

**Reports by UNESCO's Water-related Centres (category 1 and 2) on activities related to the IHP in the period July 2006 – May 2008**

**1. Basic information on the centre**

Name of the Centre		Water Center for Arid and Semi-Arid Zones of Latin America and the Caribbean (Cazalac)
Name of Director		Guido Soto
Name and title of contact person (for cooperation)		Guido Soto, Executive Director
E-mail		<a href="mailto:gsoto@cazalac.org">gsoto@cazalac.org</a>
Address		Benavente 980
Website		<a href="http://www.cazalac.org">www.cazalac.org</a>
Location of centre		city/town: <u>La Serena</u> country: <u>Chile</u>
Geographic orientation *		<input type="checkbox"/> global <input checked="" type="checkbox"/> regional
Year of establishment		2003
Themes	Focal Areas *	<input checked="" type="checkbox"/> groundwater <input type="checkbox"/> urban water <input checked="" type="checkbox"/> arid / semi-arid zones <input type="checkbox"/> humid tropics <input checked="" type="checkbox"/> droughts and floods <input type="checkbox"/> sediment transport and management <input checked="" type="checkbox"/> water and environment <input type="checkbox"/> ecohydrology <input checked="" type="checkbox"/> water law and policy <input type="checkbox"/> transboundary river basins/ aquifers <input checked="" type="checkbox"/> IWRM <input checked="" type="checkbox"/> global and climate change <input checked="" type="checkbox"/> mathematical modelling <input checked="" type="checkbox"/> social and cultural dimensions of water <input checked="" type="checkbox"/> water education <input checked="" type="checkbox"/> other: (please specify) <u>Data bases on arid zones</u>
	Scope of Activities *	<input type="checkbox"/> vocational training <input type="checkbox"/> postgraduate education <input type="checkbox"/> continuing education <input checked="" type="checkbox"/> research <input checked="" type="checkbox"/> institutional capacity-building <input type="checkbox"/> advising/ consulting <input type="checkbox"/> software development <input type="checkbox"/> other: (please specify) _____
Support bodies <sup>1</sup>		Water Directorate (Chile) Regional Government of Coquimbo (Chile) University of La Serena (Chile)
Hosting organization <sup>2</sup>		
Sources of financial support <sup>3</sup>		Government of Flanders (UNESCO-Flanders Fust) Water Directorate (Chile) Gender Water Alliance - GWA (Netherlands) European Union (CAMINAR Project)
Existing networks and cooperation <sup>4</sup>		GWADI Network United Nations Convention to Combat Desertification - UNCCD University of Bochum (Germany)

\* check on appropriate box

♦ check all that apply

<sup>1</sup> please specify bodies that cover the operational costs of the centre, and other essential costs such as salaries and utility bills, and that provide institutional support to ensure centre's sustainability

<sup>2</sup> if different from support bodies

<sup>3</sup> please specify sources of main budgetary and extrabudgetary funds to implement projects

<sup>4</sup> please write international networks, consortiums or projects that the centre is part of, or any other close links that the centre has with international organizations or programmes, which are not already mentioned above

	<p>Ben-Gurion University and Institute for Water Sciences and Technologies (IWST), (Israel)  University of Ghent (Belgium)  Instituto Mexicano de Tecnología del Agua, IMTA (México)  Instituto Argentino de Investigaciones de las Zonas Áridas - IADIZA  Institute for Water Resources (IWR) US Army Corps of Engineers (USA).  International Research Institute for Climate and Society (IRI) - University of Columbia (USA)  Newcastle University (England)  Postgrade College (México)  Central University of Venezuela  National Experimental University "Francisco de Miranda", (Venezuela)  National University of the Central Region of the Province of Buenos Aires (Argentina)  University of Talca (Chile)  Catholic University of Valparaiso (Chile)  University of Chile (Chile)  University of Concepción (Chile)  National Copper Corporation– CODELCO (Chile)  National Forestry Corporation - CONAF (Chile)  Centro de Estudios Avanzados en Zonas Áridas, CEAZA (Chile)</p>
	<p><input checked="" type="checkbox"/> director and governing board  <input type="checkbox"/> other: (please specify) _____  Link to election of board members to the IHP IGC and hosting country IHP National Committee _____  Frequency of meetings: once every <u>6</u> months_  <input type="checkbox"/> Existence of UNESCO presence at meetings</p> <p><b>Note:</b> Every year CAZALAC has a Steering Committee Meeting with the presence of the UNESCO Regional Hydrologist</p>
Institutional affiliation of director	Employed
Number of staff and types of staff	<p>total number of staff (full-time, or equivalent) :  <u>Five</u>  number of staff who are water experts:  <u>Four</u>  number of visiting scientists and postgraduate students:  <u>Four</u></p>
Annual turnover budget in USD	360,000

## 2. Activities undertaken in the framework of IHP in the period July 2006 – May 2008

### 2.2 Research activities that directly contributed to the IHP-VI and activities by WWAP

*Please include research/applied projects outputs such as publications that directly contributed to the IHP-VI and WWAP objectives*

- Map of Arid Zones of Latin America and the Caribbean (27 countries of LAC).
- CAZALAC-IWR Drought Atlas (Pilot areas in Argentina, Peru and Chile)
- Climate variability in water resources and Droughts Forecast (CAZALAC-IRI)

- Studies on vulnerability to soil erosion in arid zones.
    - PhD thesis
    - Pre-graduation student internships – Coquimbo Region. Field experimentation development and data gathering for drafting of theses
  - Map of Climatic Aggressivity in LAC (on development)
  - CAMINAR Project – Management of Basins with Mining Activities in Arid and Semi-arid Regions of South America.
  - Project on “protection and sustainable management of the American Puna Wetlands (WETPUNA)”. (Argentina, Bolivia, Chile and Peru)
  - Oasification – Hydrologic Forestry Restoration. INFOR-U.Talca-CAZALAC
- 2.3 Training activities that directly contributed to the IHP-VI and WWAP objectives
- International Course on Applied Hydrogeology, Underground Water Management in Arid Zones (Sept. 2006).
  - Course on Water and Soil Preservation in Andean Countries – COSWAND (Nov. 2006).
  - IX Latin American Academy of Soils Physics – ELAFIS (Oct. 2007).
  - Course-Workshop on the use of bioindicators in fresh water systems for the Caribbean (March, 2007). Co-organized with HELP
  - International Meeting on Erosion and Sedimentation for Managers, Decision-makers, Technicians, and Communicators (October, 2007)
  - Course-Workshop Blue Planet . Mar del Plata, Argentina (November, 2007)

### 3 Collaboration and linkages

- 3.2 Participation in major international networks, programmes, partnerships with other UN or other International Agencies, media and professional bodies
- 3.3 Participation in meetings related to the IHP and UNESCO (e.g., the UNESCO General Conference, the UNESCO Executive Board, the IHP Intergovernmental Council and/or other meetings organized by IHP)
- Water and Culture Workshops (Paraguay, Uruguay; Oct. 2006)
  - UNESCO-WET Workshop (Aug. 2006).
  - HELP – IRI / Climatic Variability – Cuenca Workshop (Nov. 2006)
  - X Symposium of the International Hydrologic Program Chilean Committee (Oct. 2006)
  - VII Regional Meeting of CONAPHIs Guatemala City (August, 2007).
  - Sixth Inter-American Dialogue on Water Management. Guatemala City (August, 2007).
  - UNCCD COP 8 (CAZALAC-UNCCD Agreement). (Sep. 2007)
  - Workshop First Forum for Basin Management and Development in Arid and Semi-arid Zones (Córdoba, Argentina; Sep. 2007).
  - Universal Forum of the Cultures. Monterrey, Mexico (Oct. 2007)
  - GWADI Network Meeting. Santiago de Chile (Dec. 2007).
  - International seminar on techniques for water augmentation in scarcity zones. Santiago de Chile, (Dec. 2007)
  - International Conference on Fog. La Serena, Chile, (July 2007).
  - Meeting to prepare the Project on “Protection and sustainable management of the American Puna Wetlands (WETPUNA)” (Oct. 2007).
  - Snows and Glaciers in Arid Zones. Sixth Meeting of the Snows and Ices Work Group of the IHP-LAC and International Workshop on Geomatic Applied to the Study of Glaciers (Mexico City; May 2007)
  - Workshop Water and Culture - San Lorenzo, Paraguay (March 2007).
- 3.5 Relationship with the UNESCO National Commission and the IHP National Committee in the country of location
- Co-Organization of the X Symposium of the International Hydrologic Program Chilean Committee (Oct. 2006)

## 4 Communication

### 4.2 Communication and knowledge dissemination activities undertaken in the framework of IHP

- Website / Electronic Newsletters / Publications
- Relational data base on LAC specialists and institutions
- Data base system for climate information on LAC
- Online publication of the Map of Arid Zones of LAC

## 5 Update on Centre Operations

### 5.2 Membership of the Board of Governors during designated period

President of Board:

Mr. Ricardo Cifuentes L., Regional Intendant.

Vice-President:

Mr. Rodrigo Weisner L., General Water Directorate

Secretary and financy areas:

Mr. Nibaldo Avilés P., Rector University of La Serena.

Directors:

Mr. Jorge Allende Rivera, University of Chile,

Mr. Manuel Cerda G., Catholic University of Valparaiso.

Mr. Roberto Pizarro T., University of Talca.

Mr. Jose Vargas Baecheler., University of Concepcion.

## 6 Annexes

### 6.2 List of publications released by the centre (there can be overlap with those listed in 2.2 above)

- Preliminary Report Data Preparation for the regional Aridity Map; Koen Verbist, Guido Soto, Manuel Soto, Fernando Santibáñez, Donal Gabriels; (2005)
- Evaluation of the infiltration process in water Harvesting systems in drylands of Chile; Marjolein DE WEIRDT; D. Gabriels; (2005)
- Evaluation of water erosion risks in drylands of Chile; Arne BAERT; Donald Gabriels; (2005)
- Evaluación de parámetros y procesos hidrológicos en el suelo. Compendio de trabajos presentados en la VII Escuela Latinoamericana de Física de Suelos.; Gabriels, Donald; Lobo, Deyanira; Soto, Guido (Editores); Programa Hidrológico Internacional PHI UNESCO (Editor); (2005)
- Evaluation of infiltration furrows for the captation of runoff water in a semiarid region in Chile; Katrijn Alaerts; D.Gabriels; W. Cornelis; (2006)
- Estimation of sediment transport in a watershed in an arid region of north Chile; Bram Vandekerckhove; D. Gabriels; W. Cornelis; (2006)
- Estimación de Parámetros de Erosión en Zonas Áridas de la IV Región Utilizando un Simulador de Lluvia; F. Nuñez; E. González; K. Verbist; (2006)
- Assessment of climate indices in drylands of Colombia; F. Neira; D. Gabriels; W. Cornelis; (2006)
- The effect of rock fragments on hydrophysical properties of a small watershed in north Chile; J Baetens; D. Gabriels; W. Cornelis; (2006)

- Estudio Aplicacion de Metodologias para determinar la eficiencia de uso del recurso hídrico. Estudio de caso en la Region de Coquimbo. (Informe final) .CAZALAC, Direccion General de Aguas (2006)
- Caracterización del proceso precipitación-escorrentía sólida utilizando un simulador de lluvia; Lagos, E.; Pizarro, R.; (2007)
- Sacle dependent influence of rock fragment cover on soil infiltration, runoff and sediment yield in arid zones of Chile; L. Loosvelt; D. Gbariels; W. Cornelis; (2007)
- Zonación de los regímenes hídricos de América latina y el Caribe desde una perspectiva climática; Programa Hidrológico Internacional de la UNESCO para América Latina y el Caribe, PHI-LAC: (Editor); Soto, Guido: Coordinador del proyecto (autor informe); Gabriels, Donald: Contraparte científica gobierno de Flandes (autor informe); Donoso, M<sup>a</sup> Concepción: Hidróloga regional PHI- UNESCO; Santibáñez, Fernando: Responsable científico (autor informe); Verbist, Koen: Coordinador científico (autor informe); (2007)
- Zonation of water regimens in Latin America and the Caribbean from a climatic point of view, focusing on vulnerable areas ; Programa Hidrológico Internacional de la UNESCO para América Latina y el Caribe, PHI- LAC: (Editor); Soto, Guido: Coordinador del proyecto (autor informe); Gabriels, Donald: Contraparte científica gobierno de Flandes (autor informe); Donoso, M<sup>a</sup> Concepción: Hidróloga regional PHI- UNESCO; Santibáñez, Fernando: Responsable científico (autor informe); Verbist, Koen: Coordinador científico (autor informe); (2007)

## **Government of Chile – UNESCO/Flanders Agreement:**

### **ACTIVITY REPORT FOR THE PERIOD JULY 2006 – MARCH 2008 FROM THE WATER CENTER FOR ARID AND SEMI-ARID ZONES OF LATIN AMERICA AND THE CARIBBEAN (CAZALAC)**

#### **INTRODUCTION**

The Water Center has been conceived as an organization responsible for coordinating /articulating scientific- and technologic actions aimed at the sustainable management of water resources in arid, semi-arid and subhumid zones of Latin America and the Caribbean.

CAZALAC is currently working on 5 specific action lines. Such medium- and short-term strategic lines are:

- Water resources assessment;
- Efficient water development;
- Water management models;
- Environmental aspects, and
- Economic and social aspects.

In addition to such strategic action lines, the Center performs the following roles and tasks:

- Becoming a specialized dissemination Center.
- Being a node with other specialized centers.
- Being a database regional center.
- Becoming a center for cooperation and catalization of international programs of UNESCO; namely HELP, the Millenium Ecosystem Assessment, FRIENDS, WWAP, and international conventions on environment and development.
- Promoting the establishment of a strong link between the Center and the focal points of the IHP National Committees of the Region, so that they can achieve their objectives more effectively and efficiently.

General Objective:

- Strengthen the technical, social, and educational development of the Region through improved water resources development and management in the arid and semi-arid zones of Latin America and the Caribbean, and broaden the role of the communities in the development of a water culture through the establishment of an activity-, project- and program regional coordination center.

Specific objectives:

- Foster scientific research in water-related matters and issues of arid- and semi-arid zone management in Latin America and the Caribbean.
- Promote closer contacts among the researchers who work in the realm of water resources of the Region.
- Disseminate the outcomes of the research activities pursued in connection with water resources in the Region's arid and semi-arid zones.
- Provide education and training on sound management of water resources and foster better regional researchers' capacities.

**TECHNICAL TEAM:**

The Center team includes:

- Three regular staff members (an Executive Director, an Engineer responsible for the Technical Areas, and an Administrative Secretary). As provided in the agreement, another professional is yet to be integrated (because of insufficient budgetary resources); the integration will take place in April, 2008.
- Two professionals for special projects (a Belgian engineer doing his Doctorate thesis, and a part-time engineer financed by a project of the European Union.
- Other professionals connected with projects developed by the Center are:
  - o Donald Gabriels, University of Ghent, Belgium
  - o Koen Verbist, University of Ghent, Belgium
  - o Damaris Orphanopoulos, MSc, Civil Eng. Rhodos Consultants.
  - o Deyanira Lobo L., Dr. in Agricultural Sciences, Central University of Venezuela
  - o Edmundo González, Civil Eng., University of La Serena
  - o James Wallis, IWR Consultant, Yale Univ, United States.
  - o Jason Giovannettone. Civil Eng, , IWR Consultant
  - o Manuel Cerda G, Civil Eng, Academic School of Engineering, Catholic University of Valparaiso.
  - o Ricardo Oyarzún L., Dr. in Hydrology, University of La Serena.
  - o Roberto Pizarro T., Dr. in Hydrology, University of Talca.
  - o Walter Baethgen. Agricultural Eng. IRI, Columbia University, United States.
  - o Wilfredo Alfaro C., MSc,, Forestal Engineer, National Forestal Corporation, Chile.
  - o Viviana Jofré. Civil Eng, (E), University of La Serena

## **FOUNDING INSTITUTIONS**

Government of Chile:

- General Waters Directorate
- Regional Government of Coquimbo
- University of La Serena

## **CENTER PARTNER INSTITUTIONS**

- University of Talca
- Catholic University of Valparaiso
- University of Chile
- University of Concepción

## **INTERNATIONAL SUPPORT**

- UNESCO-IHP
- Government of Flanders (Belgium)

Agreements signed with:

- University of Ghent, Flanders, Belgium.
- University of Bochum, Germany.
- Gender Water Alliance (GWA)
- Newcastle University, England
- Ben-Gurion University and Institute for Water Sciences and Technologies (IWST), Israel
- National Experimental University "Francisco de Miranda", Venezuela.
- National University of the Central Region of the Province of Buenos Aires, Argentina.
- Postgrade College, Mexico.
- Instituto Argentino of Investigaciones de las Zonas Áridas-IADIZA
- International Research Institute for Climate and Society (IRI), University of Columbia
- Institute for Water Resources (IWR) US Army Corps of Engineers.
- Valparaiso Catholic University, Chile
- United Nations Convention to Combat Desertification (UNCCD)
- National Copper Corporation, Chile – CODELCO (being developed)
- National Forestal Corporation, Chile - CONAF (being developed)

## ACTIVITY REPORT

### RESEARCH

#### • **Map of Arid Zones of Latin America and the Caribbean**

CAZALAC has a regional version of the map. However, a process of adjustment of the national maps was launched in January 2007, as requested by the project's participating countries. The April, 2007 coordination meeting was followed by activities aimed at improving the national versions. This effort was conducted through planning of workshop development activities involving institutions and experts from each country, so as to prepare a consensus final version.

#### ***Brazil - Workshop on Arid Areas Map (May 22- 23)***

The first national workshop was held, on the map of Brazil's arid and semi-arid zones, in order that the institutions connected with water resources, meteorology and natural resources got to know the first map developed by CAZALAC.

It was agreed that the Water Resources Secretariat coordinated its actions with the other institutions to complete the meteorological information needed to supplement the meteorological information in existence for some areas, and finally produce the definitive version of the Brazil map during a second workshop that would take place at a date pending determination.

#### ***Workshop on a National Arid Areas Map of Mexico***

The workshop was developed in the Mexican Institute of Water Technology – IMTA Mexico, October 9-10, 2007.

Workshop participants included representatives of CAZALAC, specialists and representatives of Mexican institutions connected with water resource management in arid zones. Its objective consisted of effecting corrections and validating the first version of the arid-zones map developed for Mexico in consensus with the specialists and representatives of information-using institutions.

The introduction of the map and its progress was followed by a demonstration of the operation of the CIRH program, so as to define agro-climatic indicators and finally agree on the procedures to be followed for the completion of the final version of the map.

### ***Workshop on National Maps of Arid Zones in the Caribbean***

An evaluation workshop for the national maps of the Caribbean took place in the Bahamas on 16th and 17th October, with the participation of the Regional Hydrologist, Dr. María Concepción Donoso, four representatives of the Bahamas, as well as representatives of Antigua and Barbuda, Barbados, Saint Lucia, and Jamaica.

The presentation of the project was followed by a training session for the participants, on use of the CIRH software for the development of agro-climatic indicators. Work was also conducted with the national representatives on the amendment of the maps of the Caribbean, by using additional climatic data and with knowledge support from the attendant experts. Results: After the ensuing information sharing period the final version of the national maps was completed.

### ***Enlargement of the Arid Zone Map to cover the USA (joint effort with the IWR)***

Under the agreement with the IWR of the US Army Corps of Engineers the first steps were taken to enlarge the arid, semi-arid and subhumid zones to cover the US territory, by expanding the methodology used in Latin America and the Caribbean. With the tutoring of Koen Verbist, Diplomated Civil Engineer, Pilar Rojo Castillo (ULS) collected and systematized the (freely accessible) information on over 5000 climate stations for the USA. The data are being analyzed, and the calculations developed on the aridity indexes with the CIRH software developed by UChile/CAZALAC for such purposes. A first preliminary version of the map for the United States is expected by mid-2008.

As an additional result, the registries of the United States stations will be made available in the CAZALAC web site.

### **• CAZALAC-IWR Drought Atlas**

This project is a supplementary work line of the LAC arid zone project largely using the data developed for the previous project. However, the deliverable is another product that can be used to improve the secano lands in arid zones of the participant countries –in principle, Chile, Argentina, and Peru. The purpose is to extend this project to all LAC countries with drought-affected zones, once the first experiences and products are available.

This activity is a joint effort with the Institute for Water Resources (IWR) of the US Army Corps of Engineers, with which an agreement was signed by CAZALAC in 2006. Involved in the activity are an IWR professional and a Yale professor, Dr. James Wallis, who was a member of the group of experts who developed the US Drought Atlas:

(<http://workshop.iwr.usace.army.mil/iwr/atlas/Atlasintro.htm>). Both experts were specially retained by the IWR for this initiative.

The project goal consists of analyzing precipitation data from the countries involved and developing a statistic analysis for three pilot zones of Argentina, Peru, and Chile, so as to find answers to questions such as:

How frequent are drought episodes?

What is the probability that the current drought ends in X months?

How persistent will be the drought for which we must prepare?

What is the frequency of the maximum-intensity drought observed?

The answers to such questions are an input for planning and laying the basis for a decision-making system on the drought issue.

A training workshop is being planned and would take place in Santiago (March 25-26). The methodology-training workshop participant researchers are:

Argentina: Cristina Moyano, Meteorologist, National Water Institute; Raúl Díaz, Hydrologist, National Water Institute.

Peru: Julia Ignacia Acuña Azarte, National Service for Meteorology and Hydrology, SENAMHI; Oscar Gustavo Felipe Obando, National Service for Meteorology and Hydrology, SENAMHI.

Chile: Alejandro León, University of Chile; Paula Uribe, Meteorological Service; Representative of the Waters General Directorate.

CAZALAC representatives.

#### • **Climate variability in water resources (NASA, IRI)**

Thanks to the cooperation of UNESCO IHP-LAC, contact was established with the International Research Institute (IRI) of Columbia University, New York, United States, in order to develop a research project on extreme events (droughts/floods) and climate variability forecasting for the Coquimbo Region. This initiative, which has important projections, is led by Engineer Koen Verbist, of Ghent University, seconded to CAZALAC.

The work being developed focuses on statistic evaluation of the link between the ENSO phenomenon and the precipitations in the Coquimbo Region. Such link, in turn, affects the water volumes. An assessment is being done on the efficiency of models using statistic downscaling techniques for the Climatic Global Climatic Models (GCM), to forecast droughts and water volumes in the Region. The preliminary results show that the Coquimbo Region droughts and water volumes are to some extent predictable in the medium range (3-6 months) if ENSO information is included, and that the statistic models could be the basis for a drought early warning system in such region.

A workshop is scheduled for March, 2008, to include other national institutions active in the areas of volume-forecasting and reservoirs management, impacts on irrigation zones, and drought early warning systems for the secano area.

Other activities performed follow:

***Training Course in Statistical Downscaling of Climatic Forecasting Models GSA***

In the context of this project four professionals paid a one-month visit to the United States to be trained in the IRI on models of downscaling of climatic forecasting (May 19-June 19). The professionals belong to CAZALAC, the University of La Serena, CEAZA, and the Choapa River Surveillance Council.

***Development of a Drought Early Warning System in the IV Region of Coquimbo***

During 2007 a study was performed on the feasibility of using the statistical downscaling techniques for drought forecasting and to lay the basis for the implementation of an early warning system. With the help of the DGA Waters Bank the region's data base for 44 climatic stations was developed, including daily data for the 1930-2007 period. Such data were used to build a climate forecasting model for the zone, including world climatic data. The study was performed by Diplomated Civil Engineer Viviana Jofré (ULS), tutored by Koen Verbist

Koen Verbist also made several presentations on the same issue, including those delivered in the:

- I. "International Seminar on Climatic Change and its Effects on the Agricultural Production", La Serena, October 2-3, 2007.
- II. "Seminar – Irrigation Act and Sustainability of the Resource Water for a Region that is Positioning itself as an Agrifood Power", Ovalle, December, 2007
- III. "International Conference on Desertification", Ghent, Belgium, January 23, 2008.

- **Studies on vulnerability to soil erosion in arid zones.**

The main objective of this study series is to ascertain the behavior of the arid- and semi-arid soils faced with extreme precipitation events, identifying the zones more susceptible to erosion, establish the behavior of humidity in the soils and assess the socioeconomic effect of the establishment of soil-conservation techniques. The development of maps for the various sectors studied is also being considered.

With the support of CAZALAC and the University of Ghent, a Belgian candidate to Doctorate has performed a series of research activities, data gathering and registration on edaphic and hydrologic parameters of the soils of the region of Coquimbo (Chile). Pre- and post-Doctorate students have also developed studies on erosion-risk evaluation in the zone.

Since 2005 surface runoff-measurements and subsurface soil humidity measurements are being performed in order to implement models on water behavior on hillsides without plant coverage, in soils of the IV Region.

The main activities being developed in the framework of this study series include:

- Development of controlled field tests using a rain simulator built and operated in CAZALAC
- Measurement of the various physical and chemical soil parameters and monitoring of the dynamics of their state variables all along the experimentation period.
- Simulation-model generation to forecast the effect of land use in the degradation of the water, soil, and vegetation natural resources.
- Formulation of recommendations and indications from the results of the experiences gathered.
- Implementation of a demonstration area for course- and workshop implementation for professionals, producers, and students.

Numerous pre- and post grade student theses have already been developed under the tutorship of Professor Dr. Eng. D. Gabriels and the responsibility of Eng. Koen Verbist. The following ones can be highlighted:

- Evaluation of the infiltration process in water harvesting systems in dry lands of Chile. Marjolein DE WEIRDT; D. Gabriels - (2005)
- Evaluation of water erosion risks in dry lands of Chile. Arne BAERT; Donald Gabriels - (2005)
- Estimation of sediment transport in a watershed in an arid region of Northern Chile. Bram Vandekerckhove; D. Gabriels; W. Cornelis - (2006 )
- Evaluation of infiltration furrows for runoff water catchment in a semi-arid region in Chile. Katrijn Alaerts; D.Gabriels; W. Cornelis - (2006)
- Characterization of the precipitation-solid runoff process through a rain simulator. Lagos, E.; Pizarro, R. (2007)
- Scale-dependent influence of rock fragment cover on soil infiltration, runoff and sediment yield in arid zones of Chile. L. Loosvelt; D. Gabriels; W. Cornelis -(2007)

- **Pre-graduation student internships – Coquimbo Region. Field experimentation development and data gathering for drafting of theses**

The Center hosted the pre-graduation internship activities (August, September, and October, 2007) to develop grade theses on the issues of soil erodability in the Coquimbo Region, and study the variables and parameters governing soil-humidity exchanges.

The framework of this activity is a series of research efforts on semi-arid soil degradation, and evaluation of water- and soil catching techniques to combat desertification that have been developed during the last few years, which will be included in the Doctorate curriculum of Koen Verbist in the Ghent University.

Participant Students, 2007:

Pre-graduation students or graduated participants:

Rodrigo Carvajal Ortíz - University of La Serena – Ovalle, Chile

Isella Tello - University of La Serena – Ovalle, Chile

Victor Fredes Aredondo - University of La Serena – Ovalle, Chile

Eva Gheselle - University of Ghent – Ghent, Belgium

Sabine Torfs - University of Ghent – Ghent, Belgium

Expected Results:

The measurement results are being processed to be presented as theses during the April-September, 2008 period. The results will also be published in a scientific journal by end-2008.

• **Map of Climatic Aggresivity**

This activity was not performed in 2007, since completion of arid-zone national maps was given priority to the start of new projects in the framework of the map project. This has led to a proposal for the postponing of this activity. The latter would be implemented in 2008 as a joint effort with the University of Ghent, which has the relevant experience in ascertaining climatic aggresivity for Europe.

## RESEARCH NOT CONNECTED WITH THE UNESCO/FLANDERS FUND

### • CAMINAR Project – Management of Basins with Mining Activities in Arid and Semi-arid Regions of South America.

A three-year project financed by the European Economic Community, with an approved amount of €1.799.645. Its general objective is to help establish policies, management strategies and technologies for sustainable management of the ecosystems of those hydrographic basins of the arid and semi-arid zones of South America that are vulnerable to the impact of mining activities.

#### Participants:

- University of Newcastle; England (project leader)
- University of Oviedo; Spain.
- Higher Technical Institute; Portugal.
- National University of San Agustín, Arequipa; Peru.
- LABOR Civil Association; Peru.
- Center for Ecological and Integral Development Studies (Bolivia) – CEEDI
- CAZALAC; Chile.
- University of La Serena; Chile.
- CEAZA; Chile.
- Water Management Consultants; Chile.

CAZALAC participates in the general coordination of the Chile Group, the international relations of the project with foreign agencies, the definition of the information sharing strategy, and its implementation through electronic media (Bulletin, Web page) and papers. The in-country project participants are Water Management Consultants and the Center for Advanced Studies in Arid Zones– CEAZA, and the Department of Mining Engineering of the University of La Serena (ULS).

The Basin to be assessed in Chile is that of the Elqui River, in the Coquimbo Region, with an area of 9,422 km<sup>2</sup>.

Main activities in Chile in 2007:

Information gathering

Environmental sampling drives, particularly focused on the effects of the mining activities

Inclusion of the biological components as indicators of water quality.

Participation activities of the key stakeholders of the basin.

Support for the development of two pre-graduation thesis on issues connected with the project

Cooperation in the development of a decision-support system.

### ***Launching of the CAMINAR-UE Project***

Development of the first dissemination workshop for the project named CAMINAR – “Elqui Basin Case”, “Updating and Socialization of the oriented to Basin Management-oriented Information on Elqui”, La Serena, July 13, 2007.

The Project and its goals were introduced during the workshop. The workshop was also an instance for public agencies, representatives of the Legislative Power, private organizations and the public at large to externalize their vision on the issue being considered and elicit recommendations and orientations for the work to be developed during the project period.

The workshop was attended by over 50 relevant protagonists, congressmen, regional ministries’ secretaries, and other representatives of public and governmental agencies, representatives of mining companies and other production business firms, universities, research centers, surveillance councils, academic consultants, and students.

### ***First National Workshop on the CAMINAR-UE Project***

The main objective of the national workshop was to make the project known by the national-scope institutions and organizations and have the participants identify the leading issues of interest in the area of integral management of basin running involving mining activities. The main issues selected were those aimed at:

- Developing an integrated basin management plan by means of a broad invitation sent through the water tables, by integrating and recognizing the existing achievements.
- Collecting the information available and providing the interested parties with the existing knowledge on the natural resources of the basin.
- Enhancing the surveillance and control systems of the basin management.
- Educating and creating basin-awareness, where the decisions are interrelated at all levels.
- Gathering the basin information, where decisions are interrelated at all levels.
- Making explicit and set the basin management goals so as to coalesce the wills of the parties.
- Knowing and making known the value of the water resource and other relevant resources for purposes of transparency of the markets, or the market at large.
- Improving the legislation on integrated management of the water resource at superficial and subsoil levels.

***Second Regional Workshop on the Elqui Basin and Second Meeting of the Participants' Consortium on the CAMINAR-UE Project.***

During the 6th-9th November, 2007 period there took place the second meeting of the Elqui basin and the Second International Meeting of the Group of the member institutions of the project executing consortium.

The objective of such activities was to review the Project progress, coordinate activities and receive ideas and contributions for the development of the activities remaining for the next 2 years.

**• Project on “protection and sustainable management of the American puna wetlands (WETPUNA)”**

Development of the proposal for the Project on “protection and sustainable management of the American puna wetlands (WETPUNA)” to be submitted for the project contest of the 7<sup>th</sup> Framework Program of the European Union, with the participation of Argentina, Bolivia, Chile, Peru, Italy, Spain, Portugal, and Belgium.

The emphasis of the study is to generate knowledge on the structure and functioning of the wetlands of the American Puna from the viewpoint of the physical system connected with the social and economic dimension. The main outcome desired is to develop a model for integral management of the American puna wetlands (Decision Support System – DSS) and develop proposals on rules and measures for better managing of such ecosystems.

**• Oasification – Hydrologic Forestal Restoration. INFOR-U.Talca-CAZALAC**

CAZALAC cooperated with the experiences developed by the University of Talca in the Project financed by the Government of Chile through CONICYT-INNOVA, named “Hydrological-Forestal Restoration and Oasification: Key tools for greater productivity of degraded soils of the Coquimbo region”.

As subcontractor, CAZALAC performed a series of measurements with the rain simulator in 15 places of the secano lands in the Coquimbo Region, to supplement the data needed for the optimization of hydrologic models and the optimization of rain-catching techniques, which are the final objectives of the project. Besides, land samples were taken (soil losses) and subjected to laboratory analysis, before analyzing and processing the data obtained for later use in hydrological models.

The objectives of this work mainly include determination of the erodability of the soils of the secano lands of the Region and the comparison of measurements performed with

the rain simulator with data obtained with natural rain. Information was also gathered on infiltration in the secano land soils –a fundamental aspect in the development of these hydrological models.

Project start (CAZALAC's part): November 1, 2007; final report due on 17<sup>th</sup> January, 2008.

## **TRAINING COURSES**

- **International Course on Applied Hydrogeology, Underground Water Management in Arid Zones**

A total of 27 Chilean students – professionals from the private and public sectors, teachers and students - who wanted to update and deepen their knowledge regarding theoretical and practical work on assessing basic hydrogeological parameters, attended this course. In addition, 15 pre-grade students of the Ruhr-University of Bochum and the Technical University of Darmstadt came from Germany.

The main purpose of this course was to develop an introduction to field methods in underground water resources and to assess the basic hydrogeological parameters required to predict underground water flows, as well as the transportation of soluble constituents.

### Contents:

- o Introduction to underground water systems
- o Quantitative hydrogeology
- o Hydrochemistry
- o Underground water management
- o Field practical classes

### Coordinators:

- o Guido Soto, CAZALAC.'s Executive Director
- o Edmundo González, Teacher at University of La Serena.

### Teachers:

- o Prof. Dr. Stefan Wohnlich, Ruhr-University of Bochum, Germany (Hydrogeology)
- o PD Dr. Frank Wisotzky, Ruhr-University of Bochum, Germany (Hydrochemistry)
- o PD Dr. Steffen Bender, Ruhr-University of Bochum, Germany (Groundwater Hydraulics, Decision Support Systems)
- o Prof. Dr. Ingo Sass Technical University of Darmstadt, Germany (Well Construction and Hydraulics)

- **COSWAND course**

As part of CAZALAC's 2006 program, a course on water and soil preservation in Andean countries was developed on November 27 - 29, 2006. The course was addressed to local farmers and family members of the community of Namza, Huigra, Alausí (Ecuador).

Among the main contents imparted in the course, the following can be mentioned:

- o Formation and types of soils
- o Composition and physical and mechanical properties of soil, soil water content, soil impairment, soil protection
- o Field demonstrations: (rain simulator, rain distribution; double ring infiltration)
- o Soil fertility
- o Organic materials and composted materials
- o Irrigation and drainage management
- o Field demonstrations (Different irrigation systems, compost preparation)
- o Degradation process control and water and soil preservation
- o Field demonstrations with different plows

This course was coordinated by Dr. Donald Gabriels, from the University of Ghent, Belgium, and Pedro Cisneros, PROMAS (Water and Soil Management Program), Cuenca, Ecuador. The following teachers participated in the course: Deyanira Lobo, Universidad Central de Venezuela; Felipe Cisneros, Director of PROMAS and University of Cuenca, Ecuador; and Esteban Pacheco, PROMAS, Cuenca, Ecuador.

60 participants (farmers and their family members) belonging to the community of Namza Huigra, Alausí (Ecuador) attended the course.

- **IX ELAFIS 2007**

Support for the organization of the IX Latin American Academy of Soils Physics, in Cuenca, Ecuador (01-10 October, 2007).

Subject: "Soil physics and land- and water management in slope zones". The course took place in the premises of the Cuenca University, with the support of the PROMAS, and was delivered by Professor Felipe Cisneros, with direct cooperation from Dr. Devanira Lobo, of the Central University of Venezuela, and Dr. Donald Gabriels, of Ghent University.

The course was based on theoretical classes and a final field trip which included visits to slope-soils management experiences.

The course participants were 28 professional students from 9 different countries: 3 from Mexico, 5 from Colombia, 6 from Venezuela, 2 from Chile, 1 from Brazil, 1 from Peru, 2 from Spain, 1 from Argentina and 7 from Ecuador; as well as twelve professors from five countries: 2 from Belgium, 2 from Spain, 1 from Mexico, 2 from Venezuela and 5 from Ecuador.

• **Course-Workshop on the use of bioindicators in fresh water systems for the Caribbean (N. of Pauw) 2007, Jamaica (February 28 – March 6, 2007). Co-organized with HELP**

Workshop's objectives:

- Promoting the use of framework benthonic invertebrates as a common tool for water quality monitoring to make possible the comparison of the results along the region.
- Promoting information exchange and a joint effort among the researchers of the LAC region, particularly for the exchange of information among the countries on river biological monitoring.

Course professors: Mr. Daniel Buss (Brazil); and Mrs. Simone Benassi (Brazil).

Participant students: 19 professionals and students (hydrologists, hydrogeologists, environment scientists, environment monitors) from public sector agencies and nongovernmental organizations, academic institutions (University of the Western Indies, and the University of Haiti).

• **International Meeting on Erosion and Sedimentation for Managers, Decision-makers, Technicians, and Communicators (October, 2007)**

This meeting took place in the School of Technology, UnB, – UnB, Brasilia, on 29<sup>th</sup> and 30<sup>th</sup> October, 2007.

Objectives:

- Furthering awareness on the technical, economic, social, and environmental aspects of erosion and sedimentation in Brazil and in Latin America.
- Identification of alternatives for soil- and sediment sustainable management
- Enhancing information sharing on the meeting's issue among technicians, managers, decision-makers, and communicators, for more efficient actions in management and control of both processes.

The meeting's structure was based on 4 panels with 4-5 presentations each. The matters addressed mainly included economic and social losses from erosion and sedimentation in the various sectors (Agriculture, Energy, Transport, and Sanitation), legislation and action implementation, research and erosion- and sedimentation control. New erosion-control strategies were also introduced, such as payment for environmental services.

This activity was attended by about 160 participants, including students, academicians, environmental experts, environment managers, representatives of the Energy, Agriculture, and Transport sectors, nongovernmental organizations, etc.

• **Course-Workshop Blue Planet . Mar del Plata, Argentina (November, 2007)**

A workshop developed by the Blue Planet project (Mrs. Orit Ben Zvi and Mr. Nir Orion), from the Ben Gurion University and the National Committee of Israel of the IHP, and supported by the UNESCO-IHP-LAC and CAZALAC. It was attended by 55 participants from Argentina, Uruguay, Chile, Saint Lucia, and Mexico.

2,000 books in Spanish were printed and began to be distributed in connection with the workshop, in addition to a CD that can be downloaded for free.

The workshop considered the geologic aspect of the matter and the connection among the Earth systems. A field trip was made to Sierra of los Padres, Laguna of los Padres and Mar del Plata.

***On the Blue Planet Program***

The objective of the Blue Planet program is to change the educational paradigms by promoting outdoor education, teaching of sciences, and thought systems. Originally written in Hebrew, the program has been translated into Spanish and Arabic. A version in Chinese is being developed. In Israel the reach-out program has been limited by the implementation of educational rules that leave scarce margin for outdoor education.

Since Blue Planet is mainly designed for the secondary school- and Science teachers, it can supplement the Water and Education program, which is very different in scope, themes, and objectives. The issues that matter for the LAC region, such as health, waterborne diseases, water recourse integrated management, floods, droughts, social and cultural matters, are not addressed in Blue Planet.

## **MEETINGS AND WORKSHOPS**

- **Water and Culture Workshops**

Two national workshops were developed in the cities of Montevideo, Uruguay and Asuncion, Paraguay on October 9 -10 and 12-13, 2006 within the framework of the International Hydrologic Program for Latin America and The Caribbean – IHP-LAC – of UNESCO, as part of the Water and Culture Regional Program 2006-2007 component and with the support of CAZALAC.

These workshops were aimed at presenting the IHP-LAC Water and Culture Program to the workgroups in Uruguay and Paraguay and to train them on the methodologies to develop the Water Culture Atlas in their countries.

A total of 26 people attended the workshop in both countries (14 in Montevideo and 12 in Asuncion).

In both countries, workgroups reviewed the Water Culture Project objectives, and the guidelines to select information, extending them according to their relevant needs and the individual goals of each country. In addition, the need was identified of explicitly showing the importance of obtaining a friendly interactive Water Culture Atlas by country, addressed to a wide user diversity and with diverse research and management effects. Finally, the need of extending the theoretical framework suggested by the Water Culture Project was recognized.

- **UNESCO-WET Workshop**

This workshop to select educational proposals within the Water and Education Program was developed in Jiutepec, Morelos, Mexico on August 28, 29 and 30, 2006.

Teachers and water managers from Argentina, Chile, Costa Rica, United States, Israel, Mexico, and Dominican Republic attended the workshop. Its main objective was to select the educational material proposals that will eventually be included in the General Guide for Educators of the Americas and the Caribbean of the Education and Water UNESCO/IHP-ALC – joint Project WET.

CAZALAC collaborated with the meeting development and the participation of a specialist from the General Water Directorate Study Department, Chile.

- **HELP – IRI / Climatic Variability – Cuenca Workshop**

Efforts to include the Elqui Basin in UNESCO's HELP Program were begun in 2006. A workshop was developed on November 27-28 with the purpose of analyzing possible collaboration areas with the several institutions and organizations related to the Elqui

basin.

This activity was coordinated by CAZALAC and was attended by the experts Mrs. Pilar Cornejo, Coordinator of the HELP Program for Latin America and The Caribbean; and representatives from the International Research Institute for Climate and Society (IRI), of the University of Columbia, Nueva York, Dr Walter E. Baethgen, Research Scientist, Director, Latin America and Caribbean Regional Program; Dr Casey Brown, Associate Research Scientist, Water Resources; and Dr Francisco de Assis de Souza (Assis), Visiting Research Scientist, Hydrology and Water Resources; in addition to the participation of regional and local institutions related to the use of the basin's water resources.

Activities developed included a field trip to the medium and low sector of the Elqui Basin and a meeting with local representatives related to the use of the basin's water resources, among others: the General Water Directorate, the Hydraulic Works Office, the National Environmental Commission, the Elqui River Surveillance Board, the National Irrigation Commission and CEAZA-U.Serena.

As a result of the workshop, the following main collaboration issues were agreed upon:

- Weather Information. Development of forecasting and analyzing models.
- Water management decision making.
- Agriculture under dry conditions

Main agreements:

- o Start actions to implement an institutional coordination system in the Elqui basin, on GIRH.

In conformance with the actions priorly taken by the General Water Directorate to create a Board of Directors for the Elqui basin, on GIRH, it was agreed that any initiatives to be implemented from now on will be included within this action framework in order to involve all the actors who are interested in participating.

This purpose is also aimed at starting a process to include the Elqui Basin in UNESCO's HELP Program.

The action framework to be defined shall include the following:

- Objectives
- Components / participating Institutions
- Roles
- Guidelines / Work projection along time

In this respect, the Public Works Ministry has a previous study prepared in the year 2000, on a Water Resources Management Program agreed with the World Bank through an advice requested by the Hydraulic Works Office, which was aimed at identifying any problems and limitations that the current institutional regulations represent for water management and preparing an institutional

coordination and integration proposal that will make it possible to improve water management in the basins of the Elqui, Mataquito and Itata rivers. The operation of this program was interrupted in late 2000.

Carlos Galleguillos, Regional Director of the General Water Directorate, expressed that this institution desires to continue collaborating with this issue.

- Cooperation areas proposed by the IRI
  - Weather information, weather forecasts, historical analysis and water resources decision making

Internship in the IRI. In conformance with information forwarded by W. Baethgen the following was agreed upon:

- To accept Dr. Baethgen's proposal to start taking steps to visit the IRI regarding the "downscaling" issue, in the same period that delegates from The Caribbean will visit the place (April 16 – May 11, 2007).
- Possible delegates from Chile: 1 - 3 people to be confirmed, depending on the available funds. Edmundo González, Orlando Astudillo have applied for the trip, and a third individual is considered.

Financing: In the meeting, it was reported that the following is available:

- Tickets for one attendant (financed by University of La Serena) and one month lodging for one person (funded by CAZALAC (US\$ 3,000)).

Additional sources will continue to be searched for, so that three people can travel.

Historical data. Participants report that the following information is available.

- Flow and temperature data.
- Data on the droughts occurred in 1983, 1991 and 1996.
- Degree report on Climatic Change and Catastrophic Events (floods): Analysis of actions in these extreme events:

- Agriculture in dry conditions.

It is agreed upon that this activity will be coordinated by Ricardo Oyarzun from the CEAZA, in addition to a professional from the INIA (Raul Meneses?), for which purpose the INIA Regional Director must be contacted. Raquel Oyarzun or Guido Soto are in charge of establishing this contact.

In addition, it is suggested that the dry condition should be analyzed through a degree report prepared by at least two students, one to deal with natural resources (water, soil, vegetation) and the other with the social-economic area (business administrator?). As was discussed in previous meetings, the main issue is to assess the damages caused by droughts in dry territories in the region of Coquimbo, analyze the government's social assistance actions and the chances of implementing an insurance for families that are vulnerable to droughts occurring in the dry territory.

The IRI offers the chance to obtain satellite historic data on soil water content and vegetation productivity. (for example, on the droughts occurred in 1983, 1991 and 1996)

- **X Symposium of the International Hydrologic Program Chilean Committee.**

The X Symposium of the International Hydrologic Program Chilean Committee was carried out on October 26 and 27, 2006 in the University of Talca, Santiago office. CAZALAC was in charge of coordinating the preparation of this symposium in collaboration with the several institutions that form up the IHP Nacional Committee in Chile.

The core element of this X Symposium was the issue: "Water in Arid and Semi-Arid Zones: Anticipating the Crisis".

The X Symposium had the following objectives:

- Increase awareness of the importance of water resources for the development of arid and semi-arid zones in the country, both in the scientific world and in the national community.
- Propose innovative action strategies to improve water management in arid and semi-arid zones.

The event was developed through 5 discussion panels, plus a debate, where outstanding professionals, politicians and teachers participated, who, from their perspective, contributed with their visions and experiences regarding different issues.

Panel 1: Agriculture in arid zones: Innovations to optimize the use of water resources

Panel 2: The experience of the mining industry in Chile: Facing new challenges on water use

Panel 3: Water utilities and water sustainability regarding the population's future water requirements

Panel 4: Technological research and innovation: The scientific drive to reverse shortage.

Panel 5: Key elements for an integrated water management in arid and semi-arid zones

Debate: Economic growth and water resources in Chile

Four institutions related to the activities of the IHP in Chile were in charge of the event organization:

- International Hydrologic Program Chilean Committee, CONAPHI-Chile.
- Water Center for Arid and Semi-Arid Zones in LAC
- University of Talca
- General Water Directorate

A total of 92 participants belonging to the public sector (DGA, DOH, SISS, CNR, CONAF, INIA, SAG, FONDEF), universities, private sector (surveillance unions, mining

companies, water utilities, consultants), and renown politicians linked to water management in arid zones attended the X Symposium.

The 2006 IHP National Committee – Chile awards were granted in the event, to recognize the contribution made by specialists and institutions due to their commitment to the environment in the 2005-2006 period.

- CONAPHI-Chile 2006 Award, Outstanding Scientist: Dr. Eduardo Holzapfel, Teacher at the University of Concepcion.
- CONAPHI-Chile 2006 Award, Outstanding Medium: Radio Bio-Bío.
- CONAPHI-Chile 2006 Award, Outstanding Politician: Senator Mr. Eduardo Frei Ruiz-Tagle, President of the Senate.

#### • VII Regional Meeting of CONAPHIs Guatemala City (August, 2007).

CAZALAC participated in the VII Meeting of National Committees and Focal Points of the UNESCO International Hydrologic Programme (IHP) for Latin America and the Caribbean, which took place in Guatemala City during 12-17 August, 2007.

As a Category II Regional Center under the auspices of UNESCO, CAZALAC had the opportunity to report on the activities performed during the 2006-2007 biennium, the activities programmed for the 2008-2009 biennium, and the presentation of the implementation, on the Mapserver platform, of the first version of the Map of Arid and Semi-arid Zones of Latin America and the Caribbean, in the Center's website.

A point to be highlighted is the great importance given by the country representatives to this project, particularly as regards the implementation of the first version of the Map of Arid and Semi-arid Zones of Latin America and the Caribbean, in the Center's website.

New opportunities were also identified for using the Mapserver platform implemented in the CAZALAC server, The platform will enable the various IHP-LAC programs to display information on the map about their respective projects (such as those for transboundary aquifers, and glacier location)

#### • Sixth Inter-American Dialogue on Water Management

This meeting, held in Guatemala City during the August 12-17, 2007 period, was organized by the OAS-connected Inter-American Water Resources Network. The UNESCO IHP-LAC and CAZALAC were among the organizations that provided cooperation.

In such context, CAZALAC participated in the

-Thematic Group 2: Water, the Environment and Climatic Change, Thematic Session TP-2: Water Resources Management in Arid and Semi-arid Zones, with the Executive

Director, Guido Soto, participating as a panelist with the presentation on “Integral Management of Water Resources in Arid and Semi-arid Zones and the Fight against Desertification”.

-Thematic Group 2: Sustainable Uses of Water: infrastructure, technology, and services. Thematic Session TP4-3: Appropriate technologies and alternate sources in scarcity regions, with the Executive Director participating as a Moderator, and the representative of the Technical Area of CAZALAC, Manuel Soto B., as a panelist, with the presentation on “Appropriate technologies and alternate supply sources in scarcity regions”.

#### • **UNCCD COP 8 (CAZALAC-UNCCD Agreement)**

CAZALAC participated in the eighth session of the Conference of the Parties of the United Nations Convention to Combat Desertification (COP 8), held in Madrid, Spain, from 3rd to 14th September, 2007.

The UNCCD-CAZALAC agreement was signed on 7<sup>th</sup> September, 2007. The UNCCD was represented by the Official in Charge of the Convention, Mr. Grégoire de Kalbermatten, and CAZALAC was represented by its Executive Director, Guido Soto. Participants in the ceremony included Messrs Luis Molinas, Focal Point of Paraguay and President of GRULAC for LAC; the Focal Point of Saint Lucia, representing the countries of the Caribbean; Mr. Wilfredo Alfaro, Focal Point of Chile and Pro-Tempore President of the Puna Americana Project; delegates of the National Forestal Corporation and the Agriculture and Livestock Service of Chile, and the UNCCD Officials Messrs. Sergio Zelaya, Heitor Matallo, and Richard Cox.

CAZALAC participated in two GRULAC meeting where information was provided on the agreement signed with the UNCCD, with the idea of developing a work plan and establishing closer relationships between the Focal Points of the Convention, and the IHP in each country. The first action lines were also established for the development of a proposal to be submitted to the European Union.

#### • **International Training Workshop on Groundwater Modeling in Arid and semi-Arid Areas. G-Wadi 2007 June, Lanzhou, China**

Engineer Ana María Gangas, Head, Modeling Area, Research Department of the DGA, participated in the “International Training Workshop on Groundwater Modeling in Arid and semi-arid Areas” held in June, 2007, in Lanzhou, China.

In such event, Mrs. Gangas made a presentation on Groundwater modeling and comprehensive modeling of the water resources in Chile. Cases of application in arid and semi-arid regions, and showed the Chilean experience in modeling of aquifer behavior in the arid region of Chile.

CAZALAC's contribution was limited to efforts to include a LAC participant in this activity so that the activities on this issue become known in the LAC Region. Engineer Gangas has been nominated as GWadi coordinator for LAC.

• **Workshop First Forum for Basin Management and Development in Arid and Semi-arid Zones (Córdoba, Argentina 6th-7<sup>th</sup> September).**

Participation in the “First Forum for Basin Management and Development in Arid and Semi-arid Zones”, designed to establish a space for discussion, exchanges, and integration to analyze and discuss water management experiences on issues connected with Lakes Management, Water Quality, Wetlands, Biodiversity, Water Pollution, Monitoring and Sanitation.

The issues of mining impacts in arid and semi-arid basins were addressed by a representative of CAZALAC (Dr. Ricardo Oyarzún / ULS), who introduced the CAMINAR program (Catchment Management and Mining Impacts in Arid and Semi-Arid South America). Another representative of CAZALAC (Dr. Damaris Orphanopoulos /Rhodos) presented the theme of Methodologies to ascertain the efficiency of water use in the arid regions. Both presentations prompted high interest in the audience.

• **Universal Forum of the Cultures. Monterrey, Mexico (12th October, 2007)**

During the Universal Forum of the Cultures, the Executive Director of CAZALAC, and Koen Verbist presented the paper “Water in a Sustainable World” – an activity programmed for the week devoted to Natural Resources.

The presentation was delivered to an audience of about 120 people from various educational institutions, university professors and students, and intermediate education professors and students. The forum organizers were provided with the material of the paper, for further inclusion in the compilation of the Memories of the Forum. Participation in a press meeting was also included in the framework of this event.

• **GWADI Network Meeting. Santiago de Chile, December 16, 2007.**

The UNESCO-IHP-LAC Regional Office, the GWADI Network and the Center of Water for Arid and Semi-arid Zones of Latin America and the Caribbean joined efforts for the development of the international coordination meeting of the GWADI network, with the following objectives:

- Review the progress in the implementation of the actions performed by the network work group on strengthening of the global capacity for management of the water

resources of the Arid and Semi-arid Zones and promotion of international and regional cooperation.

- Start the activities of the network in Latin America and the Caribbean, with the incorporation of the Coordinator for LAC and the creation of a regional-level work group.
- Incorporate CAZALAC, in its capacity as regional center of UNESCO.

**• International seminar on techniques to augment the water supply in scarcity zones. Santiago de Chile, 17<sup>th</sup>-18<sup>th</sup> December, 2007**

Bearing in mind the presence of world-level specialists participating in the GWADI meeting, the UNESCO-IHP-LAC Regional Office, the GWADI Network and the Water Center for Arid and Semi-arid Zones of Latin America and the Caribbean organized an international seminar mainly aimed at establishing an instance for dissemination and experience-sharing of technologies oriented to increase the water supply in scarcity zones. Desalination, water reutilization or reuse, harvesting or management of rain water runoffs, fog- and mist catching, and aquifer recharge were among the aspects addressed.

The seminar was attended by a total of 50 national and foreign persons, including professionals from the public and private sectors, academicians and students who wanted to update and deepen their knowledge on the issues of the event. If the 15 lecturers are added, a total of 65 individuals participated in the seminar. An important feature of the event was the participation of the Environment Affairs Manager of the Spanish firm INIMA, one of the world's largest companies in the area of desalination.

**• Conference on Fog. La Serena, Chile, July 22- 27, 2007**

Support for the development of the Fourth World Conference on Fog and Mist – 2007, with the objective of updating the status of knowledge on fog and mist and its potential as a water resource in areas with pronounced water scarcity, and providing such areas with updated knowledge on environment management and recovery, development and acquisition of new water resources, and the natural resources for economic and social development and risk prevention.

134 essay requests were received for this conference -- 82 of them were presented orally, along with 31 posters. The event was attended by a total of 119 persons from 30 countries of Africa, America, Asia, Europe, and Oceania.

CAZALAC made a financial contribution to the conference and to participant attendance.

A 450-page publication was produced, with the contributions presented in scientific-paper format.

• **Meeting to prepare the Project on “protection and sustainable management of the American Puna Wetlands (WETPUNA)”**

Development of a meeting in San Pedro de Atacama, Chile, on 25th-26th October, 2007, on the “protection and sustainable management of the American Puna Wetlands” project. The event was held within the context of the Endorreic Basin program.

The purpose of the meeting was to review and reach consensus with the potential partners on the project profile, and outline the first agreements needed to initiate the process of formulation of the proposal to be submitted to the project contest of the Seventh Framework Program of the European Union. The meeting was attended by delegates of Argentina, Peru and Chile.

• **Snows and Glaciers in Arid Zones. Sixth Meeting of the Snows and Ices Work Group of the IHP-LAC and International Workshop on Geomatic Applied to the Study of Glaciers (Mexico City, May, 2007).**

With the support provided by the IHP-LAC of UNESCO and CAZALAC there took place the Sixth Work Meeting of the GTNH IHP-LAC in the headquarters of the National Autonomous University of Mexico (UNAM)-Federal District, Mexico. Participants included representatives and specialists in glaciology of various Latin American countries. The following additional events were also held: (1) International Forum on Glaciology. (2) International Course-Workshop on Geomatics Applied to the Study of the Glaciers. (3) Conference on Glaciers of Latin America. (4) Fourth GTNH Work Meeting. (5) Field Visit to the Iztaccíhuatl Vulcano.

• **Workshop Water and Culture - San Lorenzo, Paraguay. 26<sup>th</sup>-27<sup>th</sup> March, 2007**

On the 26<sup>th</sup> and 27<sup>th</sup> March, 2007 the Workshop “Water and Culture” was held in the Aula Magna of the School of Architecture of the National University, in the University Campus of San Lorenzo City, Republic of Paraguay, in the framework of the visit to Paraguay of the Director-General of UNESCO, Ambassador Koichiro Matura.

The event was attended by forty professionals, representatives of several State institutions, and students of various careers.

It included the presentation of the operational framework, the objective, the work program, an overview of the activities performed and an advance report of the activities in the framework of the Water and Culture program of Paraguay.

The above was followed by the development and validation of the summary information cards on the etnias of Paraguay and their water culture.

## **DISSEMINATION ACTIVITIES, WEBSITE AND CAZALAC DATA BASE**

### **• Implementation of the Mapserver server in CAZALAC**

A Pentium Dual Core, 2.8 Ghz, RAM 960MB server was configured and commissioned, and the Slackware 11.0 /HostGIS Linux 4.0 operative system was installed on it. Additional applications installed were MapServer version 4.1; PostgreSQL 8.2; GDAL/OGR version 1.3.2; GEOS version 2.2.3; PDFlib version 7.0; GD version 2.0.33; Freetype version 9.7.3; PHP version 5.2., which make possible the online display of the information

Through these tools various data bases can be developed, and the geographic information from the implementation of various projects can be displayed online using the Mapserver Internet technology, to make this information accessible to the specialists of the Region.

### **• Website / Electronic Newsletters / Publications**

The CAZALAC Newsletter was published. The Newsletter is distributed by e-mail to the subscribers of the Center throughout the region of Latin America and the Caribbean (2100 subscribers).

The contents of CAZALAC's Website, [workshop.cazalac.org](http://workshop.cazalac.org), are updated periodically.

CAZALAC has been performing the updating and maintenance of the Website of CONAIHP-Chile, [workshop.IHP.cl](http://workshop.IHP.cl), and the maintenance of the Website in Spanish of GWA (Gender Water Alliance), <http://workshop.es.genderandwater.org>

- The information on CAZALAC has been updated and new informative triptics have been printed, so as to made known the main action lines and objectives of the Center and the activities being performed, as well as the development and distribution of informative triptics on the CAMINAR Project – Management of Basins with Mining Activities in Arid and Semi-arid Regions of South America.

### **• Relational data base on LAC specialists and institutions**

This activity involves the development of a relational data bases system of institutions, specialists, projects, and publications connected with the issues of water resource management in the region of Latin America and the Caribbean. Because of its free-use, soundness, efficiency and excellent performance features, the system is widely used throughout the world for this type of services.

The data base model used is the relational model, which enables the presentation of both objects and relations among the objects, which allows for the presentation of a set

of projects and their attributes (project name, thematic area, objectives, etc), and associate them through relations with a set of institutions and/or specialists who participate in these projects.

A graphic interface was also designed for information consultations through Internet in php language. It can be accessed from the Center's Website using the <http://workshop.cazalac.org/datos> link.

- **Data base system for climate information on LAC**

In parallel to the development of the aforementioned data base and the information gathered from the project of development of the Map of Arid Zones of LAC, a data base of climate information of the region was also developed. Its source is FAO 2001.

The system was implemented on a data base server Postgresql (Versión 8.2), and a graphic interface for information consultations through Internet in php language. It can be accessed from the Center's Website using the <http://workshop.cazalac.org/datos> link.

- **Online publication of the Map of Arid Zones of LAC**

The publication of the Map of Arid Zones of Latin America and the Caribbean was made in the Center's Website, in order to visualize, consult and analyze the information generated in the project through the network by means of the Map Server Internet technology, and make this information available to the specialists of the LAC Region; [workshop.cazalac.org/mapa\\_za.php](http://workshop.cazalac.org/mapa_za.php).