the Courses of the Bordering Rivers between Paraguay and Brazil, and its Additional Protocol (Law 1572/00).
  - Treaty for the building and administration of the Itaipu Dam: Law 89/73.
  - Treaty for the building and administration of the Yacyretá: Dam: Law 433/73.

- **Treaty of Itaipú (Brazil and Paraguay) -** Law Nº 389, dated April 26, 1973, approving and ratifying the Treaty between the Republic of Paraguay and the Federative Republic of Brazil for the hydroelectric development of the Paraná River hydraulic resources co-owned by both countries, from and including the Salto del Guaira or Salto Grande de Sete Quedas up to the mouth of the Yguaçu River, signed on 23rd April, 1973, in Brasilia. The objective of this Treaty is the hydroelectric development of the hydraulic resources of the Parana River, which are co-owned by both countries, from and including the Salto del Guaira or Salto Grande de Sete Quedas up to the mouth of the Yguaçu River

- **Treaty of Yacyretá (Argentina and Paraguay).** Law Nº 20.646, dated 26th March, 1974, approving and ratifying the international treaty signed with the Republic of Paraguay on 3rd December, 1973 with the purpose of improving the conditions of navigability of the Parana River off Yacyretá island, by fostering hydroelectric development and mitigation of the depredating effects of the floods caused by extraordinary water swelling events. In order to accomplish such goals a binational institution was created, namely YACYRETÁ (E.B.Y.), with juridical, financial and administrative capacity, as well as technical responsibility to study, project, lead and implement the works that are its subject matter, put them into operation, and develop as a unit from the technical and economic standpoint.

- Creation of the**Trinational Commission for the Pilcomayo River (Argentina, Bolivia and Paraguay).** The Constitutive Agreement of the TEl Trinational Commission of the Pilcomayo River for the Development of the Pilcomayo River Basin (Argentina, Bolivia and Paraguay) was signed in La Paz on 9th February, 1995 and approved by Act Nº 24677, dated 14th August, 1996.

**2. National Level**

***Constitutional Level***

**The 1992 National Constitution of the Republic of Paraguay** does not include any specific provisions on water; it does include provisions on environmental protection:

- Art. 7: Every individual has the right to dwell in a healthy and ecologically balanced environment…
- Art. 8: The Law will regulate those activities susceptible to produce environmental changes (…) The Law will define and punish the ecological crime. Any environmental damage will entail the obligations to restore and compensate.

***Legislative Level***

**Law Nº 3239, July 10, 2007 "On the water resources of Paraguay**". Fundamental Principles: (Article 3)

- Superficial water and groundwater are public domain ownership goods of the State
- Access to water to satisfy basic needs is a human right and must be guaranteed by the State in quantity and quality.
- Water is a natural good conditioning the survival of every living being and the ecosystems that shelter them.
- Water resources have social, environmental, and economic value.
- Surface and groundwater resources that can be used for household purposes and basic household production that are directly used by the user are freely disposable (Article 15).
- Priority order of the uses and the development of water resources: (Article 18)
  1. human consumption
  2. needs of the water ecosystems
  3. agriculture and livestock activities, including aquiculture
  4. power generation
  5. industrial activities
- Use of water resources of water beds can only be allowed under a permit or a concession (Article 32).

Law specifically dealing with groundwaters or any groundwater aspect of same.
Basic provisions (numbers, dates, articles, etc.).

Chapter II of the **Paraguayan Civil Code**, passed by the Honorable National Congress as Law 1183, on 18th December, 1985, regulates goods in connection with the persons to whom they belong. Thus, its Article 1898 specifies that the following goods belong to the public domain of the State:

b) The rivers and all the waters flowing on their natural beds, as well as such beds;
d) The navigable lakes and their beds, and
e) The roads, channels, bridges, and all public Works built for the common benefit of the inhabitants.

Subparagraph b of this Article of the Paraguayan Civil Code was amended by Act Nº 2559/05 by extending the sphere of the public domain of the State to include groundwater. This is an innovation in this area, since the fact that the State holds such rights limits the property rights of the private persons.

In addition, the Civil Code regulates matters regarding property rights on navigable river- or lake shores on a 10 meter-stripe, thus restricting ownership rights for the public interest of navigation.

**Other relevant laws on groundwaters:**

- Act Nº 1287/87 "Municipal Organic Law" – Declares that the rivers, lakes and streams are belong to the municipal domain (Art. 106, subparagraph "d").

- The Forest Law Nº 422/73, dated 16th November, 1973, provides for the implantation of protecting forests, inter alia to regularize the water regimes and protect the borders of rivers, streams, lakes, islands, channels and reservoirs. (Art. 6).
- The Decree N 18.831/86 defines the protecting forests for rivers, streams, nascents, and lakes, consisting of stripes at least 100 meter wide from the margins of same.
- Law 294/93, dated October 7, 1993 "On Environmental Impact Assessment", establishes that any project involving water use is governed, in principle, by the provisions of the Environmental Impact Assessment Law. As specified by such law, building- and operation works on water pipes, waste waters and industrial effluents, as well as all hydraulic works generally, require an Environmental Impact Assessment (EvIA) and the corresponding Environmental Impact Statement.
- The Law on drinking water service regulation, Nº 1.614 dated 19th October, 2000, establishes the General regulatory and tariff framework of the Public Service of Drinking water Supply and Sanitation of the Republic of Paraguay. This law only rules for such service.
- The Law 1561, dated 29th May, 2000, "On the creation of the National System of the Environment, the National Council of the Environment, and the Secretary of the Environment," sets a number of considerations on the resource water in its Arts. 12 subpara. n, and 25. Such Articles establish that the function and jurisdiction of the Secretariat of the Environment consist of promoting the control and monitoring of the activities aimed at the development of the forests, flora, wild fauna and water resources, authorizing the sustainable use of such resources and the activities aimed at improving environmental quality (Art. 12, subpara. n). It creates the General Directorate for the Protection and Conservation of Water Resources, which must formulate, coordinate and assess policies for the maintenance of basic water flow volumes, aquifer recharge capacities, care of the different uses, and development of the water resources while preserving the ecological balance (Art. 25).

***Regulatory level***

- Resolution 2155/2005, dated 21st December, 2005, "Establishing the technical specifications for the building of pipe-shaped wells for groundwater catching purposes."

- Resolution 50/2006, dated 24th January, 2006, issued by the Secretariat of the Environment, "Setting the rules for Paraguay's water resources management according to art. 25 of Law 1561/00, which creates the National System of the Environment, the National Council of the Environment, and the Secretary of the Environment" which sets sanctions for use of superficial water and groundwater without an environmental license.

- Resolution 255/2006, dated February 17, 2006, issued by the Secretariat of the Environment, "Establishing the classification of the superficial waters of the Republic of Paraguay".

## II. INSTITUTIONAL FRAMEWORK

### 1. Binational Institutions and other institutions

**At the transboundary level there is a common entity related to water –particularly groundwater: the Higher Orientation Council for the Project of the Guarani Aquifer System**, established by a Memorandum of Understanding between the Republic of Paraguay and the General Secretariat of the Organization of American States for the Implementation of the Project "Environmental Protection and Sustainable Development of the Project of the Guarani Aquifer System", signed in Washington on 13th January, 2003. Its administrative structure includes: a) the Higher Orientation Council for the Project of the Guarani Aquifer System, which is the top level body responsible for setting the guidelines for the implementation of the project and direct their actions in the framework of the Project Paper. It comprises three representatives from each country. b) Collegiate Coordination: it is the meeting of the four national coordinators, who are to support the Council in the technical and operational aspects of the project. c) National Units: each of these four units is established by the respective beneficiary country to facilitate and coordinate the implementation of the project at the national level. d) General Secretariat: it is the technical and administrative unit

responsible for the day-to-day activities of the Project; it is subject to the direction and supervision of the GS/OAS.

The **Inter-governmental Coordinating Committee of the La Plata River Basin (CIC)** was created in February, 1967, during the first meeting of Ministers of Foreign Affairs of the La Plata River Basin, during which the participant Governments agreed on a joint and integral study towards the implementation of multinational, bilateral and national works to foster the progress and development of the region. It was subsequently strengthened by the signing of the Treaty of the La Plata River Basin, in 1969. This is a regional organization for water resources coordination at the level of the block formed by Argentina, Brazil, Bolivia, Paraguay and Uruguay, where international cooperation projects are set, for the study of transboundary aquifer cases.

**2. National institutions**

The **Secretariat of the** Environment is the institution responsible for formulating (as well as coordinating and assessing), through the **General Directorate for Water Resource Protection and Conservation**, the policy "of maintenance and conservation of the water resources and their basins, by ensuing the renovation process, maintenance of the basic volumes of the water flows, aquifer recharge capacity, care for the different uses, and development of the water resources, while preserving the ecological balance (Article 25, Law 1561/00).

**The Secretariat of the Environment performs the management of the transboundary aquifers.**

At **the local level,** within a project being implemented (on the **Patiño Aquifer**) an interinstitutional commission is performing a practical exercise of management of such aquifer.

## PERU – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

- **Puyango - Tumbes (Ecuador-Peru).** On 27th September, 1971 the Peruvian-Ecuadorian Agreement for the Development of the Puyango-Tumbes Binational Hydrographic Basins was signed. It was approved through the Decree Law Nº 19060, on 7th December, 1971. Its objetives are as follows:

  – Rational development of the natural resources of the Tumbes River basin.
  – Agricultural and livestock industrialization.
  – Flow volumes regulation and flood control.
  – Basin management to protect the agricultural areas.
  – Vulnerability reduction on both margins of the Zarumilla River.
  – Adequate operational and quality levels of the transboundary channel.
  – Development of the agricultural areas on both margins to guarantee rural population incomes.
  – Better social and economical life standards for the inhabitants of the Tumbes Department.

- **Catamayo – Chira (Ecuador- Peru). T**he Peruvian-Ecuadorian Agreement for the Development of the Catamayo-Chira Binational Hydrographic Basins was signed on 27th September, 1971, and approved by the Decree Law Nº 19060, on 7th December, 1971. Its objetives are as follows:

  – Formulate an Ordination Plan for the integral and shared management of the Catamayo-Chira Basin, so as to enable the rational use of the resources and the social and economic sustainable development to benefit the population linked with the area. Such social and economic development focuses on social equity, environmental sustainability, and gender treatment.
  – Advance in the consolidation of Peace between Peru and Ecuador.
  – Development of the Plan for the ordination, management and development of the basin, so as to establish an integral and shared management mechanism for the Catamayo-Chira Basin.
  – Propose the design of a Basin National Management Institution.
  – Promote productive activities by the population in the framework of the integral management of the Basin.
  – Foster binational hands-on technical training in order to potentiate the productive vocations in the area and consolidate an integral vision for the management of the resources.

- **Special Project for the Titicaca Lake (Bolivia - Peru).** The Binational Special Project for the Titicaca Lake– PELT- was established through the Supreme Decree No. 023-87-MIPRE, of 27th October, 1987, as a Project of national interest and as an institution ascribed to the National Development Institute and classified as a Binational Project by the Supreme Decree No. 008-90-RE. The Project is responsible for the study, management and integral development of the resources of the Titicaca Lake in the framework of the transboundary agreements in force. Its objectives are as follows:

  – Coordinate, propose, and implement national policies through projects allowing the sustainable use of the natural resources, thus contributing to the economic and social development of its area of influence;
  – Consolidate action policies for the study, management, development and integrated conservation of the resources of the Titicaca Lake and the surrounding area;

- Ensure the execution of the studies and works for the development of the Integration Area of the Titicaca Lake;
- Organize and operate an information bank for the whole action sphere of the Special Project;
- Control and prevention of the natural phenomenae, to support agricultural, livestock and fishing production and ensure social protection to the infrastructure;
- Ecology and the environment, entailing protection, management and conservation of the natural resources;
- Water use and conservation of native species, such as those of the binational flora and fauna;
- Territorial enhancement, planning, control and protection of the existing human settlements;
- Organization of the territory and use of the natural resources, agricultural-industrial production diversification, and better life standards for the beneficiary population.

**2. National Level**

***Legislative Level***

**Waters General Law Nº 17752** (published on 24th July, 1969), and its Regulations, which cover both superficial waters and groundwaters.

***Regulatory level***

The issue of subsoil water resources is regulated by the Regulations Title IV –On Groundwaters—of the **Decree Law Nº 17752 – Waters Law General approved on 30th December, 1969 by the Supreme Decree Nº 274-69-AP/DGA**-- and includes the following Chapters and Articles.

- Chapter I: Generic provisions, Articles 1 to 14; legal framework, definition, studies and use of springs, IRH responsibilities, establishment of reserves, pollution-prevention studies, etc.

- Chapter II: On groundwater uses, Articles 15-49, authorizations for studies, requirements and use conditions, others.

- Chapter III: On groundwater studies and works. Articles 50-80. Requirements for catchment works, implementation of studies and works by the IRH, supervision of the implementation of studies and projects, licenses for water development works.

**Supreme Decree Nº 021-81-VC** Reserves to ESAL (Lima Sanitation Utility firm, now SEDAPAL) the groundwaters of the Lima and Callao aquifers, so as to ensure water supply to the Metropolitan Area of Lima.

**Supreme Decree Nº 044-84-AG (1st June, 1984):** regulates the award and regularization of licenses for use of groundwaters in the provinces of Lima and the Constitutional Province of Callao.

The S.D. Nº 078-2006-AG (28th December, 2006) empowers the **INRENA Water Resources Intendence** to authorize and approval, after hearing the Users Council, of the implementation of studies and works for the (permanent) licensing for superficial water and groundwater use.

The **Regional Governments, after hearing the Users Councils**, grant (temporary) authorizations for superficial water and groundwater use.

The Irrigation District Technical Administration grants permits for surplus water resources use, after hearing the Users' Council.

## II. INSTITUTIONAL FRAMEWORK

### 1. National institutions

Waters General Law – DL 17752 (Art 128): The Ministry of Agriculture is the organization having jurisdiction on water matters and related issues.

**Water Authorities**

- **Ministry of Agriculture**

- The **Intendent for Water Resources** (2003) (formerly DGAS): it is the highest technical-ruling authority on promotion, supervision and monitoring of the policies, plans, programs, projects and rules on sustainable use of water resources at a national level, besides pursuing studies and projects with national and transboundary technical-economic cooperation.

- **Regional Director**

- The **Irrigation District Technical Manager (ATDR)** is responsible for the control and management of the water resources. At a national level there are 68 ATDRs:

  – 32 in the Pacific watershed,
  – 32 in the Atlantic watershed,
  – and 4 in the Titicaca Lake watershed.

The Technical Management Offices of the Irrigation Districts are also responsible for the management of the aquifers.

## URUGUAY – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

#### 1. Transboundary Level

- The **Project on Environmental Protection and Sustainable Development of the Guarani Aquifer System** is being implemented to support the four countries (Brazil, Argentina, Paraguay and Uruguay) in the development and implementation of a common management and preservation framework for such aquifer. The Senior Project Direction Council approved the document "Project of Declaration of Basic Principles and Guidelines for the Guarani Aquifer System", **2004**

- **Uruguay-Brazil Treaty on the implementation of the legal status of the border area (**20 December, 1933**,** ratified by national Law 9477/1935**).**

- **Treaty of the Uruguay River** (7th April, 1961**), on** limit setting**, Argentina- Uruguay**

- **Treaty of the La Plata Basin (**23rd April, 1969**) Argentina - Bolivia - Brazil - Paraguay – Uruguay.** Its object consists of enabling harmonic and balanced development and exploitation of the región's natural resources and ensuring their *preservation* through rational use of such resources.

- **Treaty of the La Plata River and its Maritime Front** (19th November, 1973**) Argentina – Uruguay**

- **Statute of the Uruguay River (**26th February, 1975**) Argentina – Uruguay**

- **Treaty of Cooperation for the Exploitation of the Natural Resources and the Development of the Basin of the Merim Lake and Protocol for the Exploitation of the Water Resources of the Border Section of Yaguarón River** (7 July, 1977**),** between **Brazil and Uruguay**

- **Brazil-Uruguay Agreement on Scientific and Technical Cooperation** (12 June, **1975)** and March 11, 1991 Supplementary Agreement establishing a cooperation agreement in the area of water resources, supplementing the previous basic technical and scientific cooperation.

- **Brazil-Uruguay Cooperation Agreement for the Exploitation of the Natural Resources and the Development of the Cuareim River Basin (**11th March, 1991**).** Under the Agreement, both countries committed themselves to achieve and expand cooperation for the development of the Cuareim/Quaraí River Basin.

- **Brazil-Uruguay Agreement on Environmental Cooperation (**28th December, 1992**)**

#### 2. National Level

*Constitutional Level*

Uruguay's national water and sanitation policy mainly stems from **Art. 47 of the Constitution**, as amended in October, 2004, which is the basis of Uruguay's Waters Law, and sets the following principles:

- Water is a natural resource essential for life.
- Use of the resource is to be allowed without impairing the interests of future generations.
- The integrated management of the water resources is a logical reflection of the principles of unity of the hydrologic cycle, and hydrographic basin as the management basis.
- Superficial water and groundwaters are a unitary resource, subordinated to general interests, and are parts of the water public domain.
- In order to guarantee the rational use of water, some principles of the legislation enforced before

the Constitutional amendment are ratified.
- The delivery of the drinking water and sanitation public services is to be done by State entities, rather than by concessionaries.

*Legislative Level*

- **Water Code**: Decree-Act Nº 14.859, 15/12/78 - sets the powers and responsibilities of the Executive Power as to management of the country's waters, in terms of quantity and quality.
- **Irrigation Law** Nº 16.858, 3/9/97 – regulates the building of hydraulic works and the exploitation of water for irrigation purposes. Regulated by Decree 404/01, 11/10/01.
- **Environmental Laws** N° 16.170, 28/12/90; Nº 16.466, 19/1/94, on Environmental Impact, regulated by Decree 345/05, 21/9/05, and Nº 17.283, 28/11/00, on Environmental Protection.
- **Law on Soil and Waters Conservation,** N° 15.239, 23/12/81, regulated by Decree 284/90, 21/6/90.

*Regulatory level*

- **Water Contamination Prevention,** Decree 253/79, 9/5/79, as amended.
- **Sanctions for violation of the Water Code,** Decree 123/99, 28/4/99.
- **Public Registry of Waters**, Decree 460/03, 7th November, 2003
- **Technical Standard for the Building of Wells drilled** for groundwater catching purposes, Decree 86/04, 10/3/04
- **COASAS,** Water and Sanitation Advisory Commission, Decree 450/06, 15/11/06

**Groundwater Regulation:**

- The **Management Plan for the Guarani Infrabasaltic Aquifer (**Decree 214/00, 26th July, 2000) establishes the following **Management instruments:**

  - Search-, works- and extraction permits
  - Technical conditions (distance, water flow, etc.)
  - Temporal nature of the rights
  - Public audience - participation
  - Drilling warranty
  - Public Registry of the rights
  - Control: declarations and inspections
  - Sanctions for violations
  - Intervention by the Advisory Council of the Guarani Aquifer

**Transboundary groundwater regulation**

- The Concordia-Salto (Argentina - Uruguay) Pilot Project for the Guaraní Aquifer System Project has promoted the approval of specific rules for the area:

  - **Technical standards for the building of deep wells** – This is a set of rules approved in Argentina in December, 2005, by the Water Issues Ministry of Santa Fe and the Directorate of Hydraulics of Entre Ríos, and in Uruguay by the Ministry of Transportation and Public Works
  - **Agreement between the Municipalities of** Concordia and Salto (6th January, 2006) – includes a commitment to coordinate actions towards sustainable development of the thermal touristic corridor of the Uruguay River, recognizing the fact that recreational and therapeutic use of thermal waters is a most important asset for the region, and the disposal of reuse waters and effluents should be done according to the preservation of the environment. Both Municipalities agreed to effectively use their powers in the spheres of works, land use and territorial ordination.

- The Rivera-Santana (Uruguay- Brazil) Pilot Project of the Guarani Aquifer System Project has furthered the approval of specific rules for the area:

- Designation of a **Binational Commission** and declaration of municipal interest of the Project through resolutions of the Municipalities of Rivera, 21st July, 2003, and Santana do Livramento, 31st March, 2004.

## II. INSTITUTIONAL FRAMEWORK

### 1. Binational Institutions and other institutions

**Brazil-Uruguay Mixed Commission for the Development of the Merim Lake Basin (CLM).** It was established through the exchange of communications which constituted an Agreement signed on 26/04/63 between Brazil and Uruguay. The Agreement creates the Brazil-Uruguay Mixed Commission for the Development of the Merim Lake

**Brazil-Uruguay Technical Mixed Commission for the Development of the Cuareim/Quaraí River Basin.** The 11th March, 1991-Agreement created the Brazil-Uruguay Technical Mixed Commission for the Development of the Cuareim/Quaraí River Basin (CRC), as the entity responsible for the implementation of the Agreement.

**Higher Orientation Council for the Project of the Guarani Aquifer System (Argentina, Brazil, Paraguay, and Uruguay).** This is the body empowered to set the guidelines for the implementation of the Project and orientate their actions in the framework of the Project Paper. It comprises three representatives from each country.

In the **La Plata River Basin**, in 1969 the relevant Treaty instituted the **Inter-Governmental Committee for the La Plata River Basin (CIC)**, a regional institution that coordinates the water resources of the block formed by Argentina, Brazil, Bolivia, Paraguay and Uruguay, where international cooperation projects for transboundary aquifer case studies are furthered. The CIC promotes, coordinates and monitors the furtherance of multinational actions towards integrated development of the La Plata River Basin and the technical and financial assistance it organizes with the support of the international organizations it deems appropriate. It also implements the decisions made by the Foreign Affairs Ministers.

### 2. National institutions

**The Executive Power**, as the national authority in matters of waters, sets the national policy, must watch over the preservation of the environment, grants use rights and effluent-dumping permits, approves hydraulic works, maintains water use rights and an inventory of hydraulic works, decrees reserves and priorities, performs controls and imposes sanctions. Such responsibilities are fulfilled through two Ministries – the Ministry of Transport and Public Works **(MTOP), through the National Hydrography Directorate (DNH),** and the Ministry of Housing, Territorial Ordination and the Environment (MVOTMA).

**Environment and Water and Sanitation Directorates (DINAMA-DINASA)**

**Ministry of Transport and Public Works**

**- Under Decree 90/997, the DNH is responsible for:**

- Planning and developing the normative proposals for the use and sustainable development of the water resources.
- Monitoring the observance of the regulations in force.
- Managing and evaluating the national WR, trying to optimize their use.
- Granting WR use rights.
- Recording rights in the Water Public Registry.
- Approving and controlling dam- and irrigation system projects.
- Maintaining an updated inventory of water resources.
- Fiscalizing and imposing sanctions.

**Ministry of Housing, Territorial Ordination and the Environment**

- **Under Decree 257/997, the DINAMA is responsible for:**

  - Evaluating the quality of the environmental resources.
  - Preventing the environmental impact of human activities or projects.
  - Controlling those activities that affect the quality of the environmental resources.
  - Granting effluent-dumping permits.
  - Issuing Prior Environment Authorizations for certain water-developing activities.
  - Classifying water courses or bodies.
  - Fiscalizing and imposing sanctions.

- **DINASA** According to Law 17.930, 19th December, **2005**, the MVOTMA is empowered to propose to the Executive Power the formulation of national water and sanitation policies. Such Law creates both **DINASA and COASAS** (Water and Sanitation Advisory Commission). Art. 251 of Law 18.172, 31st August, **2007** transferred the water resources administration, use and control from the MTOP to the MVOTMA, effective January 1, 2008, with certain exceptions.

- **COASAS (Water and Sanitation Advisory Commission)** Created by Decree 450/06, the COASAS has two responsibilities: Cooperating with the Executive Power in the definition of policies, integrating the different visions in the sector, and providing advice to the DINASA and the Executive Power. It comprises representatives of the Public Administration, the civil society and NGOs.

The **Ministry of Livestock, Agriculture and Fishing** (MGAP) is responsible for the approval of the Plan of Use and Management of Soils and Waters for Irrigation. The MGAP perform such function through the General Directorate of Renewable Natural Resources (DGRNR).

**Ministry of Industry, Energy and Mining** (MIEM): the Mining and Geology National Directorate (DINAMIGE) implements drilling activities and performs groundwater studies, as well as hydrogeological resources studies and location activities.

**State Water and Sanitation Work Institution (OSE)** – A decentralized institution responsible for the supply of drinking water and the delivery of sanitation services throughout the country, with the exception of the City of Montevideo, where the local Government is competent.

**Groundwater-specific institutions**

**At the national level**

**Guarani Aquifer Advisory Council**, created by an Executive Power 2001 decision. Its responsibilities include those of mediating in conflicts among users, giving expert opinions on study- or extraction requests, giving advice on works and studies, monitoring the use of the aquifer and cooperating with the MTOP in all aspects involving better performance in the management area. It comprises representatives of the Public Administration, the users, and the private sector.

**Transboundary level**

**Binational Local Management Institution in the Pilot Project of the Guarani Aquifer System (SAG) in Rivera-Santana.** With the support of the municipal governments of Rivera and Santana, the COTRAGUA was created in 2003 with the objective of ordinating, monitoring, fiscalizing and effecting the implementation of the management structure proposed by the SAG Project for the pilot project. The following entities are represented in COTRAGUA: By Santana- Brazil: Water and Sanitation Directorate (DAE), Municipal Agriculture Secretariat, Secretariat of the Environment (SEMA), and Patulus Institute (a NGO); by Rivera- Uruguay: Municipal Directorate for Health, Hygiene, and the Environment; State Water and Sanitation Works (OSE); Municipal Laboratory, the private sector, Raikatu (a NGO), National Hydrography Directorate.
Its responsibilities are those of:

- Ordinating, monitoring, fiscalizing and effecting the implementation of the management proposed by the SAG Project for the pilot project.
- Formulating concerns and promoting public participation and the participation of local actors.
- Knowledge enhancing and following-up of Project activities, and their results.

## VENEZUELA – LEGAL AND INSTITUTIONAL ASPECTS

### I. LEGAL FRAMEWORK

1. **Transboundary Level** (Statements, bilateral agreements or similar instruments, or any form of cooperation in connection with transboundary waters or transboundary aquifer systems).

**With the Republic of Colombia: in the area of Carraipía Paraguachon (Guajira transboundary aquifer),** as a result of cooperation attempts in the 80's, **Basic studies** were pursued on the climatic and hydrological variables in each country. The talks have been reinitiated for continued exchange and technical cooperation purposes.

**In the area of San Antonio – Ureña and Villa del Rosario – Cúcuta (Pamplonita – Táchira Transboundary Aquifer)** there have only been regional talks with the **Republic of Colombia** and unsuccessful attempts to agree on the building of superficial reservoirs for the supply of both countries.

There used to be technical cooperation commissions for the study of the Arauca River Basin. Such commissions are no longer active. As far as groundwater is concerned, this basin belongs to the hydrogeological province of Orinoco (plains) and its spatial location corresponds to the proposed project for the Amazonas Transboundary Aquifer.

Presently there are presidential commissions between Colombia and Venezuela, including the **Binational Technical Commission for the Study of the Hydrographic Basins Used in Common by Venezuela and Colombia (CTB-CHUC)**. This commission and the MINAMB participate actively and try to set rules for the technical meetings of each basin, so as to achieve results in the realm of integral development and conservation of the hydrographic basins used in common.

**Amazonic Cooperation Treaty of 30/07/78 among Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela**. The Treaty promotes the harmonic development of the Amazonic territories with preservation of the environment, conservation and rational use of the natural resources, as well as scientific research and information-sharing among the countries.

**2. National Level**

***Constitutional Level***

The **Constitution of the Bolivarian Republic of Venezuela (1999)** represents a fundamental instrument to orientate the new environment regime. Special importance is given to the conservation of the natural resources. To achieve these objectives active State-society participation is fostered, under the premise of sustainable development.

Articles 127, 128 and 129 emphasize environment protection and ecological balance conservation as instruments for the sustainable development of Venezuela.

Article N° 304 reads: "All waters are goods belonging to the public domain of the Nation, essential for life and development. The Law will set the necessary provisions to guarantee their protection, development and recovery, respecting the phases of the hydrological cycle and the territorial ordination criteria".

***Legislative Level***

The organic laws include the Organic Law of the Environment, the Organic Law for Territorial Ordination, the Organic Law for the Delivery of Public Services of Drinking Water and Environmental Sanitation, and the Organic Law on Water and Island Spaces.

The Ordinary Laws include the Forest Law on Soils and Waters, and the Penal Law on the Environment.

**Organic Laws**

**Organic Law of the Environment** (Official Gazette of the Bolivarian Republic of Venezuela N° 31004, June 16, 1976). It sets the guidelines and ruling principles for the conservation, defense and improvement of the environment to enhance life quality, according to a holistic and systematic vision.

**Organic Law for Territorial Ordination** (Official Gazette of the Bolivarian Republic of Venezuela N° 3238 Extraordinary, 11th August, 1983). It sets the provisions that will regulate the process of territorial ordination with the Economic and Social Development Strategy of the Nation.

**Organic Law for the Delivery of Public Services of Drinking Water and Environmental Sanitation** (Official Gazette of the Bolivarian Republic of Venezuela Nº 5568, 31st December, 2001). It sets the provisions that will rule the drinking water and sanitation services in the national territory, as well as the activities of the participating agents, under the sanitary and environmental policy to be approved by the National Executive Power in such sphere.

**Ordinary Laws**

**Forest Law on Soils and Water** (Official Gazette of the Bolivarian Republic of Venezuela N° 1004, Extraordinary, 28th January, 1966). Its object consists of the conservation, development and exploitation of the natural resources specified in its text and the products derived from such resources. The Law includes a statement of public benefit on protection of hydrographic basins, water currents, and water falls, national parks, natural monuments, protecting areas, virgin region reserves, and forestall reserves.

**Penal Law on the Environment** (Official Gazette of the Bolivarian Republic of Venezuela N° 4358 Extraordinary del 3rd January, 1992). Its object consists of defining as criminal offenses those conducts that violate the provisions on conservation, defense and improvement of the environment, and setting the appropriate penal sanctions.

**Waters Law**, approved on 02/01/2007, Official Gazette N° 38595. Its object consists of setting the provisions that rule the integral management of waters as an indispensable element for life, human welfare, and the sustainable development of the nation, which are strategic in nature and involve the interests of the State. Its fundamental principles include:

- Access to water is a fundamental human right.
- Water is a social good.
- The integral management of water must be performed in a participative manner

The regulation of this law will be issued within a year from the date of the publication of the Law. The National Plan for the Integrated Management of the Waters will be published within two years from the coming into force of this law. The Law creates the national mandatory registry of water-source users, which will establish a period of three years from the date of implementation of the registry.

The new Water Law incorporates the spatial groundwater management units in the provinces and hydrogeological basins.

**The Meteorology and Hydrology Law** was approved on 23/11/2006, Official Gazette N° 5833 Extraordinary, dated 22nd December, 2006. Its object consists of regulating, coordinating and systematizing the National Meteorological and Hydrological function. Basic meteorological and hydrological information is declared as information of general interest and public use, owned by the Bolivarian Republic of Venezuela.

**Draft Risks Law – being discussed.** It sets the platform for risks management, establishing the ruling principles for the national policy to provide for the harmonic performance of the concurring jurisdictions of the National, State and Municipal Public Power, while guaranteeing the sustainable development of the Nation in aspects of risks prevention and mitigation.

***Regulatory level***

The most important decrees in the realm of water resources are the following ones:

- **"Regulations on Activities Susceptible to Effect Flow Changes, Bed Distribution and Sedimentation Issues".** Decree N° 2220, 23/04/1992, Official Gazette N° 4418 Extraordinary, 27/04/1992. Its object consists of controlling the development of activities that by provoking changes in the hydraulic works control systems, blocking beds and run-offs and artificially producing sediments, may cause damages, such as floods, water distribution deficits, bed instability, and water quality changes.

- **"Regulations on Classification and Control of the Quality of Water Bodies and Liquid Dumping Products or Effluents".** Decree 883, dated 11th October, 1995, Official Gazette Extraordinary, N° 5021, dated 18 December, 1995. It regulates matters concerning dumping of liquid products in water bodies, sewer networks, or subsoil infiltration, control of other contaminating sources, and includes a list of the activities subject to such regulations.

- **"Regulations on Environmental Assessment of Activities Susceptible to Degrade the Environment".** Decree 1257, dated 13/03/1996, Official Gazette N° 4.418 Extraordinary 27/04/1996. Its object consists of establishing the procedures for the environmental assessment of the activities susceptible to degrade the environment. For groundwater, this object basically refers to programs and development of water catchment works or infrastructures that can damage the ecosystems.

- **"Standards on Regulation and Development of Water Resources and Hydrographic Basins.** Decree N° 1400, Official Gazette N° 36013, dated 02/08/1996. Article N° 29 mandates**: "All public domain water development activities require concessions…"·**

- **"Sanitary Standards for the Location, Building, Protection, Operation, and Maintenance of Drilled Wells Designed for Drinking Water Supply" -** Official Gazette N° 36298, dated 24/09/1997. Its object consists of monitoring and watching the structural works of the water supply systems, through works of catchment of drinking water supply-designed groundwaters, in their sources,

- **"National Plan for Territorial Ordination"** "Decree N° 2945, dated 14/10/1998, Official Gazette N° 36.571, dated 30/10/1998. Its object consists of orientating the location of the population, the economic activities and the physical infrastructure, by harmonizing criteria for economic growth, social development, security and defense and conservation of the environment, based on the knowledge of the specific potentials and restrictions of each geographic area.

- **"Sanitary Rules on Drinking water Quality"**. Decision N° SG-018-98, 11/02/98 published in the Official Gazette N° 36395, 13/02/98.

- **"Regulations of the Characterization of Bottled Waters for Human Consumption and Commercial Uses in the Country"** Official Gazette N° 35277 dated 03/08/1993.

## II. INSTITUTIONAL FRAMEWORK

### 1. National institutions

The **Ministry of the Environment (MINAMB)** is Venezuela's ruling body for environmental policies. Its mandate consists of ensuring rational development of the natural resources.

From top to bottom, the **internal structure** of the MINAMB institutions dealing with natural resources development, is as follows:

- **Vice Ministry of Waters**, through the Hydrographic Basins General Directorate, Hydrology, Meteorology, and Oceanology Directorate (**line**) is involved in the management of the aquifers through Groundwater Coordination and the Water Management Directorate **(line) through the users registry**, ascribed to the aforementioned General Directorate.
- **Vice Ministry of Territorial Ordination**, through the Permits Administrative Office, **which is in charge of issuing permits related to the aquifers.**
- **Vice Ministry of the Environmental Conservation**, through the General Directorate of Environmental Quality, is responsible for assessing the quality of the waters from the various sources.

Autonomous Institutions a**scribed to the MINAMB** include **the national hydrologic head corporation (HIDROVEN), and the regional hydrologic subsidiary corporations: (HIDROCAPITAL, HIDROCENTRO, HIDROLAGO, HIDROANDES, HIDRORIENTE, HIDROPÁEZ, HIDOBOLÍVAR, HDROSUROESTE, Aguas de Monagas, Aguas de Mérida, Aguas de Yaracuy, Aguas de Portuguesa, etc.)**, which deliver the services of drinking water supply and waste water collection, treatment and disposal throughout the national territory.

Under the Law of 02/01/2007, Official Gazette N° 38.595 (Article 21), the water management institutional organization consists of:

- The Ministry with relevant jurisdiction, which will exercise the **National Waters Authority**
- The Waters National Council.
- The Hydrographic Region Councils.
- The Hydrographic Basin Councils.
- The institutional users.
- The Local Councils, the Technical Panels, and the Irrigation Committees.
- The National Institute of Indigenous Peoples.
- The Ministry with jurisdiction in defense matters, through the relevant component.
- The State Councils for Public Policies Planning and Coordination.
- The Public Planning Local Councils.

## 4. ANALYSIS OF NATIONAL LEGISLATIONS AND INTERNATIONAL AGREEMENTS ON GROUNDWATERS IN THE AMERICAS[3]

The analysis of the information gathered in the previous chapter, which includes the specific or general description of the national legislations and the international agreements of the American nations on groundwater and the aquifers, will be done by systematizing its contents in order to develop a substantive synthesis.

As apparent from the text of the excerpt prepared for each country, all countries have sanctioned legislative rules on water, and most of them have also issued certain types of regulations on groundwater. As to federal countries, the states/provinces of such nations have also sanctioned legislations on water resources.

In general, the regulatory development of groundwaters is less exhaustive than that of superficial waters, and the countries of the Americas are no exception in such respect. Regulatory development is even less considerable in the case of groundwaters belonging to transboundary aquifers, since very few countries of the region have legal or institutional mechanisms for such purposes. Where established, coordination mechanisms are characterized, in turn, by a distinct institutional lightness.

The description of the national legislations and the agreements on transboundary resources of the Americas constitutes a database of unique relevance to get to know the regime adopted by each country, study the existing texts, and offer, in a single publication, the legal and institutional framework of the Continent on such theme. It also lays the basis needed to develop a compilation of national legislations, which will entail a description of the groundwater regime and allow for the development of a detailed qualitative and quantitative analysis of its contents.

In order to analyze the legislative material compiled a matrix has been prepared around two axis –geographic and material— by taking into account, on the one hand, the regulation of the basic issues of water management, and on the other hand the different American regions. If additional information is obtained, and some existing gaps are filled, such materials can be arranged with the necessary openings, using the same criteria.

The basic themes considered to segment the legislation, subdivided by regions in **North America, Central America, the Caribbean, and South America**, include:

- **Domain and jurisdiction**, which involves defining water affiliation to public or private domains, and national, state/provincial or concurrent jurisdiction;
- **Institutional structure**, identifying the institutions responsible for water management in each jurisdiction;
- **Uses, their regulation, and protection of the resource**: one should consider that the protection of the resource is integrated with the uses and is a substantive part of management; groundwater protection rules cover both quantity and quality and are intercalated with the provisions on extraction volumes, agricultural/industrial uses, aquifer recharge, infiltration of superficial waters, etc.
- **Transboundary aquifers**, which includes agreements or understandings among two or more States when one aquifer is divided by territorial limits.

[3] By Lilian del Castillo-Laborde. The author is solely responsible for the information and opinions in this text.

### 4.1. Rules on domain and jurisdiction on groundwaters.

- **North America**

**The United States de América, Canada, and Mexico** are federal nations, which gives rise to a more intense phenomenon of concurring jurisdictions between each State/province and the Federal Government. The water regime has, therefore, different regulation levels, as determined by the Constitution of each nation in regard to the allocation of federal and state/province powers.

**Canada's** legislation grants water control, generically, to the federal authorities, under the Waters Law of 1985. The provinces, in turn, have sanctioned general regulations on water, including provisions on groundwater (Alberta, Yukon); specific rules for groundwater (British Columbia, Manitoba, Saskatchewan, Ontario, Quebec); rules on groundwater protection (British Columbia) and other rules on well drilling and water extraction (New Brunswick, Manitoba, Ontario).

In the **United States of América** state legislation –i.e., the rules sanctioned by the states of the Union—prevail on the legislation enacted by the Federal powers, since jurisdiction on water issues belong to the states. Accordingly, it is the state legislation the one which establishes the groundwater appurtenance to the public/private domain system.

**Mexico** has a federal political organization, and Article 27, para. 5 of the National Constitution provides that the subsoil natural resources belong to the domain of the Nation, thus affirming the hierarchical preeminence of national legislation on state regulations, which facilitates a management organization based on countrywide uniform rules. The Waters National Law (LAN) (2004) includes provisions on groundwater, gives the Executive Power jurisdiction on national waters, along with the capacity to establish regulated, prohibition or reserve areas, where use is subjected to permits. However, until the Government establishes such areas, groundwaters can be extracted without mandatory authorizations of licenses. The Basin Councils and Groundwater Technical Committees also participate in the ordination of the resource. The law recognizes the regulatory capacity of the states and municipalities. Regional aquifers are subjected to the central jurisdiction of the Waters National Commission (CONAGUA).

- **The Caribbean**

**The 1974 Law of Haiti** regulates groundwater use and classifies such waters as a public good. The **Dominican Republic** considers water use as a part of the public domain, subjected to use permits under the 1962 Law, and regulates groundwater use under the specific Law of 1969, which governs the development and conservation of groundwater. Environmental rules have also been sanctioned on groundwater protection. All of them are national in scope.

- **Central America**

**Guatemala's** Constitution determines that superficial water and groundwater are State-owned goods, i.e. public-domain goods. The Law on Environmental protection and improvement includes rules on water resources management. In **Nicaragua**, Decree No. 107/2001 regulates superficial water and groundwater, as well as their quantity and quality, as a unit. The Waters Law of 2007, which is not yet in force, establish the management regime for superficial water and groundwaters.

**Honduras** supplements its 1927 Waters General Law with the 1927 Water and Sanitation Law, which includes provisions on aquifer protection. **Belize** approved its Waters Law in 2001; the Law includes provisions on aquifer recharge areas. In **El Salvador,** the Irrigation Law of 1970, as amended, includes groundwaters in water resources, and the 1998 Law of the Environment mandates the identification and preservation of the recharge areas and the protection of the aquifers.

In its 1942 Waters Law and numerous subsequent laws, **Costa Rica** establishes that water belongs to the public domain and the private domain, and sets the national jurisdiction for its regulation. **Panama's** Constitution (Article 255) declares that lake- and river waters belong to the State, as well as all waters for public use and public services. The 1966 Decree-Law and the 1998 General Law of the Environment (Law 41) reiterate that water, in all its states, including groundwater, belongs to the public domain of the State.

- **South America**

The 1999 Constitution of **Venezuela** declares that all waters belong to the public dominion of the Nation (Article 304). The Waters Law of 2007, still not followed by implementing regulations, creates spatial units for groundwater management. **Ecuador** has sanctioned the Waters Law (1972), national in scope, which regulates the development and concession of groundwater (Chapter VIII, Articles 43 to 47). In **Bolivia**, the Political Constitution of 2004 provides that the soil, the subsoil, the lake- and river waters, are goods belonging to the primary domain of the State and are a part of the State public domain (Articles 136 and 137).

In **Paraguay** the Civil Code (Article 1898) stipulates that groundwaters are goods belonging to the State's public dominion under the 2005 amendments (prior to the amendments, they belonged to the private domain). The public-domain nature of superficial water and groundwater s is reiterated by Law 3239/2007, on water resources. Law 1561/2000, which creates the National System of the Environment, mandates the formulation of policies for the conservation of the recharge capacity of the aquifers. The Municipal Organic Law No. 1287 (1987) stipulates that all rivers, lakes, and streams belong to the Municipal domain. In **Peru**, the Waters General Law, as sanctioned in 1969, sets the national jurisdiction on waters; it includes provisions on groundwater, in connection with uses and execution of works.

**Colombia** sanctioned the Renewable Natural Resources and Environmental Protection Code I 1974. The law includes the principles of groundwater use. In **Chile**, the Water Code (1981) describes water as a good belonging to the public domain of the State and regulates the concession of use rights to private persons. In **Uruguay,** the Constitution (Article 47) determines the nature of public good of water.

The 1988 Constitution of **Brazil** establishes the public-domain nature of water, and classifies waters into federal and state waters. Groundwaters belong to the public domain of the states, which are to legislate on management thereof (Article 26.1). The 1997 Waters Law reiterates that water is a public domain good and will be governed by the National Policy on Water Resources. The Law creates the National Waters Institution as its implementation body. A large part of the states (Amazonia, Paraná, Pará, Mato Grosso, São Paulo, Minas Gerais, Goiás) have specific provisions on groundwaters.

In **Argentina,** the Constitution proclaims the right to a 'healthy environment', which requires 'rational use of natural resources'; as regards groundwaters, the Civil Code, as amended in such respect (Article 2341) indicates that such waters belong to the public domain of the State. Each province sanctions its own water laws, since water is included in their original

domain. Jurisdiction is shared between the national Government and the provincial governments.

### 4.2. Institutional scheme on groundwater

- **North America**

**Canada, the United States, and Mexico** have numerous federal and state institutions with jurisdiction on water issues, although with different features. While in **Canada and Mexico** national institutions are the ones having jurisdiction on waters, which they share with the states and other intermediate institutions, in the **United States** the Federal Government is responsible for the environmental and water-quality aspects, but the state entities have broad jurisdiction on water resources.

In **Canada,** the generic jurisdiction corresponds to the Ministry of the Environment (1985 Law of the Department of the Environment, and 1999 Law on Environmental Protection), and water matters are included in the jurisdiction of twenty departments (those of the Environment, Natural Resources, Health, etc.). Their functions are coordinated with the provinces through the Inter-Departmental Waters Committee.

In the United States**,** the Federal Government, through the Environmental Protection Institution (EPA), assesses groundwater quality, particularly as respects drinking water quality, and sends reports to the Congress on the Nation's groundwater quality and the effectiveness of the groundwater protection state programs. The Institution may finance state programs to ensure groundwater protection, if the state so request [Safe Drinking Waters Act 1429 sec 131].

In **Mexico**, the National Water Commission, a decentralized institution of the Secretariat for the Environment and Natural Resources, is the national authority in water issues. For the performance of its responsibilities it is organized in three levels: 1) the Central or National level, comprising eight General Subdirectorates; 2) the Regional level, represented by 13 Basin institutions, and 3) the State level, consisting of 20 Local Directorates.

- **The Caribbean**

**Haiti** has granted jurisdiction on natural resources to the Ministry of the Environment, while the Ministry of Agriculture, Natural Resources and Rural Development is responsible for groundwater exploitation. The **Dominican Republic** has granted jurisdiction on superficial water and groundwaters, as well as regulation of the groundwater exploitation permits to the Secretariat of the Environment and Natural Resources. A National Institute of Hydraulic Resources has also been established.

- **Central America**

In **Guatemala,** the jurisdiction of the Ministry of the Environment and Natural Resources includes water issues. In **Honduras**, the Secretariat for Natural Resources and the Environment has jurisdiction on water issues, while irrigation is included in the jurisdiction of the Secretariat for Agriculture and Livestock. In **Belize** no governmental institution is responsible for water resources.

In Nic**aragua,** Law 290/1998 includes the institutional framework for water management. Jurisdiction on water management has been assigned to the Ministry of the Environment and Natural Resources (MARENA). In **Costa Rica,** the ruling institution on water issues is the

Ministry of the Environment and Energy (MINAE) (Law 276/1942), which manages the National Water and Waterways Registry. The National Groundwater, Irrigation and Drainage Service (SENARA) promotes surface and groundwater resources use, knowledge and protection, and supervises the National Wells Archive.

**El Salvador** has granted jurisdiction on groundwaters to the Ministry of the Environment and Natural Resources. **Panama** has granted jurisdiction on groundwaters to the National Authority of the Environment, which supervises the management of hydrologic basins and water concessions and permits (Law 41/1998). Well drilling for drinking water supply and agricultural and livestock uses, and groundwater are regulated. A Water Resources Hydraulic Resources Consultative Council has also been established (Decree 70/1973).

- **South America**

In **Colombia,** water management responsibilities have been entrusted to the Ministry of the Environment, Housing, and Territorial Development (Law 99, 1993, which also grants jurisdiction on groundwaters to regional autonomous corporations. At the local level, the exploitation of superficial water and groundwaters belongs to the sphere of hydrographic basin ordainment (Decree 1729/2004). In **Venezuela**, the Ministry of the Environment is the institution with jurisdiction on natural resources. It supervises the Vice-Ministry of Water, which coordinates the activities relative to groundwaters, and the Vice-Ministry of Territorial Development, which grants the permits for aquifer use. Under the Law of January 2, 2007, this Ministry will supervise the National Water Authority. A National Waters Council has also been created, along with the Regional and Basin Councils, among other institutions with jurisdiction in the sphere of water.

In **Ecuador,** jurisdiction on water issues has been granted to the National Council on Water Resources, ascribed to the Ministry of Agriculture and Livestock, which has jurisdiction on granting of development rights, drilling and submission of information requests on groundwaters. A Waters Consultative Council and Provincial Councils have also been created; they share jurisdiction within an articulated legislative scheme.

In **Peru,** under the 1972 General Waters Law, which legislates on superficial water and groundwaters, the administrative jurisdiction on water issues has been conferred to the Ministry of Agriculture. A Water Resources Intendency was also established, with general jurisdiction on sustainable use of water resources. Superficial water and groundwater management jurisdiction for agricultural use has been entrusted to each Technical Manager of the Irrigation District. There are 68 such Managers in the country.

In **Bolivia,** Law 3351/2006 established the Ministry of Waters, responsible for the management of all water resources in the country. It has also jurisdiction regarding… (Ministerial Decision 024/2004). In **Chile**, the Waters General Directorate, reporting to the Ministry of Public Works, is the authority having jurisdiction on land waters, both superficial water and groundwater, and is the institution responsible for the assignment of water rights.

At the national level, **Brazil** has a complex institutional structure. The 1997 Waters Law (No. 9433) establishes the National Water Resources Council as the highest instance of the National Water Resources Management System, responsible for structuring the means of implementing the national policy on water resources. Established in 2000 (Law 9984), the National Waters Institution (ANA) is the federal institution for the implementation of such policy and a component of the National System for the Water Resources Management. It establishes its operational rules, administrative structure and financing. The Federal Government participates in the Basins Committee for those water bodies covering more than

one state. The Ministry of the Environment, through the Water Resources and Urban Environment Secretariat (Decree 6101/2007), formulates the water resources environmental policy and monitors its implementation, and coordinates national groundwater programs and is responsible for the transboundary aquifer programs, including the Project for Environmental Protection and Sustainable Development of the Guarani Aquifer System and the ISARM Americas Program. At the state level Water Resources State Councils are established.

In **Paraguay**, the General Environmental Law, 1561/2000, established the Environment Secretariat, with the function of monitoring the water resources exploitation activities. Through the General Directorate of Water Resources Protection and Conservation, the Secretariat must formulate the policies for the maintenance of the recharge capacity of the aquifers. In **Uruguay**, the entities responsible for the management of water resources are the Ministry of Housing, Territorial Ordinance and the Environment, the Ministry of Transportation and Public Works, which supervises the National Hydrography Directorate, responsible, in turn, for water management, and the Ministry of Public Health, which monitors the quality of water for human consumption. A Public Water Registry has also been established (2003).

In **Argentina**, the Water Resources Secretariat develops and implements the national water policy, with the technical support of the National Water Institute (INA). The INA includes the Regional Groundwater Center (CRAS), with headquarters in the Province of San Juan. Under the federal regime, the provinces sanction the local legislation on superficial water and groundwaters. Each of them has established provincial water management institutions.

### 4.3. Rules on groundwater use and protection regulation

- **North America**

In **Canada**, the federal legislation established the quality parameters for drinking water under the 1978 Law. The provinces regulate its various uses. In 1996 British Columbia sanctioned the Waters Law, the Water Protection Law, and the rules and regulations for groundwater and drinking water protection. The Province of Saskatchewan sanctioned groundwater rules and regulations. The Province of Manitoba has regulated drilling for groundwater extraction (1990 Law); the Provinces of Ontario (2002 Law) and New Brunswick (1989 Law) have also regulated such activities. The Province of Yukon sanctioned its Waters Law in 1992. The Province of Quebec has regulated drinking water quality and the aquifers.

In the **United States of América,** groundwater appropriation follows various legal criteria. Alaska and other states have adopted the permit system. The range of theories being applied include those of absolute land ownership, where the landowner is not responsible for the potential damages caused by groundwater use (Maine, Texas); 'first appropriation', where use priority is granted to the owner who had started the exploitation (Idaho, Montana, New Mexico, North Dakota, Washington); 'reasonable use', which recognizes the land surface owner the right of using groundwater reasonable use of groundwater for useful purposes (Arizona, Michigan, New Hampshire, New York, Ohio, Pennsylvania, Wisconsin); 'correlative rights', where reasonable use is combined with use priorities (California, Minnesota, Vermont), as well as variants or combinations of the aforementioned theories in other states. In a number of states, the rules applied to groundwater use stem from the doctrine established in judicial decisions. This legislative overview shows that whatever the legal principles implemented, almost all states regulate groundwater use. Groundwater use requires consultations with the Legal Office of the Department of Agriculture, which allows the

Federal Government to supervise the resource and potentially establish some common management guidelines to avoid the problem of state legislation diversity.

Through CONAGUA, **Mexico** regulates inter-regional aquifers. Groundwater use is not subjected to permits so long as prohibitions, regulations or reserves are not established. In such scenario a concession is to be requested, based on the water volume to be used and the works planned. The Advisory Councils established are responsible for the formulation, implementation and follow-up of aquifer preservation programs and action, and cooperate with CONAGUA.

- **The Caribbean**

In Haiti, the Law of 1974 regulates the number of wells that can exist in a community and mandates the beneficiaries of deep wells to abide by the specifications to avoid aquifer waste and contamination. In the **Dominican Republic**, Law 487/1969, as amended, regulates groundwater management; its exploitation is subject to concessions and permits and includes provisions on groundwater protection.

- **Central America**

In **Guatemala,** one of the objectives of the Decree 68/86 on protection and improvement of the environment is the rational, integral use of basins and water systems. **El Salvador** has sanctioned the Irrigation and Drainage Law (Law 153/1970), which is enforced by the Ministry of Agriculture and Livestock. The Ministry of the Environment and Natural Resources (MARN) identifies the aquifer recharge areas and promotes those actions allowing their recovery and protection (1998 Environment Law, as amended in 1001, Article 71). The Hydroelectric Executive Commission for the Lempa River (Law 137/1948 and the Decree of 1984) develops the energy resources of El Salvador.

**Belize** has sanctioned the Water Industry Act (2001), which includes provisions for the protection of the aquifer recharge areas. **Honduras** has sanctioned the National Waters Development Law and the Framework Law on drinking water and sanitation. Irrigation, in turn, is the responsibility of the Secretariat for Agriculture and Livestock. **Nicaragua** has sanctioned the Law on Drilling Permits and National Wells Registry (1969), which specifically regulates groundwater use.

In **Costa Rica**, drilling projects for groundwater use require a permit from the Waters Director of the Ministry of the Environment and Energy (MINAE). Firms involved in groundwater extraction drilling must register in the MINAE. The 1998 Regulations on drilling and groundwater exploitation sets wells-drilling limits in areas declared by the Government as protection and aquifer-reserve areas, areas vulnerable to contamination or affected by overexploitation or saline-intrusion risks, or by risks of conditions potentially damaging for the aquifer, or areas of interference with other wells, rivers or water nascents. The SENARA is responsible for water resources development and protection activities, including those on groundwaters. **Panama** has regulated the granting of permits and concessions for superficial water and groundwater use (Decree 70/1973). Groundwater concessions have been regulated (Decree 70/1973), as well as discharges of liquid effluents in surface and groundwater bodies (2000). The National Authority for the Environment is responsible for natural resources conservation, exploitation, use and management.

- **South America**

In the framework of its national environmental policy, **Colombia** has entrusted the IDEAM specialized institute the functions of measuring and studying groundwater. The regional autonomous corporations, in turn, are responsible for the management of such resource (1993). A Scarcity Index for groundwaters has been developed (IDEAM - 2006). The **Ecuador's** Waters Law Title VIII (1972) includes rules on groundwater development and concession. The Ministry of the Environment monitors the quality of waters. **Venezuela** has enacted the Waters Law (2007) and sanctioned the hydrographic basins Decree (1996). The new Law creates the registry of users of water sources and includes the spatial units for groundwater management in provinces and hydrogeological basins.

In **Peru**, the Law on Promotion of Investments in the Agricultural Sector (1991) empowers Irrigation Districts to authorize studies and works for such investments and grant superficial water and groundwater use licenses. **Chile** has set groundwater exploration and exploitation standards (Decision No. 341/2005). **Bolivia** has sanctioned the Law on Protection and Support for the Irrigation Sector, which regulates use and exploitation of water resources for irrigation (Law No. 2878/2004). The Law creates the registries and sets rules for irrigation authorizations and cancellation of same, under the authority of the National Irrigation Service (SENARI). The SENARI will presumably be replaced by the authority having jurisdiction on water resources. The Political Constitution (Article 171) and the Law No. 266 (Articles 49, and 50) recognize the rights of the indigenous and native peoples on use and development of the water sources for drinking water services.

**Brazil's** Waters Law sets the general rules for use of the resource (1997), and there is state legislation on groundwater use. The states of Pará (1998), Mato Grosso (2004), São Paulo (1988), Minas Gerais (2000), Goiás (2000), Río Grande do Sul (2002) have legislated on groundwater conservation and protection; the states of Amazonas (2001) and Paraná (1999) have legislated on groundwaters. Through a 2005 decision, **Paraguay** set technical standards for pipe-shaped wells for groundwater catching.

**Argentina**'s national Law on Environment Water Management (2003) sets the basic principles on water use. The Secretariat for the Environment and Sustainable Development is responsible for the preservation and protection of the natural resources (2003), and the Subsecretariat for Water Resources develops the objectives on superficial water and groundwater s quality. According to their powers relative to water, the provinces sanction the local rules on use and protection of superficial water and groundwater. **Uruguay** has a centralized system on use and management of water resources, based on the National Hydrography Directorate, which maintains a registry of industrial uses. The Ministry of Public Health monitors drinking water quality through the Environment Health Division. The country's general rules for all types of waters are included in the 1978 Water Code. Specific rule-implementing Decrees are those for the Guarani Aquifer Management Plan (2000) and the Technical Standard on deep well drilling (2004). The National Constitution of Uruguay prohibits damages to the environment. While there are no specific rules for groundwater-quality protection, a number of general regulations are relevant, such as those for the Laws of Environmental Impact (1994), and Environmental Protection (2000), as well as implementing Decrees.

## 4.4. Transboundary aquifers

- **North America**

Through the Border Water Treaty of 1909, the **United States of América** and **Canada** established the International Joint Commission (IJC) to prevent conflicts along this long border line. The IJC functions were expanded by the signing of new agreements on border water bodies, which entrusted the Commission with supervision and recommendation tasks on the implementation of the agreement on water quality of the Great Lakes (1972, 1978, protocol of 1987). Even though groundwaters are not specifically mentioned in such agreements, both Governments, and the IJC, are increasingly pursuing activities on aquifers and groundwaters. Their recommendations are not mandatory, but are taken into account by both countries and by the Great Lakes riparian states.

Also at an interjurisdictional level, the agreement on the 'Great Lakes Sustainable Water Resources of the San Lorenzo River Basin', signed in 2005 between the Great Lakes riparian states of the **United States of América** and the Ontario and Quebec provinces of **Canada**, includes groundwaters in its definition of waters. **Canada and the United States of América** have established, at state level, an Agreement on the Abbotsford-Sumas transboundary aquifer. This agreement, signed by the State of Washington (United States) and British Columbia (Canada) in 1992, establishes a Council and a Task Force that formulate recommendations on quality and management of the aquifer.

Through the March, 1889 Convention, the **United States of América** and **Mexico** established the International Border Commission (IBC). It was expanded by the February 3, 1944 Treaty, which regulates the use of the waters of the Grande, Colorado and Tijuana Rivers. The Commission, renamed as International Borders and Waters Commission (IBWC-CILA), binational in nature, is formed by two national delegations headed by a representative of each nation appointed by his or her Federal Government. The Commission's task is that of helping solve border issues and implement projects for the development of the waters of the border rivers, and follows a reciprocal consultation process when new developments in any of the countries affect superficial or groundwaters. Regarding the latter, the Commission agreed (Minute 242/1973) to set a limit to groundwater extraction from the Lower Colorado River Basin, and decided to implement reciprocal prior consultations for new ventures on the border areas, or changes to the existing ones. A sampling program has also been implemented for the aquifer of Nogales, Sonora (Mexico) and Nogales, Arizona (United States). In addition an information-sharing and modelling mechanism has been set between the cities of Juarez, Chihuahua (Mexico) and El Paso, Texas (United States), for the local aquifer.

- **The Caribbean**

**Haiti** and the **Dominican Republic** share the transboundary aquifers of Artibonito and Massacre. A project for strategic long-lasting use of such aquifers is being developed through the GEF-UNEP-OAS-UNESCO.

- **Central America**

**Guatemala** and **Mexico** have established the International Borders and Waters Commission (CILA), with jurisdiction on the international rivers between both countries (Treaty of 1990). **El Salvador, Guatemala,** and **Honduras** have reached an Agreement for the implementation of the Trifinio Plan, which has an autonomous Trinational Executive Secretariat and is responsible for the implementation of the Trinational Program for the Upper Segment of the Lempa River Basin and the Trinational Protected Area of Montecristi. The Program

generates information on the region's groundwaters. The three countries have signed a memorandum of understanding (2003) to strengthen cooperation between the hydrology and meteorology services in the area of hydrometeorologic forecasting in the international basin of the Lempa River.

In 2006, **El Salvador** and **Guatemala** agreed on enhanced cooperation for the sustainable development of the binational basin of the Güija Lake. **Costa Rica** and **Nicaragua** adopted the technical cooperation agreement for the San Juan River basin (1994).

- **South America**

**Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, and Venezuela** participate in the Project for the Integrated and Sustainable Management of Transboundary Water Resources in the Basin of the Amazonas River.

**Colombia** and **Venezuela** have performed studies on the transboundary aquifer of Guajira and share the Pamplonita-Táchira aquifer. Both countries established the Binational Technical Commission for the Study of the Hydrographic Basins of Common Use. **Colombia, Venezuela** and the Organization of American States (**OAS**) signed the Agreement for the conservation and integral development of the binational basin of the Catatumbo River (1982), which is born in Colombia and flows into the Maracaibo Lake, providing the lake with 2/3 of its fresh water.

In the framework of its 1979 Treaty for Amazonic Cooperation, **Ecuador** and **Colombia** created the Binational Subcommittee for Hydrographic Basins, the Environment, and Geothermia, which includes the binational basins of Mira, Mataje and Carchi Guaytara. **Ecuado**r and **Peru** have signed the Agreements for the development of the binational basins of Puyango-Tumbes (1971) and Catamayo-Chira (1971), implemented by the binational project for the management of the Catamayo-Chira basin, with the support of the Spanish Institution for International Cooperation (2001). They also participate in the regional Project for hydrogeological characterization of the aquifer of the Zarumilla River, in the framework of the Regional Project for Sustainable Management of Groundwaters in Latin America (RLA/08/031 OIEA).

**Bolivia** participates in different projects on transboundary aquifers with bordering countries in the context of the UNESCO/OAS ISARM Americas, namely: aquifers of the Amazonas and the Pantanal with **Brazil**, Titicaca aquifer with **Peru**, Agua Dulce aquifer with **Paraguay**, Ollagüe Pastos Grandes aquifer with **Chile,** and Puneños aquifers with **Argentina**, since most of its resources have such characteristic.

Having signed the Treaty of the La Plata Basin in 1969, **Argentina, Bolivia, Brazil, Paraguay,** and **Uruguay** are furthering the Framework Program of the La Plata Basin, with the contribution of GEF/UNEP/OAS. One of the component of the Project includes the study of the aquifers of the region, particularly that of Yrendá-Toba-Tarijeño in the territories of Bolivia, Argentina and Paraguay, so as to enhance the knowledge of such aquifers and consider joint-management measures.

**Brazil** and **Paraguay** signed the cooperation aquifer for the integrated management of the Apa River (2006). **Brazil** and **Uruguay** signed the Agreement for the Development of the Merim Lake and the border segments of the Yaguarón River (1978), as well as the Agreement for the Development of the Cuareim River Basin (1991). Both of them involve water resources in its broadest sense.

**Argentina, Brazil, Paraguay**, and **Uruguay –**the countries that share the Guarani Aquifer System—participate in the Guarani Aquifer Project, designed to augment the knowledge of the resource and develop rules for protection and sustainable use thereof.

In the Americas, the growing number of projects in the stage of planning and execution will enrich the knowledge on the region's aquifers and be the starting point for progress in the development of cooperation and protection regimes among the Member States. They will particularly provide them with the tools needed to evaluate the resources they possess in adequate quantity and quality, the use/recharge relation, and demonstrate the need for management and protection rules allowing for the benefits of its use for the current and future generations, which will increasingly rely on groundwater water resources.

# 5. CONCLUSIONS AND RECOMMENDATIONS

## 5.1. Conclusions

This volume focuses on the legal and institutional framework for the management of the transboundary aquifer systems in the Americas. The term "aquifer", as per its juridical definition, includes the geological formation and the water it contains. "Aquifer system", in turn, is the aquifer comprising two or more interconnected aquifers. The rules applicable to the aquifers regulate its legal nature, its domain and jurisdiction, the rules governing its use and the obligations to protect the resource.

The codification project of the International Law Commission (ILC) approved at first reading in 2006 (A/N.4/L.683, May 12, 2006) has replaced the term 'groundwaters' with 'aquifer' and 'aquifer system', for reasons of technical accuracy. However, national legislations in general contain standards that regulate use of 'groundwater', rather than provisions on 'aquifer'.

For similar reasons, the existing conventions (Espoo Agreement on Assessment of the Environment Impact in a Transboundary Context, 1991; the European Convention on Protection and Use of Transboundary Waterways and International Lakes, Helsinki, 1992; the Protocol on Shared Waterway Systems of the Community for the Development of Southern Africa (SADC), 2001), the 1994 ILC Recommendation on 'Confined Transboundary Groundwater", the rules developed by the International Law Association (Helsinki, 1966, and Seoul, 1986) refer to groundwater. The Draft Treaty of Bellagio on Transboundary Groundwater, in turn, regulates both aquifers and groundwaters, and the Rules of Berlin approved by the International Law Association (ILA) in 2004 use both terms as interchangeable.

It is to be understood that the above-referred instruments –some of them binding; others being academic contributions--, as well as national legislations, apply in an analogous manner both to groundwaters and aquifers.

The different chapters of this volume introduce the backdrop of the legislation and binational or regional agreements that regulate the use of groundwaters and transboundary aquifers in the Americas. This material was synthesized by regions (North America, Central America, The Caribbean and South America) and by themes (Domain and jurisdiction, Institutional Structure, Use and regulation, Protection, Transboundary aquifers) in the preceding chapter. The compendium developed facilitates the task of extracting some common elements from this diverse set of rules.

In order to focus on the elements that can be considered as a common denominator of the legal and institutional framework for the aquifer systems of the countries of the Americas, the two structures that are most relevant for this study have been considered, i.e. national legislation on groundwaters –even if they do not belong to transboundary aquifers, and the agreements, legislation and programs on transboundary groundwaters

- **National legislations on groundwaters:**

  - Like most countries in the world, those of the Americas show less developed national and local regulations on groundwaters, relative to superficial waters. Simultaneously, there is progress as to legislative development in the spheres of water regimes and uses. In 2007, a number of countries (**Nicaragua, Paraguay and Venezuela**) adopted a General Waters Law, while other countries (**Honduras and Costa Rica**) are developing a draft Waters Law. In **Paraguay and Venezuela** Access to water has

been recognized as a human right, together with the social value of water, which had already been recognized by Uruguay.

- The common elements observed in the legislation are, as to domain, the preeminence of their nature of public goods. When groundwater is considered a good appertaining to the private domain, the use of the resource by the landowner is subjected to rules of groundwater protection. As to jurisdiction, in federal countries, state institutions are getting greater powers relative to national instances.

- Institutional jurisdiction powers are largely concentrated around national environmental institutions. In some cases they are shared with water resource-specific institutions or departments.

- Legislation on groundwater use offered different variants, In general terms it regulates extractions by requiring licenses.

- Some countries have sanctioned rules on groundwater protection; this matter, however, is very slightly developed in the legislative area. In some cases, legislations limit themselves to mention the obligation to preserve the quality of the groundwaters, since their continuous use in time is threatened.

- **Legal schemes on transboundary aquifers.**

  - The enhanced knowledge in the composition of the subsoil reveals the existence of new transboundary aquifers in the Americas. Such scientific progress stem from new study initiatives focused in some cases in a joint manner by the countries where the aquifer is located. For this purpose mechanisms have been established, for the implementation of programs, sampling exercises, or information sharing. In general, such mechanisms do not have a distinct institutional structure; some exceptions are to be found in the United States of América-Mexico border. They are technical cooperation mechanisms not designed to adopt decisions on joint management of the groundwaters. Cooperation aims to enrich the knowledge on groundwater water resources in order to improve the management by each Member State Party of the aquifer.

  - Cooperation among the Member States that share a transboundary aquifer is also reflected by data- and information sharing, development of studies, report sharing, participation in programs with international institutions, drafting of recommendations, inspections, pilot project dissemination, etc.

  - The series of activities performed by the countries that share one specific aquifer are increasingly relevant, since they are an active process from facts to law. In fact, the usual procedure consists in establishing institutions by the *a priori* setting of a legal framework, followed by the installation of executing institutions. However, such mechanisms are not always resilient or successful. For these reasons, setting into motion cooperation mechanisms with limited objectives and a minimal legal and institutional framework can be extremely useful and evolve to an organization with cooperation schemes already established. International structures can be necessary for efficient management of the transboundary natural resources; however, even if they have been established, its success is questionable.

- Information sharing is a procedure that starts a practice of communication on the conditions of the resource, allows for assessment of same and helps understand the management standards used in each country. Besides, it indicates that the countries where transboundary aquifers are located recognize the importance of establishing cooperation mechanisms and strengthen such trend.

### 5.2. Recommendations

The only purpose of the recommendations advanced is to highlight a number of aspects that could be taken into account and objectives that could be stressed on legislating about national aquifers or concluding agreements on the transboundary aquifers.

The recommendations are inspired in the special circumstances of a resource insufficiently known, increasingly used and scarcely regulated. They refer to national legislations and binational or regional understandings.

- **National legislation on groundwaters**

  - Advance in the inventory and assessment of the transboundary or nontransboundary aquifer located within the territory of each country. Adopt and implement rules on groundwater uses.

  - Consolidate the legislation on groundwater in the light of the water policy that inspires it and the new regulations adopted in the last few years, which indicate growing awareness and information on the information and vulnerability of this resource.

  - The institutions with jurisdiction in groundwater management should, therefore, priorize the knowledge of the aquifers. Numerous American countries have rules on groundwater development; however, such rules only lead to good management if applied on the basis of updated data and consistent with the features of the aquifers in their respective territories. This aspect should be stressed, since the effectiveness of a rule depends on the possibilities of its implementation. Regulations are little use if the regulated object is unknown, and management cannot be sound unless the resource been managed is unknown.

  - At the legislative level the identity of the groundwater legal regime should be stressed. The regime should be granted the necessary autonomy, and have the institutions needed to (a) Increase the knowledge of the subsoil water resources, their recharge and discharge areas and their participation in the hydrological cycle; (b) Develop rules for adequate management of such resources; (c) Create uses registries to protect the resource, both in quantity and quality.

- **Understandings on transboundary aquifers.**

  - Incorporate cooperation involving data- and information sharing, so as to facilitate gradual progress towards the development of coordinated plans among the countries belonging to the same aquifer. The establishment of coordination mechanisms would further the exchange process and the adoption of measures for better management of the resource.

- In the understandings on transboundary aquifers described in the previous chapters no binational or regional coordination processes were established for the inventory, evaluation, information-sharing, uses, or protection mechanisms for such aquifers. In such spheres, subsoil water management by the American countries remains in the area of national or state jurisdiction. Hence, the coordination of the management activities performed in each country would benefit from the establishment of mechanisms that perform such function. This requires binational or regional understandings where the unitary nature of transboundary aquifers be considered. Coordination, in turn, could be framed into a simple facilitating and supporting institutional scheme. This is a possible and feasible scenario for the efforts to overcome the abundant current differences.

## 6. COORDINATORS, COLLABORATORS AND PARTICIPATING INSTITUTIONS

### ARGENTINA

**Ofelia Tujchneider**
Investigador CONICET
Profesor Titular Gestión de los Recursos Hídricos Subterráneos
Directora, Grupo de Investigaciones Geohidrológicas
Universidad Nacional del Litoral
Facultad de Ingeniería y Ciencias Hídricas
Ciudad Universitaria - C.C. 217 - Ruta Nacional Nº 168 – Km. 472,4
(3000) Santa Fe - Argentina
Tel: (54-342) 457-5233/45/46 Int 150 Tel/Fax: (54-342) 459-2287
e-mail: pichy@fich.unl.edu.ar; ofeliatujchneider@yahoo.com.ar

**Collaborators**

**Viviana Rodríguez**
Facultad de Ingeniería y Ciencias Hídricas
Ciudad Universitaria - C.C. 217 - Ruta Nacional Nº 168 – Km. 472,4
Universidad Nacional del Litoral
(3000) Santa Fe - Argentina
Tel: (54-342) 452-5233/45/46 Int. 109
e-mail: vrodri@fich1.unl.edu.ar

**Verónica Musacchio.**
Becaria Programa ISARM Américas
Facultad de Ingeniería y Ciencias Hídricas
Ciudad Universitaria - C.C. 217 - Ruta Nacional Nº 168 – Km. 472,4
Universidad Nacional del Litoral
(3000) Santa Fe - Argentina
Tel: (54-342) 457-5233/45/46 Int 150
e-mail: musavero@yahoo.com.ar

### BELIZE

**Ramón Frutos**
Belize National Meteorological Service
Philip Goldson International Airport
PO Box 717 Belize City, Belize
Tel (501) 225 – 2011 Fax (501) 225 – 2101
e-mail: climat@hydromet.gov.bz

### BOLIVIA

**Zoilo Moncada Cortés**
Director General Ejecutivo
Servicio Nacional de Geología y Técnico de Minas SERGEOTECMIN
Federico Zuazo 1673, Esquina Reyes Ortiz
La Paz, Bolivia
Tel: (591-2)233-1236 Fax (591-2)239-1725
email: zmoncada@sergeomin.gov.bo

**BRAZIL**

**Julio Thadeu Silva Kettelhut**
Secretaría de Recursos Hídricos y Ambiente Urbano
Ministerio do Meio Ambiente – SRHU/MMA
SEPN Quadra 505, Lote 02, Ed. Marre Prendi Cruz
70730-540 Asa Norte, Brasilia DF, Brazil
Tel: (55-61) 9696-9790
e-mail: julio.kettelhut@mma.gov.br

**Collaborators:**

**Adriana Niemeyer Pires Ferreira**
Técnica Especializada – SRHU/MMA
SEPN Quadra 505, Lote 02, Ed. Marre Prendi Cruz
70730-540 Asa Norte, Brasilia DF, Brazil
e-mail: adriana.ferreira@mma.gov.br

**Claudia Ferreira Lima**
Técnica Especializada – SRHU/MMA
SEPN Quadra 505, Lote 02, Ed. Marre Prendi Cruz
70730-540 Asa Norte, Brasilia DF, Brazil
e-mail: claudia.lima@mma.gov.br

**Fabricio Bueno da Fonseca Cardoso**
Técnico Especializado – SRHU/MMA
SEPN Quadra 505, Lote 02, Ed. Marre Prendi Cruz
70730-540 Asa Norte, Brasilia DF, Brazil
e-mail: fabrício.cardoso@mma.gov.br

**CANADA**

**Alfonso Rivera**
Chief Hydrogeologist and Program Manager/
Chef Hydrogéologue et Gestiónnaire de Programme
Geological Survey of Canada / Commission Géologique du Canada
Natural Resources Canada / Ressources Naturelles Canada
490, rue de la Couronne
Quebec (Quebec) G1K 9A9, Canada
Tel: (1 418) 654-2688 Fax: (1 418) 654-2615
e-mail: arivera@nrcan.gc.ca

**Colaborator:**

**Dean Sherratt**
Senior Legal Officer
Department of Foreign Affaires and International Trade (DFAIT)
125 Sussex Drive
Ottawa, ON, Canada
K1A 0G2
e-mail: dean.sherratt@inyernational.gc.ca

**CHILE**

**Rodrigo Weisner Lazo**
Director, Dirección General de Aguas – DGA
Ministry of Obras Publicas MOP
Morandé 59 Of. 725 7º piso Santiago, Chile
Tel: (56-2) 449-3776 Fax: (56-2) 449-3818
e-mail: rodrigo.weisner@mop.gov.cl

**Collaborators:**

**José Francisco Muñoz P.**
Profesor Titular del Departamento de Ingeniería Hidráulica y Ambiental,
Escuela de Ingeniería Universidad Católica de Chile,
Profesor Titular, Especialidad: Hidrogeología Ingeniería Hidráulica
Contaminación del Agua Subterránea
e-mail: jose.munoz@uc.cl

**James Mc Phee Torres**
Profesor Asistente, División de Recursos Hídricos y Medio Ambiente,
Departamento de Ingeniería Civil, Escuela de Engeniería y Ciencias,
Facultad de Ciencias Físicas y Matemáticas
Tel: (562) 978-4397
e-mail: jmcphee@uchile.cl

**COLOMBIA**

**Hebert Gonzalo Rivera**
Sub-Director Hidrología – IDEAM
Instituto de Hidrología, Meteorología y Estudios Ambientales
Tel: (57-1)352-7119
e-mail: agua@ideam.gov.co; hebert@ideam.gov.co

**Collaborator:**

**Eduardo Zamudio Huertas**
Subdirección de Hidrología IDEAM
Instituto de Hidrología, Meteorología y Estudios Ambientales
Tel: (57-1) 635-6003 Fax: (57-1) 352-7160 ext.1628
e-mail: ezamudio@ideam.gov.co

**COSTA RICA**

**Rodrigo A Calvo Porras**
Área de Auscultación de Obras
Instituto Costarricense de Electricidad – ICE
PO. Box 801-2150 San José, Costa Rica
Tel.: (506) 220-7594 Fax: (506) 220-7667
e-mail: rcalvop@ice.go.cr

**Collaborator:**

**José Miguel Zeledon Calderon**
Director, Departamento de Aguas
Ministrerio de Ambiente y Energía
San José, Costa Rica
e-mail: mzeledon@imn.ac.cr

**ECUADOR**

**Napoleón Burbano Ortiz**
Jefe del Departamento de Aguas Subterráneas – INAMHI
Iñaquito N36-14 y Corea o (Iñaquito700 y Corea)
Quito – Ecuador
Tel: (593 2) 224-8268 Tele/fax: (593 2) 243-3934
e-mail: napoleon@inamhi.gov.ec

**EL SALVADOR**

**Ana Deisy López**
Directora, Servicio Hidrológico Nacional SHN
Servicio Nacional de Estudios Territoriales – SNET
Ministerio de Medio Ambiente y Recursos Naturales MARN
Km 5½ Carretera a Nueva San Salvador
Av. Y Col. Las Mercedes, Edificio ISTA
Apartado Postal 27 - Centro de Gobierno
San Salvador, El Salvador
Tel: (503) 2283-2263 Fax: (503) 2283-2269
e-mail: adlopez@snet.gob.sv

**Collaborators:**

**José Mario Guevara Retana**
Investigador en Hidrogeología
Servicio Hidrológico Nacional, SHN
Servicio Nacional de Estudios Territoriales – SNET
Ministerio de Medio Ambiente y Recursos Naturales MARN
Km 5½ Carretera a Nueva San Salvador
Av. Y Col. Las Mercedes, Edificio ISTA
Apartado Postal 27 – Centro de Gobierno
San Salvador, El Salvador
Tel: (503) 2283-2261 Fax: (503) 2283-2269
e-mail: mguevara@snet.gob.sv

**Celina Mena**
Coordinadora Área de Información y Estudios Especiales
Servicio Hidrológico Nacional, SHN
Servicio Nacional de Estudios Territoriales – SNET
Ministerio de Medio Ambiente y Recursos Naturales MARN
Km 5½ Carretera a Nueva San Salvador
Av. Y Col. Las Mercedes, Edificio ISTA
Apartado Postal 27 – Centro de Gobierno
San Salvador, El Salvador
Tel: (503) 2283-2264n / Fax: (503) 2283-2269 / e-mail: cmena@snet.gob.sv

**GUATEMALA**

**Fulgencio Garavito**
Jefe de Unidad de Servicios Hídricos
Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología (INSIVUMEH).
7 Av. 14-57 Zona 13 Guatemala, Guatemala
Tel:(502) 23314967 (502) 23314986 Fax (502) 23315005
e-mail: fgaravito@insivumeh.gob.gt; fulga20002003@yahoo.com

**Collaborator:**

**Pedro Tax**
Coordinador Departamento de Investigación y Servicios Hídricos
Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología (INSIVUMEH).
7 Av. 14-57 Zona 13 Guatemala, Guatemala
Tel: (502) 23314967 (502) 23314986 Fax (502) 23315005
e-mail: pedrotax@insivumeh.gob.gt

**GUYANA**

**Dilip Jaigopaul**
Chief Hydrometereological Officer
Ministry of Agriculture
Hydrometeorological Service, Guyana
Tel: (592-2) 254-247
e-mail: dkjhym@guyana.net.gy

**HAITI**

**Michel Junior Plancher**
Quality Water and Environment Laboratory
Université de Quisqueya
Port au Prince, HAÏTI
Tel: 509-423-4269 Fax : 509-221-4211
e-mail: timichelp@yahoo.fr

**Collaborators:**

**Astrel Joseph,**
Maestría en Ecotoxicología, Ambiente y Manejo de Aguas,
Coordinador de las Direcciónes Departamentales
Ministerio de Medio Ambiente
Puerto Principe, HAITI
Tel: (509) 4551626 / (509) 6817050

**Urbain Fifi**
Doctorant
Ecole Nationale des Travaux Publics de l'Etat
Rue Maurice Audin 69518 Vaulx-en-Velin cedex
France
Tel: 0 (33)4 37 48 1843 (casa)
Tel: 0 (33)4 72 04 7081 (oficina)

**Evens Emmanuel**
Doyen de la Faculté des Sciences, de Génie et d'Architecture
Directeur du Laboratoire de Qualité de l'Eau et de l'Environnement
Université Quisqueya
BP 796, Port-au-Prince, HAÏTI
Cel: (509) 423 4269
e-mail: evemm1@yahoo.fr

**HONDURAS**

**Kennet Rivera Ayestas**
Punto Focal RIRH
Director General de Recursos Hídricos
Dirección General de Recursos Hídricos – DGRH
Secretaría de Recursos Naturales y Ambiente SERNA
Avenida La Fao contiguo a Hondutel Miraflores
Edificio Deformin Boulevard Centroamérica
Apdo. Postal 309 Tegucigalpa , Honduras CA
Tel: (504) 235-4529/30
Fax: (504) 235-8638
e-mail: kriay@yahoo.com

**Collaborator:**

**Sergio Galel Sánchez Arita**
Asistente del Director
Dirección de Recursos Hídricos de la SERNA
Tel: (504) 235-45-29 y 235-45-30
Fax.(504) 235-86-38
Dirección: Edificio de DEFOMIN, Ave. La FAO, Boulevard Centroamérica,
Tegucigalpa, Honduras, C.A.
e-mail: galelhn@yahoo.es

**MEXICO**

**Rubén Chávez Guillén**
Gerente de Aguas Subterráneas
Comisión Nacional del Agua – CONAGUA
Secretaría de Medio Ambiente y Recursos Naturales SEMARNAT
Av. Insurgentes Sur No. 2416. Piso 9 Ala sur. Colonia Copilco El Bajo
México, D.F. 04340.
Tel: (52 55) 5174-4422 y 23
e-mail: ruben.chavez@cna.gob.mx

**Collaborators:**

**Víctor Manuel Castañón Arcos**
Jefe de Proyecto de Evaluación y Modelación.- CONAGUA
Av. Insurgentes Sur No. 2416. Piso 9 Ala sur. Colonia Copilco El Bajo
México, D.F. 04340.
Tel: (52 55) 5174-4000 extensión 1655
e-mail: victor.castanon@cna.gob.mx

**Roberto A. Sención Aceves**
Subgerente de Evaluación y Ordenamiento de Acuíferos.- CONAGUA
Av. Insurgentes Sur No. 2416. Piso 9 Ala sur. Colonia Copilco El Bajo
México, D.F. 04340.
Tel: (52 55) 5174-4425 y 26
e-mail: roberto.sencion@cna.gob.mx

**Angélica Molina Maldonado**
Especialista en Hidráulica.- CONAGUA
Av. Insurgentes Sur No. 2416. Piso 8 Ala Oriente. Colonia Copilco El Bajo
México, D.F. 04340.
Tel: (52 55) 5174-4000 extensión 1526
e-mail: angelica.molina@cna.gob.mx

**María Mireya Figueroa de Jesús**
Especialista en Hidráulica. CONAGUA
Av. Insurgentes Sur No. 2416. Piso 8 Ala Oriente. Colonia Copilco El Bajo
México, D.F. 04340.
Tel: (52 55) 5174-4000 extensión 1526
e-mail: maria.figueroa@cna.gob.mx

**NICARAGUA**

**Silvia Martínez España**
Directora de Recursos Hídricos y Cuencas
Dirección General de Recursos Naturales – DRGN
Ministerio del Ambiente y Recursos Naturales
Aptdo Postal 5123, Km. 12 ½, Carretera Norte - Managua. Nicaragua
Tel/Fax: (505) 263-1994/233-1173
e-mail: smartinez@marena.gob.ni; rps@ideay.net.ni; simaresp1@yahoo.com

**Collaborator:**

**Enoc Castillo**
Responsable Departamento de aguas Subterráneas
Dirección de Recursos Hídricos
Intituto Nicaraguense de Estudios Territoriales – INETER
Apartado Postal 2110, Frente a Policlinica Oriental
Managua, Nicaragua
Tel: (505) 249-2746
e-mail: enoc.castillo@rh.ineter.gob.ni

**PANAMA**

**Hilda Candanedo**
Directora Nacional de Gestión Integrada de Cuencas
Hidrográficas de la Autoridad Nacional del Ambiente de PANAMA – ANAM
Albroke, Edif. 804, 3$^{o}$ piso
Ciudad de PANAMA, República de PANAMA
Apartado Postal ANAM C-Zona 0843-00793,
PANAMA - PANAMA
Tel: (507) 500-0866 Fax: (507) 500-0773
e-mail: h.candanedo@anam.gob.pa

**Collaborator:**

**Eric Tejeira Bryan**
Autoridad Nacional del Ambiente – ANAM
Dirección de Gestión Integrada de Cuencas Hidrográficas
Ciudad de PANAMA, República de PANAMA
Apartado Postal ANAM C-Zona 0843-00793,
PANAMA - PANAMA
e-mail: erictejeira@anam.gob.pa; geoltejeira@yahoo.com

**PARAGUAY**

**Ana María Castillo Clerici**
Jefa Departamento de Recursos Hídricos
Vice-Ministerio de Minas y Energía –
Ministerio de Obras Públicas y Comunicaciones
Los Rosales y Nangapiry
San Lorenzo, Paraguay
Tel: (595-21) 672-531
e-mail: acler_54@yahoo.com; ana.clerici@gmail.com

**Collaborators:**

**Elena Benítez**
Dirección General de Protección y
Conservación de los Recursos Hídricos – SEAM
Asunción, Paraguay
Tel: (595 -21) 615 811 - cel: 0981 158 969
e-mail: ejefe@hotmail.com

**Santiago Jara Gamarra**
Dirección General de Protección y
Conservación de los Recursos Hídricos – SEAM
Asunción, Paraguay
Tel: (595 -21) 615 811 cel: 0981 158 969
Tel/Fax: (595-21) 582-507
e-mail: sjara@telesurf.com.py

**Celso Velazquez**
Madame Lynch 3000
Asunción, Paraguay
Cel: (595) 971-224833
Fax:(595) 414-5004
e-mail: vcelso@telesurf.com.py

**Félix Carvallo**
Dirección General de Protección y
Conservación de los Recursos Hídricos – SEAM
Asunción, Paraguay
Tel: (595 -21) 615 811 –
e-mail: lfacarvallo@gmail.com

**PERU**

**Edwin Zenteno Tupiño**
Especialista en Hidrogeología, Jefe del Área de Aguas Subterráneas
Instituto Nacional de Recursos Naturales – INRENA
Intendencia de Recursos Hídricos
Calle Diecisiete 355
Urb. El Palomar – San Isidro
Lima 27, Peru
Tel: (51-1) 225-9725 Fax:
e-mail: Zentenoedwin@hotmail.com; ezenteno@inrena.gob.pe

**REPÚBLICA DOMINICANA**

**Hector Rodríguez Pimentel**
Director, Instituto Nacional de Recursos Hidráulicos - INDRHI
Av. Jimenez Moya esq. República de Líbano Centro de los Héroes
Apartado Postal 1407
Santo Domingo, República Dominicana
Tel: (809) 533-0455 508-2741 Fax: (809) 508-2741
e-mail: dirección@indrhi.gov.do

**Collaborators:**

**Jose Raúl Pérez Duran**
Gerente de Planificación, Director, Instituto Nacional de Recursos Hidráulicos - INDRHI
Av. Jimenez Moya esq. República de Líbano Centro de los Héroes
Apartado Postal 1407, Santo Domingo, República Dominicana
Tel: (809) 532-3271-3201 Fax: (809) 508-2741
e-mail: jraulperezd@yahoo.com

**Hector Rodriguez M.**
Encargado del departamento de Hidrología, Instituto Nacional de Recursos Hidráulicos - INDRHI
Av. Jimenez Moya esq. República de Líbano Centro de los Héroes
Apartado Postal 1407, Santo Domingo, República Dominicana.
Tel: (809) 532-32271 -3479 Fax: (809) 508-7215
e-mail: hector6403@hotmail.com

**SURINAME**

**Moekiran Armand Amatali**
Ministry of Public Works
Director, Hydraulic Research Division
Comm. Weythinghweg 130, Paramaribo, Suriname
Tel: (597) 490-963 (oficina)
Tel: (597) 490-288 (casa)
Cel: (597) 854-3422
Fax: (597) 46-4901
e-mail: armand_amat@yahoo.com;

**UNITED STATES OF AMERICA**

**Jim Stefanov**
Deputy Director, Investigations and Research
USGS Texas Water Science Center
8027 Exchange Drive
Austin, TX 78754-4733, USA
Tel: 512-927-3543 (oficina)
Cel: 512-350-7301
Fax: 512-927-3590
e-mail: jestefan@usgs.gov

**Collaborator:**

**Norman Grannemann**
USGS Great Lakes Program Coordinator
6520 Mercantile Way, Suite 5
Lansing, MI 48911 USA
Tel: (517) 887 8936
e-mail: nggranne@usgs.gov

**URUGUAY**

**Edi Juri**
Presidente del Comité Nacional del PHI - Punto Focal RIRH
Director Nacional de Hidrografía
Ministerio de Transporte y Obras Públicas
Rincón 575, Piso 2, Montevideo, C.P.11100, Uruguay
Tel: (598-2) 916-8839 ó 916-4783
Fax: (598-2) 916-4667
e-mail: ejuri@dnh.gub.uy ; dirección@dnh.gub.uy

**Collaborators:**

**Ana Vidal**
Departamento Jurídico Notarial
Dirección Nacional de Hidrografía
Rincón 575, Piso 2, Montevideo, C.P.11100, Uruguay
Tel: (598-2) 9158333 int.20227
e-mail: avidal@dnh.gub.uy

**Juan Ledesma**
Unidad Técnica de Aguas Subterráneas
División Recursos Hídricos
Dirección Nacional de Hidrografía
Rincón 575, Piso 2, Montevideo, C.P.11100, Uruguay
Tel: (598-2) 9158333 int. 20212
e-mail: jledesma@dnh.gub.uy

**Lourdes Batista**
Departamento de Administración de Aguas
División Recursos Hídricos
Dirección Nacional de Hidrografía
Rincón 575, Piso 2, Montevideo, C.P.11100, Uruguay
Tel: (598-2) 9158333 int. 20213
e-mail: lbatista@dnh.gub.uy

**Lourdes Rocha**
Departamento de Administración de Aguas
División Recursos Hídricos
Dirección Nacional de Hidrografía
Rincón 575, Piso 2, Montevideo, C.P.11100, Uruguay
Tel: (598-2) 1916-4666 int. 337 Fax: (598-2) 1916-4667

**Malena Pessi**
Departamento Aguas Subterráneas/OSE
Jefe de Sección Estudios Hidrogeológicos
Carlos Roxlo 1275 p.4
Montevideo, Uruguay
Tel: (598-2) 1952-2525; Fax: (598-2) 1952-2546

**VENEZUELA**

**Fernando Decarli**
Hidrogeólogo - Coordinador del Grupo de Aguas Subterráneas
Ministerio del Ambiente MINAMB
Dirección General Cuencas Hidrográficas
Dirección de Hidrología, Meteorología y Oceanología
Torre Sur, piso 5 DHMO, C.S.B. El Silencio
Caracas, Venezuela.
Tel: (58-212) 408-4743 Fax: (58-212) 408-4734 Cel: (58-416) 620-8331
e-mail: fdecarli@cantv.net; fdecarli@minamb.gob.ve; fdecarli@gmail.com

**INTERNATIONAL ORGANIZATIONS**

**UNESCO**

**Alice Aureli**
Hydrogeologist, Water Sciences División
1, Rue Miollis,
75732 Paris Cedex 15, France
Tel: (33 1) 4568-3938
Fax: (33 1) 4568-5811
e-mail: a.aureli@unesco.org; e.felici@unesco.org

**María Concepción Donoso**
Regional Hydrologist for Latin America and the Caribbean
Programme Specialist in Environmental Sciences and Water Resources UNESCO
Edificio MERCOSUR
Dr. Luis Piera 1992, 2º piso
11200 Montevideo, Uruguay
Tel: (598-2) 413-2075 Fax: (598-2) 413-2094
e-mail: phi@unesco.org.uy; mcdonoso@unesco.org.uy

**Raya Marina Stephan**
Water Law Specialist
UNESCO IHP
1 rue Miollis
75732 Paris cedex 15
Tel: 33 1 45684115
e-mail: r.stephan@unesco.org

**Shammy Puri**
Consultant to UNESCO-IHP
1 Rue Miollis - 75015 Paris
Francia
Tel: + 33 1 456 83946
e-mail: ShammyPuri@aol.com

**OAS/OEA**

**Scott Vaughan**
Director, Department of Sustainable Development – DSD
Organization of American States - OAS
1889 F Street
NW 20006 Washington D C -USA
Tel: (1-202) 458-6248 Fax: (1-202) 458-3560
e-mail: svaughan@oas.org

**Jorge Rucks**
Chief, División II DSD/OAS
Projects Technical Unit, OAS/Argentina
Department of Sustainable Development – DSD,
Organization of American States –OAS
Junín 1940 - 1113 Buenos Aires, Argentina
Tel: (54-11) 4803-7606 Fax: (54-11) 4801-6092
e-mail: oea@oea.com.ar; jrucks@oas.org

**Nelson da Franca Ribeiro dos Anjos**
General Coordinator, UNESCO/OAS ISARM Americas Programme,
Office in Brasilia, DSD/OAS
SPS Area 5 Quadra 3 Bloco B, Edificio ANA sala 205
70610-200 Brasilia, DF, Brasil
Tel/Fax (55-61) 3445-2846
e-mail: nelsonf@oeabrasil.com.br

**Michela Miletto**
Groundwater Specialist,
Liaison Officer, OAS-UNESCO
Operations Coordinator, UNESCO-OAS ISARM Americas Programme, Department of Sustainable Development, DSD,
Organization of American States –OAS
1889 F Street
NW Washington D.C. 20006, USA
Tel: (1-202) 458-3862 fax: (1-202) 458-3560/3168
e-mail: mmiletto@oas.org

**Lydia María Ugas**
Project Technical Assistant,
Department of Sustainable Development, DSD,
Organization of American States –OAS
1889 F Street NW Washington D.C. 20006, USA
Tel: (1-202) 458-3556 Fax: (1-202) 458-3862/3168
e-mail: lugas@oas.org

**Special guests to the V Coordination Meeting (Montreal, Canada, 2007)**

**Ambassador Chusei Yamada**
UN International Law Commission
3-16-1 Ebisu, Shibuya-ku
Tokyo 150-0013 Japón
Tel/Fax: 81-3-3443-7851
e-mail: chuyama@mtd.biglobe.ne.jp

**Ariel W. González**
Consejero
Cancillería de la República Argentina - Ministerio de Relaciones Exteriores, Comercio Internacional y Culto/Legal Advisor Office
Esmeralda 1212 (C1007ABR) Buenos Aires - Argentina
Tel: 54 (11) 4819-7000
e-mail: awg@mrecic.gov.ar

**Lilian del Castillo-Laborde**
International Public Law Professor
Facultad de Derecho - Universidad de Buenos Aires
Coordinadora de Cuenca del Plata - Ministerio
de Relaciones Exteriores, Comercio Internacional y Culto
Buenos Aires, Argentina
Tel/Fax: (54-11) 4812-6897
e-mail: lclab@fibertel.com.ar ; lcl@mrecic.gov.ar

**Gabriel Eckstein**
George W. McCleskey Profesor of Water Law
Director, Center for Water Law & Policy
Texas Tech University School of Law
Texas, USA
Tel: (806) 742-3990
e-mail: gabriel.eckstein@ttu.edu

**Mantha Mehallis**
Director and Professor Environmental MBA Program Crisis
& Emergency Management MBA Program, College of Business,
Florida Atlantic University
P O Box 3091 Boca Raton, Florida 33431-0991, USA
Tel: (561) 297-0052 Fax: (561) 297-2675
e-mail: mehallis@fau.edu

**Jac Van der Gun**
International Groundwater Resources Assessment Centre (IGRAC)
Princetonlaan 6 - P.O. Box 80015
3508 TA Utretch - Netherlands
Tel: + 31 30 256 4762  Fax : + 31 30 256 47 55
e-mail: jac.vandergun@tno.nl
Website: www.igrac.nl

## ACRONYMS AND WEB SITES

- **International**

| | |
|---|---|
| **ALHSUD** | Asociación Latinoamericana de Hidrología Subterránea para el Desarrollo – http://www.alhsud.com |
| **DSD/DDS** | Department of Sustainable Development /Departamento de Desarrollo Sostenible – http://www.oas.org/usde |
| **FAO** | Food and Agriculture Organization/Organización de las Naciones Unidas para la Agricultura y la Alimentación (United Nations/Naciones Unidas) – http://www.fao.org |
| **GEF/ FMAM** | Global Environment Facility/Fondo para el Medio Ambiente Mundial – http://www.gefweb.org |
| **IAEA /OIEA** | International Atomic Energy Institution/Organismo Internacional de Energía Atómica - http://www.cinu.org.mx/onu/estructura/organismos/oiea.htm |
| **IAH/AIH** | International Association of Hydrogeologists/Asociación Internacional de Hidrogeólogos - http://www.iah.org/isarm |
| **IGRAC** | International Groundwater Resources Assessment Centre/Centro Internacional de Evaluación de Aguas Subterráneas - http://www.igrac.nl |
| **IHP/PHI** | International Hydrological Programme/Programa Hidrológico Internacional – http://www.unesco.org/water/ihp/ - http://www.unesco.org.uy/phi/ |
| **ISARM** | Internationally Shared Aquifer Resources Management/Gestión de los Recursos Acuíferos Transfronterizos – http://isarm.nitg.tno.nl/ |
| **IWRN/RIRH/** | Interamerican Water Resources Network/Red Interamericana de Recursos Hídricos – http://www.iwrn.net/ |
| **OAS/OEA** | Organization of American States /Organización de Estados Americanos - http://www.oas.org |
| **UN/ONU** | United Nations Organization/Organización de las Naciones Unidas - http://www.un.org/spanish/ |
| **UNECE** | United Nations Economic Commission for Europe / Commission Económica de Naciones Unidas para Europa – http://www.unece.org/ |
| **UNEP /PNUMA** | United Nations Environmental Program / Programa de las Naciones Unidas para el Medio Ambiente – http://www.unep.org/ |
| **UNESCO** | United Nations Educational, Scientific, and Cultural Organization/Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura – http://portal.unesco.org/ - http://www.unesco.org.uy |
| **UNESCWA** | United Nations Economic and Social Commission for Western Asia Comisión Económica y Social de las Naciones Unidas para Asia Occidental - **:** http://www.escwa.un.org |
| **UN ILC** | United Nations International Law Commission / Comision de Derecho Internacional de Naciones Unidas – http://www.un.org/law/ilc/ |
| **UNDP/PNUD** | United Nations Development Programme/Programa de las Naciones Unidas para el Desarrollo – http://www.undp.org/ |
| **WB/BM** | World Bank/Banco Mundial – http://www.worldbank.org/ |

## North America

| | |
|---|---|
| **CONAGUA** | Comisión National del Agua – Mexico - http://www.cna.gob.mx |
| **DFAIT** | Department of Foreign Affairs and International Trade – Canada - http://www.dfait-maeci.gc.ca/index.aspx |
| **FAU** | Florida Atlantic University – USA - http://www.fau.edu/ |
| **GSC/NRCan** | Geological Survey of Canada/Natural Resources Canada - http://ess.nrcan.gc.ca/ http://ess.nrcan.gc.ca/gm/ |
| **IBWC / CILA** | International Borders and Waters Commission / Comisión Internacional sobre Límites y Aguas - USA and Mexico - http://www.ibwc.state.gov/ |
| **IJC** | International Joint Comisión – USA and Canada http://www.ijc.org/en/home/main_accueil.htm |
| **SEMARNAT** | Secretaría de Medio Ambiente y Recursos Naturales - Mexico - http://www.semarnat.gob.mx/Pages/inicio.aspx |
| **TTU** | Texas Tech University School of Law – USA - http://www.law.ttu.edu |
| **USGS** | US Geological Survey – USA - http://water.usgs.gov/ogw/gwrp/ |

## • The Caribbean

| | |
|---|---|
| **INDRHI** | Instituto Nacional de Recursos Hidráulicos – Rep. Dominicana – http://www.indrhi.gov.do/ |
| **SNRE** | Service National des Resources et Eaux – Haiti– http://www.haiti.gov |

## • Central America

| | |
|---|---|
| **A y A** | Instituto Costarricense de Acueductos y Alcantarillados – Costa Rica- http://www.aya.go.cr/informacion/Urbanismo/tom/2.html |
| **ANAM** | Autoridad Nacional del Ambiente – Panama – http://www.anam.gob.pa |
| **BNMS** | Belize National Meteorological Service – http://www.hydromet.gov.bz. |
| **DGRH/SERNA** | Dirección General de Recursos Hídricos / Secretaría de Recursos Naturales y Ambiente – Honduras– http://www.serna.gob.hn |
| **DRHC/MARENA** | Dirección de Recursos Hídricos y Cuenca/Ministerio de Ambiente y Recursos Naturales – Nicaragua -http://www.marena.gob.ni |
| **ETESA** | Empresa de Transmisión Eléctrica SA – Panama- http://www.etesa.com.pa/ |
| **ICE** | Instituto Costarricense de Electricidad – Costa Rica- http://www.ice.gov.cr |
| **INETER** | Instituto Nicaragüense de Estudios Territoriales – Nicaragua - http://www.ineter.gob.ni/ |
| **INSIVUMEH** | Instituto Nacional de Sismología, Vulcanología y Meteorología – Guatemala – http://www.insivumeh.gob.gt. |
| **MARENA** | Ministerio de Ambiente y Recursos Naturales de Nicargua - Nicaragua - http://www.marena.gob.ni/ |
| **MARN** | Ministerio de Medio Ambiente y Recursos Naturales – El Salvador- http://www.marn.gob.sv |
| **MINAE** | Ministerio de Ambiente y Energía – Costa Rica - http://www.minae.go.cr |
| **SENARA** | Servicio Nacional de Aguas Subterráneas, Riego y Avenamiento – Costa Rica - http://www.infoagro.go.cr/senara/historia/cronologia.html |

| | |
|---|---|
| **SHN** | Servicio Hidrológico Nacional del SNET/MARN – El Salvador- http://www.snet.gob.sv/Hidrologia/shn.php?file=shn |
| **SNET** | Servicio Nacional de Estudios Territoriales del MARN - El Salvador- http://www.snet.gob.sv |

- **South America**

| | |
|---|---|
| **ABAS** | Associação Brazileira de Águas Subterâneas – Brazil - http://www.abas.org.br |
| **ANA** | Agencia Nacional de Águas – Brazil - http://www.ana.gov.br |
| **CIC** | Comité Intergubernamental Coordinador de la Cuenca del Plata – http://www.cicplata.org |
| **CNRH** | Consejo Nacional de Recursos Hídricos – Ecuador - http://www.cnrh.gov.ec |
| **CONICET** | Consejo Nacional de Investigaciones Científicas y Técnicas – Argentina http://www.conicet.gov.ar |
| **CPRM** | Serviço Geológico do Brasil – Brazil - http://www.cprm.gov.br |
| **CRAS** | Centro Regional de Aguas Subterráneas – Argentina - http://www.ina.gov.ar/internas/inter1e10.htm |
| **DAEE/SP** | Departamento de Águas e Energia Elétrica de São Paulo – Brazil - http://www.daee.sp.gov.br |
| **DGA** | Dirección General de Aguas – Chile -- http://www.dga.cl |
| **DARH** | Departamento de Administración de Recursos Hídricos – Chile- www.tramitefacil.gob.cl/1481/article-96059.html |
| **DGPCRH/SEAM** | Dirección General de Protección y Conservación de los Recursos Hídricos/Secretaría del Ambiente – Paraguay - http://www.seam.gov.py / |
| **DINAMIGE** | Dirección Nacional de Minería y Geología – Uruguay – http://www.dinamige.com.uy |
| **DNH/MTOP** | Dirección Nacional de Hidrografía/Ministerio de Transporte y Obras Públicas – Uruguay – http://www.dnh.com.uy. |
| **DHMO/DGCH/ MINAMB** | Dirección de Hidrología, Meteorología y Oceanología/Dirección General de Cuencas Hidrográficas/ Ministerio de Ambiente – Venezuela- http://www.minamb.gob.ve |
| **DNPM** | Departamento Nacional de Produção Mineral – Brazil - http://www.dnpm.gov.br |
| **DRH/VMME/MOPC** | Departamento de Recursos Hídricos/Vice Ministerio de Minas y Energía/ Ministry of Obras Públicas y Comunicaciones - Paraguay – http://www.mopc.gov.py |
| **HRD** | Hydraulic Research Division – Suriname – http://www.angelfire.com/stars3/amatali/ |
| **HS** | Hydrometeorological Service – Guyana – http://www.hydromet.gov.gy/ |
| **IDEA** | Instituto de Derecho y Economía Ambiental – Paraguay - http://www.idea.org.py/beta/ |
| **IDEAM** | Instituto de Hidrología, Meteorología y Estudios Ambientales –Colombia – http://www.ideam.gov.co |
| **IG/SP** | Instituto Geológico de São Paulo – Brazil - http://www.igeologico.sp.gov.br/ |
| **INA** | Instituto Nacional del Agua – Argentina - http://www.ina.gov.ar/ |

| | |
|---|---|
| **INAMHI** | Instituto Nacional de Meteorología e Hidrología – Ecuador - http://www.inamhi.gov.ec |
| **INRENA** | Instituto Nacional de Recursos Naturales – Peru - http://www.inrena.gob.pe |
| **OSE** | Obras Sanitarias del Estado – Uruguay – http://www.ose.com.uy |
| **SENARI** | Servicio Nacional de Riego – Bolivia - http://www.riegobolivia.org/ |
| **SERGEOTECMIN** | Servicio Nacional de Geología y Técnico de Minas – Bolivia – http://www.sergeomin.gov.bo |
| **SRHU/MMA** | Secretaria de Recursos Hídricos e Ambiente Urbano do Ministério do Meio Ambiente. – Brazil - http://www.mma.gov.br/ |
| **UBA** | Universidad de Buenos Aires – Argentina - http://www.uba.ar/homepage.php |
| **UC** | Universidad de Chile - http://www.uchile.cl/ |
| **UCC** | Universidad Católica de Chile - http://www.puc.cl/ |
| **UNL** | Universidad Nacional del Litoral – Argentina - http://www.unl.edu.ar |
| **USP** | Universidade de São Paulo – Brazil - http://www.usp.br |