



The Framework Program for the Sustainable Management of La Plata Basin's Water Resources, with respect to the effects of climate variability and change



## Framework Program of the La Plata River Basin

### Implementation Process and Primary Outcomes



**CIC**  
Cuenca del Plata



GLOBAL ENVIRONMENT  
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Framework Program of the La Plata River Basin  
Implementation Process and Primary Outcomes

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# Preface

The La Plata Basin is one of the most important in the world, both in terms of size and socio-economic characteristics. It is an area of more than three million square kilometers, currently inhabited by more than 110 million people, and which produces more than 70 percent of the GDP of the five countries that comprise it.

The Basin is a water system with remarkable biological diversity and productivity. It is home to the largest wetland corridor in South America, and is recognized as one of the most important basins in the world due to the quantity, variety, and endemism of its ichthyofauna. Despite its richness, it is one of the basins most affected socially and economically by cyclical flooding and persistent periods of drought. The relationship between hydrology, changes in land use, and uncertainties regarding the future climate poses a series of challenges to reduce vulnerability to natural disasters and to address environmental management and the needs of impoverished and marginalized populations. In this scenario, the required economic and social development within the framework of regional integration raises the need for great efforts in

valuation, awareness-raising, and education on nature.

In 2001, the governments of the five countries that make up the Intergovernmental Coordinating Committee of the La Plata Basin (CIC) decided to incorporate technical capacities into the organization in order to meet these challenges and to set up an action program as a management guide where water resources play a key role, including the relationships between surface and groundwater and their links to land use and climate. In this effort, which for the first time developed an integrated approach, the participating institutions agreed on the need to strengthen a common vision for the Basin, seeking to identify and prioritize common problems and their main causes so as to address them in a joint and coordinated way.

Based on this precedent, and with the support of the GS/OAS and PNUMA, Global Environment Fund (FMAM) funding was secured to implement the *Framework Program for the Sustainable Management of Water Resources in the La Plata Basin, with respect to the effects of climate variability and change* (Framework Program, FP). The Program was conceived as a

long-term management process, to be implemented in a coordinated fashion by the five countries within the framework of the CIC. During the initial stage of project preparation (2005-2007) through a participatory process, the main Basin-wide challenges were identified and the preliminary proposals for management responses aimed at solving or mitigating these problems were outlined.

Phase 1 of the Framework Program—carried out between 2010 and 2016—allowed for the deepening of the diagnostic, thus making it possible to characterize the Basin's problems in a more precise and detailed way, obtaining an integral overview of the state of the water systems. Based on this improved knowledge, the Transboundary Diagnostic Analysis (TDA) and the Strategic Action Program (SAP) were formulated to document policies and priority actions agreed upon by the five countries in order to solve the main problems identified, particularly those of a cross-border nature.

The work was carried out with the active participation of national institutions in each country, through specialists designated to form thematic working groups, which acted as planning and technical consensus in implementing the different subcomponents that make up the execution of the Framework Program. The outcomes of this effort are summarized in a series of publications—which include this document—that show the results obtained.

The Intergovernmental Coordinating Committee of the Countries of the La Plata Basin welcomes the commitment and effort of each of the individuals and institutions that supported and participated in the implementation of the Framework Program. It also recognizes the valuable cooperation and input of the Organization of American States (OAS), through its Department of Sustainable Development, which collaborated with and supported the CIC in the implementation of the Program, and of the United Nations Environment Program (PNUMA), which acted as the implementation agency of the Global Environment Fund (FMAM).

The work carried out during this first phase of the Framework Program represented a pioneer experience, where more than 150 institutions and 1,500 specialists from the region managed to articulate the interests and wishes of each country in the search for a common objective related to the integrated management of water resources in the framework of climate variability and change. It is hoped that the management experience and the technical tools developed will cement and strengthen the will for cooperation and regional integration, seeking to make progress toward the goal of achieving sustainable development and well-being for the inhabitants of the countries of the La Plata Basin.





# Chapter 1: Introduction

The La Plata Basin is an expansive region of South America of more than three million square kilometers, covering a large area of central and northern Argentina, south-central Brazil, south-east Bolivia, the whole territory of Paraguay, and most of Uruguay. Due to its size and the flow of

its rivers, it is one of the largest and most important basins in the world. It is the region of South America with the most economic development and the highest population density, as it comprises nearly 70 percent of the gross domestic product and 50 percent of the inhabitants of the five

## **The CIC and the La Plata River Basin Treaty**

In 1969, the governments of Argentina, Bolivia, Brazil, Paraguay, and Uruguay signed the La Plata River Basin Treaty, the main binding legal instrument in the Basin. Through this Treaty, the Intergovernmental Coordinating Committee of the Countries of the La Plata Basin (CIC) was consolidated as the body that promotes its objectives. The CIC was created in February 1967, during the First Meeting of Foreign Ministers of the Plata Basin, at which time the participating governments agreed to carry out a joint and comprehensive study of the area, aiming to carry out multinational, bilateral, and national works for the progress and development of the region.

Since its inception, the CIC has focused on areas of common interest in the five countries, facilitating studies, programs, and infrastructure works on hydrology, natural resources, transport and navigation, soil, and energy. In particular, the OAS' comprehensive study of the natural resources of the La Plata Basin in the 1970s was instrumental in guiding the actions of the countries towards harnessing energy and transport potential (CIC-OEA, 1973), and for which environmentally critical zones were registered, such as the Pilcomayo and Bermejo sub-basins, characterized by the highest global erosion and sediment transport indexes, or the Upper Paraguay sub-basin (Pantanal), for the value of its wetland ecosystem and its key role in the water regulation of the whole Basin.

countries. The five capitals of the states that make it up are also located there: Buenos Aires, Sucre<sup>1</sup>, Brasilia, Asunción, and Montevideo.

Historic problems associated with climate variability have defined the La Plata Basin as one of the most affected in social and economic terms because of cyclical flooding and persistent periods of drought. The relationship between hydrology, changes in land use, and the behavior of the climate, along with the changes that are insinuated, raise new variables when seeking to reduce the vulnerability of the Basin to extreme natural phenomena and to tend to its environmental management.

There are also new and different challenges to overcoming the constraints imposed on the Basin countries by a persistent high percentage of the population in conditions of poverty and indigence; people who, living in a predominantly diverse and rich environment, do not have access to the benefits that this entails. In this scenario, the economic and social development required within the broader regional integration framework raises the need for great efforts in valuation, awareness-raising, and education on nature.

In recognition of these problems, the governments of the five countries that make up the CIC have relied on their revitalization to meet these new challenges, incorporating technical capabilities into the organization and setting up an Action Plan as a guide for its management.

The reevaluation of the relationship between surface and groundwater, as well as its links with climate and land use, with an approach that was first addressed in an integrated way, led to the preparation of the Framework Program, directed at a long-term management process to be implemented in a coordinated manner by the five countries within the framework of the CIC. In this effort, participating institutions agreed on the need to strengthen their common vision for the Basin, seeking to identify and prioritize universal problems and to determine their main causes in order to define a consensus management plan aiming to address them within the framework of a participatory process that includes all of the actors involved, taking into account the key role played by water resources within the framework of integrated management.

This planning effort, with regard to the sustainable management of the Basin, is summarized in this report, which reviews the activities and results achieved in the first stage of the Framework Program. The document describes the design, work structure, activities, and products achieved in each of the components and sub-components of the Project, which provided technical elements to consolidate the Transboundary Diagnostic Analysis (TDA) and Strategic Action Program (SAP). The preparation of the TDA, as a management experience, and the consolidation of the SAP, as a policy-guiding document agreed upon by the five countries to resolve or mitigate the main problems affecting the Basin, is considered an effort of global interest aimed at benefiting the sustainable development of the La Plata Basin.

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<sup>1</sup> Sucre is the capital and seat of the judiciary, while La Paz, which is not located within the La Plata Basin, is the seat of executive, legislative, and electoral bodies.





# Chapter 2: Framework Program for the Sustainable Management of Water Resources in the Context of Climate Variability and Change

## 2.1 Identification and Preparation of the Project

During the IV Inter-American Dialogue on Water Management (Foz de Iguazú, Brazil, 2001), the need to prepare a program to advance the integrated management of water resources in relation to climate in the La Plata Basin was determined. Based on this initiative, and in the context of the CIC, the Framework Program for the Sustainable Management of Water Resources in the La Plata Basin, with respect to the effects of variability and climate change was prepared (hereinafter referred to as the Framework Program), with funding from the Global Environment Fund (FMAM) and technical and administrative support from the Department of Sustainable Development of the OAS (DSD-OAS), through the United Nations Environment Program (PNUMA) as the implementation agency.

The preparation of the Framework Program (2003-2005) was also possible because of technical cooperation from the La Plata Basin Financial Development Fund (FONPLA-

TA) and because of the channeling of the World Meteorological Organization (WMO) efforts, derived from the execution of the Cooperation Agreement in force with the CIC. Phase 1 (2010-2016) was supported by the Itaipú, Yacyretá, and Salto Grande binational hydroelectric companies, as well as the UNESCO International Hydrological Programme (IHP), and the geological and meteorological services of the five countries, among other institutions .

The overall objective of the project was to strengthen cross-border cooperation between the governments of Argentina, Bolivia, Brazil, Paraguay, and Uruguay to ensure the integrated and sustainable management of the shared water resources of the Basin in the context of climate variability and change, capitalizing on opportunities for development.

### PDF Block B<sup>2</sup> (2003-2005)

During the period between November 2003 and December 2005, the Framework Program's PDF Block B was finalized, which

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2 PDF Block B is an initial request for GEF resources to prepare cooperation program and securing its funding.

made it possible to identify the actions to be carried out in the next five-year stage (Stage 1), including defining a Strategic Action Program (SAP) through a consolidated participatory process in each country and in the area of the La Plata Basin.

The development of the PDF Block B was carried out considering the following stages:

- Defining the vision of the La Plata Basin.
- The preparation of a Macro-Trans-boundary Diagnostic Analysis (Macro-TDA).
- The preparation and consensus on a Strategic Action Framework Program (PMAE or PM) to be developed in Stage 1.

The vision of the La Plata Basin was based on: (i) the United Nations Millennium Development Goals agreed upon in the year 2000 and (ii) the report *Water for the 21<sup>st</sup> Century: Vision to action - South America*, presented at the 2nd World Water Forum, held in Holland in the same year. During the Framework Program development process, each country expressed its vision through workshops and national reports, which were then integrated into a regional document, discussed and agreed upon at an international event. From this process, they were able to highlight the critical aspects of the state and behavior of water systems, as well as the main barriers that existed to overcome or mitigate the major problems and the causes that generated them in order to reach the integrated vision of the Basin.

## 2.2 The Macro TDA. Identifying the primary Critical Transboundary Issues

The Macro-Transboundary Diagnostic Analysis (Macro-TDA) was drawn up with a scientific and social base, in which the present and emerging critical transboundary issues in the La Plata Basin and their corresponding causal chains were defined. The Macro-TDA process included a series of national and regional integration workshops. First, both the main issues and the information gaps and proposals for strategic actions were defined.

The Critical Transboundary Issues (CTI) identified were:

- i. Extreme hydrological events linked to climate variability and change, particularly prolonged, recurrent, and intense floods, and the extensive periods of cyclical drought affecting parts of the Basin, with devastating social, economic, and environmental effects.
- ii. The loss of water quality, a problem caused by organic and chemical contaminants from point and diffuse sources, together with the lack of common standards and instruments to collectively determine quality parameters. In addition, limitations were identified in the control and monitoring network of the five countries, which make it impossible to carry out coherent and comprehensive diagnoses of the water quality of the rivers in the Basin.
- iii. The sedimentation of waterways and bodies of water in the Basin, which limit the capacity of waterways and ports and carry important maintenance costs, and which also fill the dams' reservoirs and alter the quality of their waters. These

processes are caused by erosion and land degradation, which has increased from changes in land use and loss of vegetation cover.

- iv. Alterations to biodiversity—particularly in river and coastal ecosystems, including wetlands—caused mainly by habitat loss and fragmentation.
- v. Unsustainable use of fishery resources due to overfishing or lack of catch protection methods. Fishing is an economic activity that provides basic food for important sectors of society, including indigenous populations and poor sectors of the population.
- vi. Unsustainable use of aquifers in critical areas, the conservation of which makes it necessary to manage them collectively with superficial and climate resources, taking sustainable development needs into account.
- vii. Water use conflicts and the environmental impact of irrigated crops, without an overall vision and capacity to generate participatory processes to achieve a balanced resolution for all actors involved.
- viii. The lack of disaster contingency plans, including dam safety, problems associated with accident and disaster prevention mainly related to the shipping and transport of hazardous and polluting materials.
- ix. Unsafe drinking water and the deterioration of environmental health and its effects on human health, pollution problems, and changes in water quality.

The consolidation of the information from the vision and the Macro TDA was ana-

lyzed in thematic workshops composed of experts from the five countries of the Basin, where they defined the strategic actions that would be included in the Stra-

tegic Action Framework Program, to be implemented in 2010-16. These actions were then approved by the countries in the CIC.

## 2.3 Framework Program of the La Plata Basin Design

Based on the results of Macro TDA, a preliminary program was defined in 2005 to solve or mitigate the main problems and to fill the information gaps. The structure of the Framework Program (FP) included four components:

- I. Strengthening cooperative capacity for integrated water resource management, with an emphasis on hydro-climatic aspects, including strengthening the CIC's capacity for coordination, planning, and management and the technical and institutional capacities of participating institutions. The objective of Component I was designed through the following subcomponents:

*I.1: Harmonization of the legal and institutional frameworks, including actions to advance the conceptual development of harmonized legal frameworks. The activities included the identification, deepening, schematization, and dissemination of concepts, legislation, and institutional structures on water-environmental topics at the national, regional, and international levels, as well as the identification of the key elements for elaborating a proposal for legal and institutional harmonization.*

This subcomponent also included the implementation of a Decision-making Support System, seeking to establish the basis for accessing, articulating, processing and integrating information related to the Basin, in support of decision-making related to the integrated management of resources, hydrological events, ex-

treme and high-risk hydrological events, droughts, and water pollution, among others.

El subcomponente incluyó también la implementación de un Sistema de apoyo a la toma de decisiones, buscando establecer las bases para acceder, articular, procesar e integrar información relacionada con la Cuenca, en apoyo a la toma de decisiones relacionados con la gestión integrada de los recursos hídricos, eventos hidrológicos extremos y de alto riesgo, sequías y contaminación de aguas, entre otros.

*I.2: Public participation, education and communication. Transverse subcomponent aimed at strengthening the active participation of civil society, increasing knowledge and interaction between organizations in the Basin and involving key social actors in order to promote greater civil society participation in development and in the sustainable management of natural resources, with particular regard for gender equity. An important instrument for this objective was the Fund for Promoting Public Participation (FPPP), aimed at promoting the involvement of civil society organizations, municipalities, private companies, and other actors in critical aspects of the Basin.*

*I.3: Monitoring and evaluation plan, including a monitoring plan that is based on the indicators defined in the Logical Framework. Indicators are a useful tool for monitoring, understood as a process of continuous evaluation of the progress and achievements of the Program, and for the distinct evaluation instances.*

II. Integrated management of water resources. A component aimed at gathering and consolidating the technical information necessary to promote the integrated management of surface-ground-water resources and their adaptation to climate variability and change. Includes the following subcomponents:

*II.1: Integrated water balance in the La Plata Basin*, activities aimed at assessing water supply and demand at the basin level, as a support tool for resource management.

*II.2: Evaluation and monitoring of water quality and pollution*, measurement of basic parameters in trans-boundary rivers and consolidation of technical capacities of the responsible national institutions in this area, working under a common regional understanding within the CIC. It also includes strengthening the basic network of monitoring in shared watercourses, in order to monitor qualitative and quantitative physical-chemical conditions.

*II.3: Integrated management of groundwater*, generating the preliminary guidelines for the integrated management of surface and groundwater in the La Plata Basin, based on the experiences of the Guaraní Project and the implementation of the Yrendá Toba Tarijeño Aquifer System (YTTAS) Management Project.

*II.4: Ecosystem management*, generating harmonized strategies and promoting activities for the conservation and sustainable use of biodiversity in the La Plata Basin, with particular attention to wetland, river ecosystem, and fish fauna conservation.

*II.5: Control of land degradation*, generating basic information on soils of the Basin, identifying critical areas, and integrating the actions carried out by different projects (Bermejo, Pantanal, Gran Chaco, and Pilcomayo).

*II.6: Opportunities for sustainable development* considers promoting projects that mitigate climate change—that encourage clean technologies and capturing greenhouse gases—and the development of an ecotourism and nautical tourism project for the islands, coasts, and wetlands of the Uruguay River.

*II.7: Implementation of Demonstrative Pilot Projects* in order to provide local management experiences and information for the preparation of the final TDA and the SAP during Phase I. It includes: (i) Pilot project for pollution and erosion control in the Pilcomayo River basin (Bolivia/Argentina/Paraguay); ii) Pilot project for a hydro-environmental warning system—floods and droughts in the confluence zone of the Paraguay and Paraná rivers (Argentina/Paraguay/Brazil); iii) Pilot project for the resolution of water use conflicts in the Cuareim/Quaraí river basin (Brazil/Uruguay); iv) Pilot project for biodiversity conservation in an area of the Paraná River with reservoirs (Argentina/Brazil/Paraguay).

III. Hydro-climatic forecasting system of the La Plata Basin and adaptation to the hydrological effects of climate variability and change, aimed at obtaining greater knowledge, technical and operational capacity in the five countries of the La Plata Basin in order to predict, with greater certainty and anticipation, the hydrological

effects of climate variability and change, and in particular to consider disaster mitigation, such as flooding and droughts and climate adaptation in the Basin.

IV. Preparation of the Transboundary Diagnostic Analysis and the Strategic Action Program. The results of Components I, II, and III provided the necessary inputs to adjust and give greater detail to the Macro TDA developed in the project

preparation stage. The consolidation of the TDA at the basin level, together with the results of the demonstrative pilot projects and the specific complementary studies allowed for a deeper Strategic Action Framework Program proposal, defining technically justified and socially approved priority strategic guidelines that were later consolidated for the formulation of the SAP, to be implemented in future stages.



# Chapter 3: Implementation of the Framework Program of the La Plata Basin 2010– 2016

## 3.1 Implementation Strategy

The implementation of the Framework Program was carried out based on the direct participation of the five countries' institutions with competencies in each of the project's thematic areas. To this end, hundreds of experts were convened on the various issues addressed, also involving the institutions and their authorities.

The countries' technical and institutional contributions for developing project activities included 14 Working Groups, covering the topics established in the Project associated with water resource management, climate variability and change, and sustainable development. They included four Demonstrative Pilot Projects, 12 Public Participation Projects, and the replication of the Cultivating Good Water Program

### Institutional Structure of the Project

- *Steering Committee (SC)*: senior decision-making authority for the implementation of the project, composed of political and technical representatives to the CIC, the CIC Secretary-General (also designated Project Director), the executing agency (UNEP), and the executing organism (OAS).
- *Implementation Coordination*: project monitoring body, composed of the National Coordinators, the Project Director, the PCU, and the GS/OAS. It met periodically to support the planning and review of project activities.
- *Thematic Groups*: organized for each subcomponent of the project, composed of one technical representative per country (total number: five representatives for each Thematic Group).
- *National Project Units (UNP)*: an inter-ministerial working group responsible for the implementation of projects in each country, made up of all the representatives of thematic groups in each of the countries, led by the respective National Coordinators.

in six micro basins in the influence area of the three existing binational hydroelectric plants in the Basin (Itaipú, Yacyretá, and Salto Grande).

These activities were attended by the majority of the competent institutions of the countries in their respective topics, which establish and/or implement agriculture, hydroelectric, navigation, and urban policies. These institutions were represented by qualified technicians very close to the decision-makers and/or by outstanding academics, all of them coordinated in each country by the respective National Coordinator.

The members of each Working Group, based on the realities of their respective institutions and the policies established in each country, and accompanied by the Implementation Coordination, updated the Transboundary Diagnostic Analysis (TDA), which since its inception has been based on the consensus of the countries, analyzing the objectives of each subcomponent and designing information-gathering activities. The initial activities were largely carried out by junior consultants in each country, supervised by the national thematic representatives and the respective National Coordination.

The participation of institutional authorities and technical and academic personnel in each country in the implementation of project's components was a key factor contributing to the process of institutional strengthening and regional integration, which achieved the coordinated and integrated approach needed to address the issues related to water in the context of climate variability and change throughout the Basin. Although the benefits of the direct participation of national institutions were highly valued during project, the dedication

in most cases was limited, which is why more exchanges were required to achieve consensus and coordination between the countries/institutions. This process motivated adjustments in the specific objectives and results of the thematic groups, without compromising the development of TDA and PAE as final products of the project, which were completed and added to the important involvement of governmental and academic institutions.

According to the characteristics of the themes of each subcomponent, agreements were made for the development of analysis tools, equipment priorities were established, and integrative consultants were contracted by each WG, generally associated with technical and/or academic institutions appointed by each country.

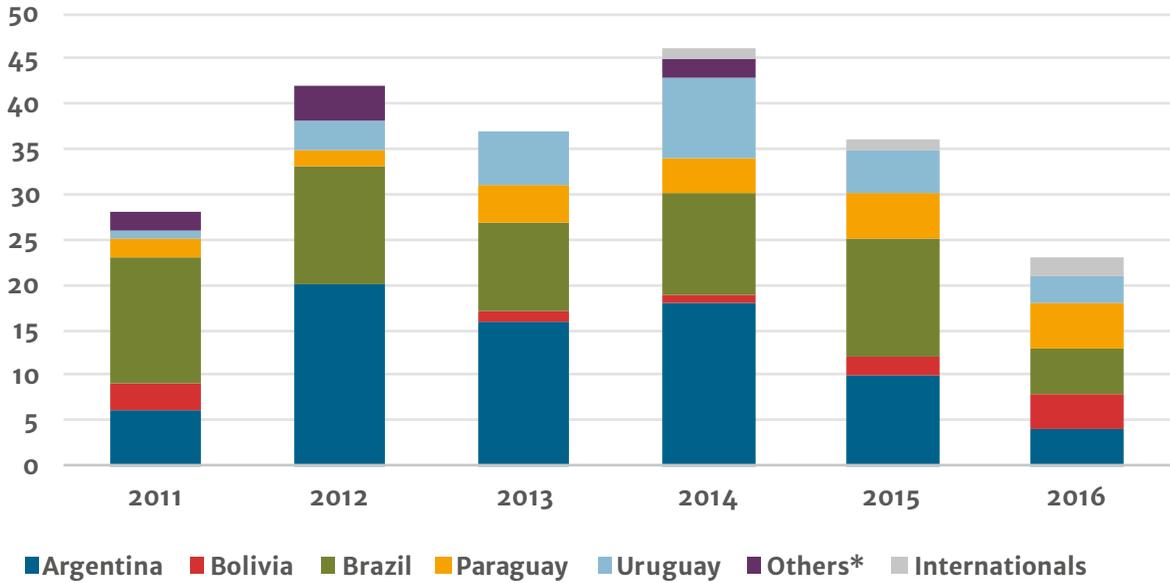
Altogether, the activities and processes involved the active presence of more than 1500 technicians from the five countries, involving more than 150 institutions. A total of 212 events were carried out with more than 4000 participants (**Figure 3.1.1** and **Figure 3.1.2**).

This qualified and committed participation, resulting in a direct appropriation of project development, facilitated the Transboundary Diagnostic Analysis (TDA) and made it possible to establish a Strategic Action Program (SAP) integrated into the development policies and treaties of each country at the level of international agencies and conventions, such as the World Meteorological Organization (WMO) or the international conventions on Wetlands (Ramsar), Biodiversity, Desertification and Climate Change, among others.

The authorities of these institutions, either directly or through their technicians, enriched the PAE with contributions and

Figure 3.1.1

**Distribution of FP events by year and by country**

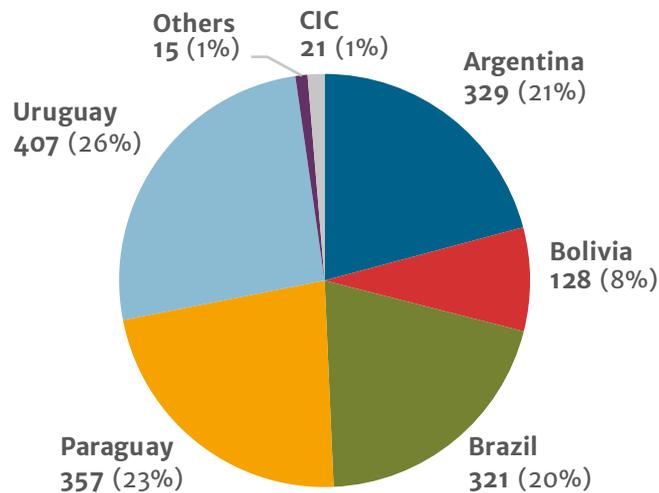


During the management period, the FP made between 23 and 46 events per year, in each of the five countries of the Basin, in binational entities and in international environments.

(\*) Events carried out in binational or virtual entities

Figure 3.1.2

**Participants in FP events by country**



In all of the events organized by the Framework Program, the 1578 participants were either from the five Basin countries (98%), CIC personnel, or international officials.

guidelines that helped define important projects in the natural resource management—in particular water resources—that allowed for the deepening and expanding of the sustainable development of the Basin<sup>3</sup>.

The execution of the FP was based on four components, each containing the 14 Working Groups indicated in **Table 3.1.1**. A description of each of component, and the results obtained, are detailed in the following chapter.

**Table 3.1.1**

**Framework Program Components and Working Groups**

<b>WG Subcomponent</b>	<b>Working Group (WG)</b>
<b>I. Strengthening cooperative capacity for integrated water resource management</b>	<ol style="list-style-type: none"> <li>1. Legal and institutional framework</li> <li>2. Decision-making support system</li> <li>3. Public participation, communication, and education</li> </ol>
<b>II. Integrated management of water resources</b>	<ol style="list-style-type: none"> <li>4. Integrated hydraulic balance</li> <li>5. Evaluation and monitoring of water quality and quantity</li> <li>6. Integrated groundwater management</li> <li>7. Aquatic ecosystem management</li> <li>8. Land degradation</li> <li>9. Opportunities for sustainable development</li> </ol> <p><i>Demonstrative Pilot Projects:</i></p> <ol style="list-style-type: none"> <li>10. Biodiversity</li> <li>11. Confluence</li> <li>12. Cuareim/Quaraí</li> <li>13. Pilcomayo</li> </ol>
<b>III. Hydro-climatic models</b>	<ol style="list-style-type: none"> <li>14. Hydro-climatic models and adaptation scenarios</li> </ol>
<b>IV. Preparation of the TDA and the SAP</b>	All 14 working groups participated

<sup>3</sup> The Mid-Term Evaluator, designated by the GEF, has stated: "the project has catalyzed a level of national ownership rarely found in GEF/International Waters projects, and tangible strengthening of cross-border cooperation between riparian national governments . . . The high level of ownership demonstrated by national stakeholders at all levels is a good sign of the project's success in achieving its objectives and for the future sustainability of its results."

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Technical Meeting at the Beginning of the Project  
(Brazil, 2011)



Second Steering Committee Meeting  
(Argentina, 2011)



Ninth Steering Committee Meeting  
(Bolivia, 2016)

### 3.2 Outcomes and Products

The key products of the Framework Program were the updating of the TDA with information associated with the effects of climate variability and change, as well as the formulation of the long-term La Plata Basin SAP.

During the execution of the FP, technical and institutional capacities were strengthened at the national and Basin levels within the scope of the CIC. In particular:

- Regarding CIC authorities, 11 steering committee meetings and 20 implementation coordination meetings were held with political and technical authorities from the five countries.
- At the national level, the National Coordination Units in the five countries met at the beginning of the project to review and process the project document and, at the end, to provide contributions to the updated TDA and the SAP. During the project execution process, each country carried out its internal process according to its own criteria.
- There were meetings on groundwater held as an interinstitutional knowledge exchange, involving more than a hundred technicians (Salta, Argentina, 2012), meetings on hydro-climatic models (Sao José dos Campos, Brazil, 2012), on best practices for irrigated crops (Porto Alegre, Brazil, 2014), and on the Ramsar initiative (Asuncion, Paraguay, 2015), among others.
- Trainings were designed according to the needs identified by the various thematic groups and involved more than 700 professionals during 26 events on surface and integrated water balance, collection and preservation of water quality samples, measuring liquid discharges in large rivers, cartography associated with groundwater, conservation biogeography, land use maps, environmental education and project development, use of hydro-climatic scenario models (ETA-INPE), use of satellite imagery for hydrology and environment, and use of radar data, among others.
- The replicability of the Itaipú Cultivating Good Water Project in six micro basins of the three cross-border hydroelectric plants, summoning more than 300 people from the region that included the various social actors involved in management.
- The project also had a place at international events, including the FMAM Biennial International Water Conferences (2011, 2013, and 2015), the VI World Water Forum (2012), the Stockholm World Water Week (2012), the Fourth International Conference on Climate Services ICCS (2014), the Water Technology Conference (2015), and the Meeting of Latin American Youth for Sustainable Development (2015). It also supported the participation of the five countries in national events related to water resources, such as the Paraguayan Congress of Water Resources (2015), the National Water Congress in Argentina (2015), the RIOS Conference in Montevideo (2015), among others.



Meeting of Latin American Youth for Sustainable Development  
(Honduras, 2015)



8th FMAM International Water Conference  
(Sri Lanka, 2016)



CIC Stand – Framework Program in the 6th World Water Forum  
(Francia, 2012)

A summary of the activities carried out and the results achieved by the 14 Working Groups on which the implementation of the Framework Program was structured are presented below, taking into account the context of action and the methodology on which action was taken with the updating of the TDA and the formulation of the SAP in mind. A table is also included with the institutions of the five countries that have participated in each of the WGs.

### 3.2.1 Legal and Institutional Framework

#### ***Background and context***

In the five countries that make up the La Plata Basin there is a broad legal framework for the environmental management and protection, especially of water resources, which is integrated with national, provincial, state, or municipal provisions that are constitutional, legal and regulatory in nature. In the Basin countries there are different political and administrative structures, with different levels of institutional development and technical capacities for natural resource management.

There is a gap between the legal framework and its practical application. In general, countries have developed an important body of legislation and, following regional and international trends, have incorporated principles and tools in line with the need for natural resource management and protection, and in some cases, take climate change into account. Institutional reasons are invoked, such as shortages of human and financial resources, lack of training, centralized organizations removed from local problems, and other factors also carry weight, such as the lack of regulation based on scientific knowledge, lack of regulation by users, water use customs, lack of participation, diffusion, etc.

#### ***Methodology***

This subcomponent focused its objectives on consolidating the principles of Integrated Water Resources Management (IWRM). To this end, it promoted the participation and strengthening of national and sub-national institutions responsible for issues related to water resources, natural resources, economic development, climate, public health, sanitation, land use planning, fisheries, wildlife, and agricultural agencies.

In order to strengthen institutional capacity and coordinate sustainable development management in order to obtain environmental benefits at the regional level, it was decided that countries should act together in four main areas: a) integration and deepening of knowledge of legal foundations, with a unified approach to water, land, and climate management, with an approach based on ecosystems; b) institutional coordination for sustainable management among the five countries and the strengthening of their technical and managerial capacity; c) interactive inclusion and meaningful participation of institutional actors and civil society organizations; d) articulation, integration, processing, and ability to analyze and disseminate information to facilitate decision-making in a safe and responsible manner.

In order to strengthen joint management capacity, the different legal and institutional frameworks already in place in the five countries that make up the Basin were all taken into account.

The work was carried out by consultants hired in the five countries, who in some cases analyzed the issues concerning their own countries and, in others, dealt with international and/or regional issues. The activities of the group were coordinated by

CIC representatives, with the collaboration of the Project Coordination Unit.

### **Results**

Through the implementation of this sub-component the necessary arrangements were made to allow for the participation of different inter-ministerial bodies, from both the National Project Units (NPU) and the subnational ones. It also sought to strengthen the technical and legal conditions needed to support the CIC and the national institutions in activities to promote integrated hydro-climatic management, the formulation of the Strategic Action Program (SAP), and its subsequent implementation. These activities were considered essential to strengthen capacities for the management and exchange of information, the analysis of the legal framework for integrated management of water resources based on hydro-climatic scenarios, providing inputs for the coordination and supervision of project implementation.

The specific outputs and results of the work carried out in this subcomponent include:

- *Survey of national legislation:* Summaries of legislation on water resources and the environment currently in force in the countries were obtained, which served as a basis for developing other products and for identifying needs for harmonizing legislation. A compilation and systematization of the constitutional provisions of the five countries was also carried out.
- *Survey of international treaties and conventions:* A document was compiled that groups together the conventions, treaties, agreements, and all of the international treaties of which the countries of the La Plata Basin are involved related to the topics covered in the Framework Program, and the international instruments common among countries.
- *Analysis of the institutional legal framework:* Conclusions were reached regarding the legal and institutional framework in the countries of the La Plata Basin related to water resource management and the treatment of Critical Transboundary Issues, identifying common principles and concepts, harmonization needs, and gaps in legislation. Proposals were drawn up for actions to harmonize the legal and institutional framework to facilitate and promote the treatment of critical transboundary issues and integrated water resource management within the scope of the CIC.
- *Institutional strengthening:* Conclusions and recommendations were reached regarding the need for strengthening the coordination and implementation of IWRM action throughout the La Plata Basin, and the treatment of Critical Transboundary Issues at the national and regional levels. The analysis included the status of binational and regional institutions and agencies active in the region involved in the treatment of CTIs and IWRM, identifying existing coordination mechanisms and strengthening and cooperation needs. Finally, a proposal was made for lines of action to strengthen the institutional capacities of the CIC in its relationship to and interaction with national institutions for SAP implementation.
- *Characterization of the legal regulations and institutional structure in the countries:* Conclusions were reached regarding the regulations and institu-

tional structure of the La Plata Basin System in relation to its capacity for treating the CTIs and IWRM, identifying management recommendations with the intent to draw up the Strategic Action Program. The document integrated the results achieved by the other three consultancies mentioned and identified the existing legal gaps. A consolidated transboundary diagnostic analysis of the legal and institutional situation was carried out and the need to strengthen the CIC's capac-

ity was analyzed by formulating a proposal to enable the implementation of the actions prioritized in the SAP.

- *Institutional and Legal Framework for the Integrated Management of Water Resources in the La Plata Basin publication:* This document was edited and published as a foundational material for consultation and reference on the subject, directed at water managers and technicians from different state organisms in the five countries.

Table 3.2.1.1

### Institutions Participating in the Legal and Institutional Framework WG

Country	Institutions
<b>Argentina</b>	Ministry of Foreign Affairs and Education, Under-secretariat of Water Resources (SSRH), Ministry of Environment and Sustainable Development (MAyDS)
<b>Bolivia</b>	Ministry of Foreign Affairs, Embassy of the Plurinational State of Bolivia in Argentina
<b>Brazil</b>	Ministry of Foreign Affairs, Secretary of Urban Environment and Water Resources (SRHU / MMA)
<b>Paraguay</b>	Ministry of Foreign Affairs, Embassy of Paraguay in Argentina, Secretary of the Environment (SEAM),
<b>Uruguay</b>	Ministry of Foreign Affairs; Ministry of Housing, Land Use, and Environment (MVOTMA)



Launching of the Framework Program with senior authorities from the five countries  
(Buenos Aires, 2012)



Cover of the book Institutional and Legal Framework  
for the Integrated Management of Water Resources  
in the La Plata Basin



Base map of the La Plata Basin available for  
1:3,000,000 scale printing and including all layers of  
information in the DSS GIS.

## 3.2.2 Decision-making Support System

### **Background and context**

The Decision-making Support System (DSS), implemented as a support for IWRM, aims to establish the foundation for accessing, articulating, processing, and integrating information related to the Basin, and making it available to the SG-CIC in support of decision-making for the integrated management of water resources. The system focuses mainly on the development of a future operational tool useful in the occurrence of extreme and high-risk hydrological events (floods, droughts, water pollution, and forecasting of natural or man-made disasters with transboundary effects), based on water use and climate variability and change.

### **Methodology**

The activities were carried out by specialists from the five countries, following the guidelines of the project document together with the guidelines arising from the Implementation Coordination and approved by the steering committee. Specialists met on numerous occasions to discuss the objectives, content, and design of the DSS. For the software development of the system, the International Center for Hydroinformatics (CIH) of UNESCO, of the Itaipú Technological Park (PTI) was contracted.

### **Results**

A decision-making support system was implemented to strengthen the water resources management capacity of the Basin by facilitating access to information necessary for regional decision-making. To this end, the DSS provides access to information generated by the institutions governing water and environmental resources in the

five countries and other regional and extra-regional sources through an integrated computer platform. It has six nodes that are operated from the five countries and the CIC, using a communication structure that allows data exchange with the servers in the institutions that generate hydro-environmental information in the countries.

The system currently provides the base map of the La Plata Basin, thematic mapping developed by the Framework Program and historical records of hydro-meteorological variables in some countries. It also houses some information generated by other projects previously implemented in the Basin. Its modular design allows for the future incorporation of more information and tools for the processing of this information in the future, through which it will be possible to analyze issues related to these issues at the regional level. It operates on a computer platform that uses free software, allowing the institutional information that the countries publish to be seen and to formulate consultations. Through a simple interface it is possible to obtain results and reports designed in an interactive way through maps and graphs.

- *Base Map of the La Plata Basin:* A cartographic product was obtained consisting of a map of the LPB in 1:3 million scale, and a geodata base on a 1:250,000 scale that was used as base map of the support system. The product was developed with the participation of representatives of the five countries, who, through numerous instances of correction and verification of the information, made it possible to obtain the most accurate integrated map of the Basin that exists at the moment. It should be mentioned that the last map of the LPB as a whole was drawn up by the OAS in the 1970s.

- *Installed hardware and communications infrastructure:* A computer network was implemented, integrated by six nodes installed in the five countries, and the CIC is able to communicate with one another and with the institutions generating the information that the system provides.
- *Main software and consulting and reporting applications:* A specific software was implemented capable of linking the DSS with the institutions generating hydro-climatic information for the region and responding to queries from the users.
- *Human resources for system administration:* A group of administrators sufficiently trained to operate the system in the countries and the CIC was formed.
- *Publication Decision-making Support System in the La Plata Basin:* Database and thematic mapping: This document was edited and published as a foundational material for consultation and reference geared toward those responsible for water management and technicians from different state organisms in the five countries.

Table 3.2.2.1

### Institutions Participating in the Support System WG

Country	Institutions
<b>Argentina</b>	Under-secretariat for Water Resources (SSRH), Ministry of Environment and Sustainable Development, National Water Institute (INA)
<b>Bolivia</b>	Ministry of Foreign Affairs, Military Geographic Institute, Ministry of Environment and Water (MMAYA)
<b>Brazil</b>	Superintendent of Information Technology of the National Water Agency, Binational Itaipú (IB), International Center for Hydroinformatics (CIH), Ministry of Foreign Affairs, Secretariat of Urban Environment and Water Resources (SRHU/MMA)
<b>Paraguay</b>	Secretary of the Environment (SEAM), Faculty of Engineering of the National University of Asunción (FIUNA)
<b>Uruguay</b>	Ministry of Housing, Land Use, and Environment (MVOTMA), Uruguayan Institute of Meteorology (INUMET), University of the Republic (UDELAR), Mixed Technical Commission of Salto Grande (CTM-SG)



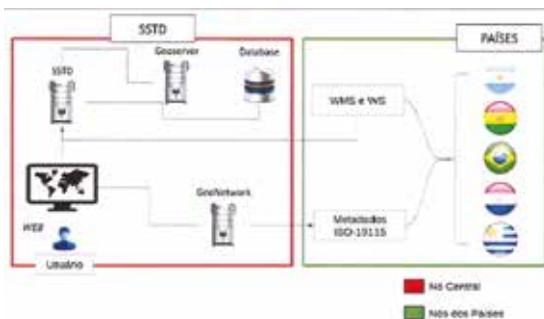
DSS Training for Argentina, Brazil, Paraguay, and Uruguay



DSS Conceptual Scheme



Cover of the publication "Decision Support System of the La Plata Basin".



Architecture of the DSS



Training and launching of the node in Bolivia

### 3.2.3 Public Participation, Communication, and Education

#### ***Background and context***

The importance of public participation in environmental protection and sustainable development has increased worldwide and is a sensitive topic for the La Plata Basin. This process involves strengthening democracy and raising awareness on the sustainable management of natural resources and the environment as a responsibility of state institutions and civil society. Awareness of the need for public participation in development-related activities has grown in local governments, in some cases conditioned by the opening of channels and opportunities for participation in management processes. Given the size of the La Plata Basin, developments were laid out in the form of demonstrative pilot projects, projects financed by the Fund for Promoting Public Participation and micro basin management replicating the Cultivating Good Water program of Binational Itaipu, considering fundamental experiences for the design of the SAP.

#### ***Methodology***

Through this subcomponent, public participation was promoted in a comprehensive and transverse way throughout the implementation process, ensuring the adequate participation and involvement of the public and private sectors as a whole.

The subcomponent included a WG consisting of one representative per country, together with the works carried out using the guidelines arising from the document produced by the Implementation Coordination and resolved by the Steering Committee. Both the public and private sectors were involved in carrying out the activities,

through ministries, universities, NGOs, companies, and organized civil society groups, in particular in the four Demonstrative Pilot Projects that form part of the Framework Program.

The development of the Cultivating Good Water Priority Project was carried out by representatives of the six micro basins involved, representatives of the Itaipu Cultivating Water Program, the WG, and the Framework Program coordination unit. Regular meetings were held to assess the progress of program implementation in each micro basin.

To implement the Fund for Promoting Public Participation (FPPP), two Terms of Reference were developed and agreed upon by the five countries. Based on these terms, two public calls were made for project proposals related to critical transboundary issues in the Basin and promoting public participation. A total of 12 subprojects were implemented.

#### ***Results***

The Framework Program has sought to consolidate the current participatory processes—which in some cases are fragmented—and to promote the promotion of joint activities with the various sectors involved, with special emphasis on civil society organizations. It has also sought to respond to deficiencies in the proper management of information gleaned during the project preparation stage, as well as to the lack of awareness in defining actions aimed at promoting decision-making on environmental protection based on appropriate information and with the participation of all stakeholders, taking into account gender equality and the inclusion of indigenous peoples and vulnerable populations.

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Civil society, the academic sector, and state authorities of different levels have been involved in implementing the four DPPs, which have been strengthened to meet each of the DPPS' objectives. In some cases new legal and academic structures have been created, a product of the needs particular to each case and the local demand. All activities have been accompanied by training in environmental education and in some cases specific research has been carried out to better understand the dynamics of water resources and their physical and biological environment.

- *Implementation of the Priority Project Cultivating Good Water:* A product of the joint work of different local actors, mainly micro-enterprises and various other sectors (agriculture, recycling, beekeepers, medicinal plants, etc.) was implemented. This activity has been implemented in the areas of influence of the main binational hydroelectric plants of the Basin: Itaipú, Yacyretá, and Salto Grande. The activities were mainly focused on six micro basin where the

participatory approach was replicated with a focus on territorial and water resource management that establishes the watersheds as a management unit and places water as a central axis of interconnection and motivation. Through this activity the interaction of hydroelectric plants with the community in their areas of influence through the CIC has been achieved.

- *Implementation of the Fund for Promoting Public Participation:* Twelve socio-environmental subprojects were carried out that were implemented mainly in the areas of DPP influence, binationally in most cases. These activities were developed by civil organizations, universities, and NGOs. They had a strong impact on the DPP localities in the Cuareim/Quaraí and Confluence areas due to the great flooding that occurred in December 2015 and April 2016, where civil and public organizations worked together to face this extreme event in a more coordinated and efficient way through the implementation of these sub-projects. Environmental education and communication has also been addressed with great success.
- *Dissemination of project information:* The project website ([projectscic.org](http://projectscic.org)) was established, in which all the documents of the Framework Program were made available, and which is periodically updated with news from the La Plata Basin and about the events that take place within the framework of the project. Informational materials such as banners, brochures, and videos were also produced. The project and its activities were promoted through different types of media.
- *'Fund for Public Participation Projects. A Replication of the Cultivating Good Water*

*Program' publication:* This document was edited and published as a foundational material for consultation and reference

on the topic, directed at water managers and technicians in different types of state organisms in the five countries.

Table 3.2.3.1

### Institutions Participating in the Public Participation, Communication, and Education WG

Country	Institutions
<b>Argentina</b>	Ministry of Environment and Sustainable Development (MAyDS), Mixed Technical Commission of Salto Grande (CTM-SG), Yacyretá Binational Entity (EBY)
<b>Bolivia</b>	General Directorate of Biodiversity and Protected Areas, Ministry of Environment and Water (MMAyA), Ministry of Foreign Affairs
<b>Brazil</b>	Ministry of Foreign Affairs, Binational Itaipú (IB), Secretary of Urban Environment and Water Resources (SRHU), Paulista State University (UNESP), ECOAR Institute
<b>Paraguay</b>	Secretary of the Environment (SEAM), Secretary of Information and Communication (SICOM), National University of Pilar, Yacyretá Binational Entity (EBY), Binational Itaipú (IB)
<b>Uruguay</b>	Ministry of Education and Culture (MEC), Presidential Secretary of Communication, National System of Protected Areas (SNA), University of the Republic (UDELAR), National Directorate of Aquatic Resources (DINARA), Mixed Technical Commission of Salto Grande (CTM-SG)

Note: The institutions directly involved in the Demonstrative Pilot Projects are included in the chapters corresponding to each one.



Meeting with the bricklayers and Sanders of the Cuareim/Quaraí DPP.



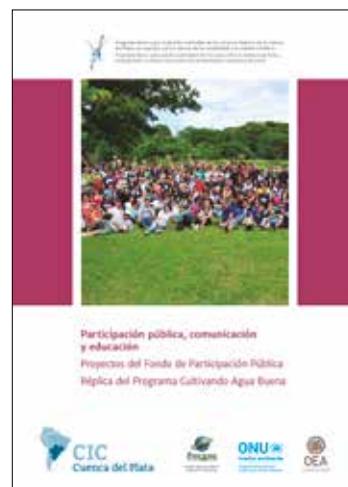
Student discussion in the parents' school during the dynamic workshop "Height Negotiations" in the Confluence DPP



First international workshop on Integrated Rainwater Management in Polder Cities in Pilar, Paraguay



Framework Program website, in Spanish and Portuguese



Cover of the document Fund for Public Participation Projects. A Replication of the Cultivating Good Water Program

### 3.2.4 Integrated Water Balance

#### **Background and context**

The assessment of a basin's water balance is an important tool for decision-making, especially when it involves several countries and actors. The use of various emerging techniques for calculating water balance allows for detailed assessments of water resources for use by decision-makers. In fact, interdisciplinary tools within the integrated water balance (IWB) approach provide water resource planners with an instrument for determining the distribution and control of freshwater resources, taking into account temporal and spatial constraints.

Argentina, Bolivia, and Paraguay carried out a surface water balance (SWB) in the 1980s and 1990s. Since that date, some countries continued to work nationally, reaching different levels of progress, but did not achieve a Basin-wide product.

The Macro TDA made it possible to discover that the authorities of the Basin lacked a detailed analysis and a global vision of water balance, due in part to sectoral biases. There was also no comprehensive Basin assessment linking groundwater strategies with those of surface water management and the alignment of those strategies with those related to critical management challenges such as drought, water shortage, or a method of analysis for risk factors associated with reduced water availability as a result of climate variability and change. To remedy these shortcomings, an integrated assessment of the distribution, use, and demand of water in the Basin was required as a diagnosis.

#### **Methodology**

The Water Balance Working Group was composed of one representative per coun-

try and its activities followed the guidelines of the project document, together with the directives arising from the Implementation Coordination and approved by the steering committee.

The first activity of the subcomponent was compiling background and fundamental information through junior consultancies at the national level. Based on this information, and as established by the WG, the surface water balance of the La Plata Basin was calculated following the Téméz-CHAC methodology. A manual was developed for the implementation of this methodology in the Basin and a training workshop took place that was attended by professionals from the five member countries. Subsequently, the SWB was implemented through national consultancies.

The methodology for estimating water use and demand was agreed upon by the working group and implemented nationally in each country. It includes the following uses: domestic, agricultural, livestock, industrial, and mining.

In the framework of the Demonstrative Pilot Projects, the SADr-IPH management model was implemented through two consultancies. The SADr-IPH model is an integrated water balance calculation methodology for river basin management purposes.

#### **Results**

The first phase of the Framework Program has focused on surface water balance, the analysis of demand, and progress has been made on the groundwater analysis, leaving pending only the integration of the three components to complete the integrated water balance management tool for the Basin, an integration that was realized at Basin level in the Cuareim/Quaraí pilot project.

The Surface Water Balance was calculated nationally in each country using the Témez-CHAC Model monthly, with the exception of Brazil, where the Large Watershed Model (MGB) was implemented, which is a daily time step model that was aggregated monthly so that it could be integrated into the other countries' results.

- *Water balance information diagnostic in the La Plata Basin*<sup>4</sup>: Inventory of cartographic, hydro-meteorological, and climatological information, as well as information on demand and use in the Basin, integrated in a common format. This constituted the baseline for developing other activities for the water balance subcomponent and for estimating water use and demand in the La Plata Basin. It also provided an information database that is part of the Decision-Making Support System (DSS) of the Basin.
- *Estimation of water use and demand in the La Plata Basin at the national level*: Analysis of water use and demand in the La Plata Basin at the provincial/state/ministerial level, which forms one of the two variables of water balance. An inventory of information on use and demand was also carried out.
- *Calculated surface water balance for the entire Basin at the national level*: Implementation of a methodology for calculating surface water balance throughout the Basin, which paves the way for guidelines on the use of water resources and serves as a foundation for planners and policy-makers planning hydraulic projects. National information needs to be modeled at the Basin level as a future step.
- *Integrated water balance calculated for the Cuareim/Quaraí basin*<sup>5</sup>: Implementation of a management model that takes into account water use and demand and the availability of water resources to determine the integrated water balance of the Cuareim/Quaraí basin, following the SADR-IPH hydrological management model. This product provides water resource planners with a quantitative, temporal, spatial, and detailed assessment of water resources considering their availability and demand, which is an important input for IWRM.
- *Publication*: 'Water balance in the La Plata Basin. Availability and use, considering future scenarios. Management models': It is a basic material for consultation and reference on the availability of water resources in the La Plata Basin, a tool which can be potentially used in water resource use management in the Basin.

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<sup>4</sup> Information generated in the Hydroclimatology WG.

<sup>5</sup> Information generated in the Cuareim-Quaraí Demonstrative Pilot Project

Table 3.2.4.1

### Institutions Participating in the Water Balance WG

Country	Institutions
<b>Argentina</b>	Under-secretariat of Water Resources (SSRH), National Water Institute (INA), National University of Córdoba (UNC), National Weather Service (SMN), Institute of Agricultural Technology (INTA), Faculty of Engineering and Water Sciences, Litoral National University (FICH-UNL), Federal Water Council (COHIFE), Faculty of Agricultural Sciences, National University of Entre Ríos (UNER)
<b>Bolivia</b>	National Meteorology and Hydrology Service (SENAMHI), Ministry of Environment and Water (MMAyA)
<b>Brazil</b>	Institute of Hydraulic Research, Federal University of Rio Grande do Sul (IPH – UFRGS), International Center for Hydroinformatics (CIH), University of San Pablo (USP), Secretary of Environment and Water Resources of Goiás (SEMARH), Binational Itaipú (IB), Brazilian Geological Service (CPRM)
<b>Paraguay</b>	Secretary of the Environment (SEAM), Yacyretá Binational Entity (EBY), Engineering Faculty, National University of Asunción (UNA), International Center for Hydroinformatics (CIH), Paraguayan Association of Water Resources (APRH), Nuestra Señora de la Asunción Catholic University (UCA)
<b>Uruguay</b>	Ministry of Housing, Land Use, and Environment (MVOTMA), Institute of Fluid Mechanics and Environmental Engineering, University of the Republic (IMFIA), Mixed Technical Commission of Salto Grande (CTM-SG), National Institute of Agricultural Research (INIA), International Hydrological Program (PHI) UNESCO, University of the Republic (UDELAR) North Region



### 3.2.5 Evaluation and Monitoring of Water Quality and Quantity

#### **Background and context**

The natural resources of the La Plata Basin are of vital importance to the environment and to the social and economic development of the region. Water quality degradation is a critical and emerging issue in the Basin, a consequence of pollution and sedimentation processes.

Industrial and mining activities and untreated sewage discharges cause chemical and organic pollution, to which must be added diffuse pollution, whose main origin is agricultural activity.

Increased erosion due to human processes and land degradation due to changes in land use and deforestation leads to sedimentation that affects the navigability of waterways and ports, the filling of reservoirs, and degradation of water quality, generating higher maintenance costs with consequences on the human use of water resources and on the diverse ecosystems of the Basin.

The transboundary factor associated with sediment transport plays an important role, since the areas which generate and receive sediment within the Basin are distinct, very distant from each other, and involve different countries. Therefore, the search for solutions can only advance if this problem is considered through a global approach.

Pollution and sedimentation, coupled with increasing pressure on natural resources and current development trends, indicate the need to define common action plans and policies for mitigation and to establish a system for monitoring water quality

with common or shared standards among the five countries, allowing a coherent and complete diagnostic of water quality.

#### **Methodology**

The activities were organized by the corresponding Working Group, which was responsible for the direct planning and execution of the products within the framework of the guidelines of the project document, together with the directives arising from the Implementation Coordination and approved by the steering committee. Regular meetings were held in which the WG agreed on the activities to be carried out, the methodology to be followed, and the corresponding budget.

With respect to the products obtained, which are listed below, the collection of foundational and background information was carried out with the support of junior consultants. The monitoring campaigns were developed through the contracting of national institutions jointly between the five countries. Prior to carrying out the campaigns, the laboratories in each country selected to analyze the samples participated in an inter-calibration conducted by the Global Environment Monitoring System (GEMS), a UNEP program. All the data obtained from the campaigns were integrated, consolidated, and analyzed through an integrative consultancy. The estimation of the point source and diffuse pollution was done through an international consultancy that worked closely with the WG.

#### **Results**

The objective of the subcomponent was to develop a regional knowledge base within the framework of the CIC, to establish a common set of measurement param-

ters, to carry out an inventory of pollution sources, and to develop a protocol for the monitoring of water quality and quantity in the Basin, taking advantage of the technical advances in the area and enriching them from the cooperation between the five countries involved.

In response to the problem, and based on the background data collection, two monitoring campaigns were carried out between the five countries to obtain a current status of surface water quality in the Basin. Likewise, point source and diffuse contaminant loads were estimated. The subcomponent also included purchasing equipment for monitoring flows and training professionals from the countries in their use.

The specific outputs and results of the work developed in this subcomponent include:

- *Collecting background information:* Compilation of background data from monitoring campaigns carried out in the Basin. Identification of monitoring points of interest, of existing protocol, and of a comparative analysis of current legislation in the countries with respect to water quality. This information was the basis for developing the La Plata Basin Methodology Guide and designing the monitoring campaigns.
- *Methodological guide:* Guide in which the stations are established, the set of sampling and analysis parameters and protocol for the evaluation of water quality. The Guide was agreed upon by the five countries and is of paramount importance to ensure that the results of monitoring campaigns are compatible and samples are taken properly under common protocols for further analysis. It was carried out based on a preliminary methodological guide that was es-

tablished in 2005 during the preparation phase of the project. This guide will be taken as a basis for the next monitoring campaigns carried out in the Basin to ensure harmonized monitoring in cooperation with national.

- *Water quality and quantity monitoring campaigns:* Through the two monitoring campaigns carried out during the project, a database of field and laboratory parameters was formed that painted a clear picture of the current state of surface water resources of the Basin. The analysis of the results yielded the strategic actions for the TDA and the SAP. The important to note that the campaigns were designed and carried out by the national institutions involved in water resource management of each country, not by external companies, thus strengthening the capacities of these institutions and the linkages between them.
- *Analysis of point source and diffuse pollution:* Estimation of contaminant loads of point and diffuse origin in the La Plata Basin, based on information collected and provided by the countries. The estimates were made with a regional focus and an effort to make the information compatible for each sub-basin in such a way that it was consistent and allowed for valid comparisons for the whole Basin. Through the results it was possible to determine the significant contributions of pollutants in each sub-basin. Within the framework of this product, the installed capacity and the strengths and weaknesses of the institutions involved in assessing water quality and quantity in the five countries were also evaluated.
- *'Quality and quantity of water in the La Plata Basin' publication:* This document was edited and published as a foundational

material for consultation and reference on the diagnosis of the surface water quality in the La Plata Basin, a tool di-

rected at those responsible for river basin management of different state agencies in the five countries.

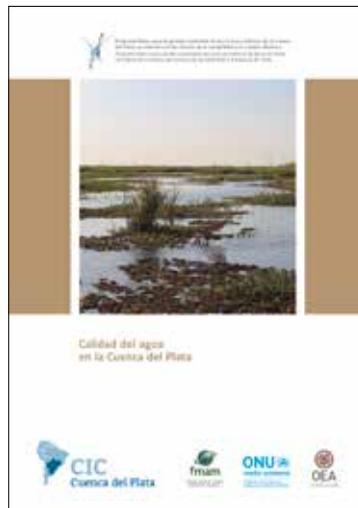
Table 3.2.5.1

### Institutions Participating in the Water Quality WG

Country	Institutions
<b>Argentina</b>	Under-secretariat of Water Resources (SSRH), National Water Institute (INA), Ezeiza Atomic Center (CAE), Resources Evaluation S. A. (EVARSA)
<b>Bolivia</b>	Ministry of Environment and Water (MMAYA), National Naval Hydrography Service (SNHN)
<b>Brazil</b>	National Water Agency (ANA), Paulista State University (UNESP), Environmental Institute of Paraná (IAP), Brazilian Geological Service (CPRM)
<b>Paraguay</b>	Secretary of the Environment (SEAM), National University of Asunción (UNA)
<b>Uruguay</b>	National Environment Directorate (DINAMA), National Directorate of Water (DINAGUA)



Measuring the flow of the Cuareim/Quaraí River during a workshop, using ADCP and M9 acoustic meters ADCP y M9 based on the Doppler effect.



Cover of the publication "Water Quality in the La Plata Basin"

### 3.2.6 Integrated Groundwater Management

#### **Background and context**

Essential to Integrated Water Resources Management (IWRM) is the consideration of groundwater due to the need to improve the characterization of aquifers and management practices, facilitating the joint management of surface and groundwater.

In the LPB, the natural development of urban and rural populations, associated with the sharp incline in agricultural and industrial activities, has increased water resource use—groundwater in particular—in a significant way. This growth, as expected, in addition to demographic parameters, is due to the intrinsic characteristics of aquifers, such as the occurrence of potentially productive units and the groundwater quality.

With the growth of cities, water supplies—particularly aquifers—are often overexploited or contaminated, with a subsequent risk to the health of the population. Deep aquifers have little or no connection to the surface waters of the Basin. However, the recharge areas of these aquifers, including the Guaraní, coincide with vast areas of the Basin where the aquifer's delineating rocks surface. The protection of these recharge areas should therefore be part of the joint integrated management of the Basin. In general, the level of knowledge about these deep resources is scarce, limited to the identification of areas where oil exploration and deep-well drilling have occurred.

In addition to the Guaraní Aquifer System, priority aquifers have been identified within the Basin, such as the Yrendá-Tobá-Tarijeño Aquifer System (YTTAS). YT-

TAS is a system of great regional importance, with extreme water shortage in a semi-arid climate, and with brackish and salty groundwater in the area of transit and discharge. In fact, approximately 80 percent of the population in the YTTAS area does not have access to drinking water. The potential impacts of climate change (including increased desertification) in this region of social vulnerability led countries during the UNESCO/OAS First ISARM Americas Program Coordination Workshop, held in Montevideo (Uruguay) in 2003, to establish the YTTAS as a priority area for implementing a sustainable and integrated management approach.

#### **Methodology**

The activities of this subcomponent were organized primarily by the corresponding Working Group, which was responsible for the direct planning and execution of the products within the framework of the guidelines of the project document, together with the directives arising from the Implementation Coordination and approved by the steering committee. Regular meetings were held in which the WG agreed on the activities to be carried out, the methodology to be followed, and the corresponding budget.

Geological services or similar entities from the countries participated actively in carrying out the activities of this subcomponent throughout the project.

The collection of baseline information took place with the support of junior consultancies. On the other hand, the hydrogeological map of the La Plata Basin was made entirely by counterparts from the countries and under the coordination of the Brazilian Geological Service (CPRM), which integrated the map through international workshops.

In these workshops, professionals from the five countries were trained in the application of the methodology for developing hydrogeological maps.

The activities for the Yrendá-Tobá-Tarijeño Aquifer System (YTTAS) were developed by the WG with the support of national and integration consultancies. National consultancies carried out the development of the geological map.

### **Results**

The objective of the subcomponent was to develop information and preliminary guidelines for the integrated management of surface and groundwater resources in the La Plata Basin, based on the experiences of the Guaraní Aquifer System Project, as well as the advancements in the Yrenda-Toba-Tarijeño Aquifer System Project (YTTAS) in the semi-arid region of the Chaco, as well as other experiences in transboundary aquifers.

In this context, the transboundary aquifers of the Basin were characterized, and geological and hydrogeological maps of the YTTAS, of the Cuareim/Quaraí river basin, and of the entire La Plata Basin were developed.

The specific outputs and results of the work in this subcomponent include:

- *Groundwater diagnostic in the La Plata Basin*: Includes inventory of existing wells in the Basin and a database of information and history on groundwater.
- *Characterization of the YTTAS*: Includes an integrated hydrogeological diagnostic, the elaboration of both a geological map and a hydrogeological map, and a socio-productive analysis of the study area. Based on the studies carried out, the WG designed a pilot project proposal for YTTAS to be implemented during the SAP.
- *Characterization of aquifers in the La Plata Basin*. Diagnostic and characterization of the Serra Geral, Arapey, Upper Paraná, and Pantanal aquifers. Development of the hydrogeological map and thematic maps of the entire La Plata Basin, together between all five countries with the participation of the competent institutions, under a common methodology agreed upon by the working group from the survey, analysis, processing, and integration of the geological, hydrogeological, and drilling information. The mapping methodology was designed to plan the availability of groundwater resources throughout the southern cone of America.
- *Guidelines for the joint management of groundwater in the La Plata Basin*: Strategic Action Plan agreed upon by the countries concerning groundwater in the La Plata Basin, which contains guidelines and directives essential for its management, based on the other products of the subcomponent.
- *Hydrogeological characterization of the Cuareim/Quaraí river basin*. Joint field studies (Brazil-Uruguay) and the elaboration of the hydrogeological map of the Basin.
- *'Groundwater in the La Plata Basin' publication*: Foundational material for consultation and reference on the status of groundwater in the LPB, a tool with potential for use in groundwater management of the Basin.

Table 3.2.6.1

### Institutions Participating in the Groundwater WG

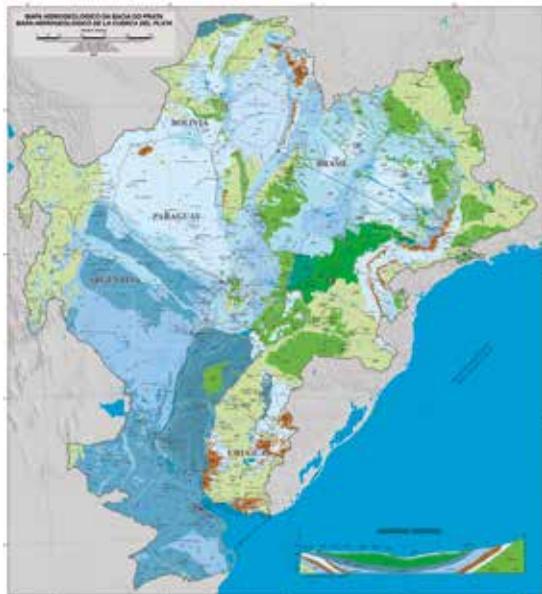
Country	Institutions
<b>Argentina</b>	Under-secretariat of Water Resources (SSRH), Ministry of Environment and Sustainable Development (MAyDS), Argentine Geological Mining Service (SEGEMAR), Water Directorate of Entre Ríos
<b>Bolivia</b>	Geological and Mining Service (SERGEOMIN)
<b>Brazil</b>	Sao Paulo Department of Water and Electricity (DAEE-SP Paulista State University (UNESP), Brazilian Geological Service (CPRM)
<b>Paraguay</b>	Secretary of the Environment (SEAM), Engineering Faculty in the National University of Asunción (FIUNA)
<b>Uruguay</b>	Ministry of Housing, Land Use, and Environment (MVOTMA), Regional Center for Groundwater Management (CeReGAS), Ministry of Industry, Energy, and Mining (MIEM), Administration of State Sanitary Works (OSE)



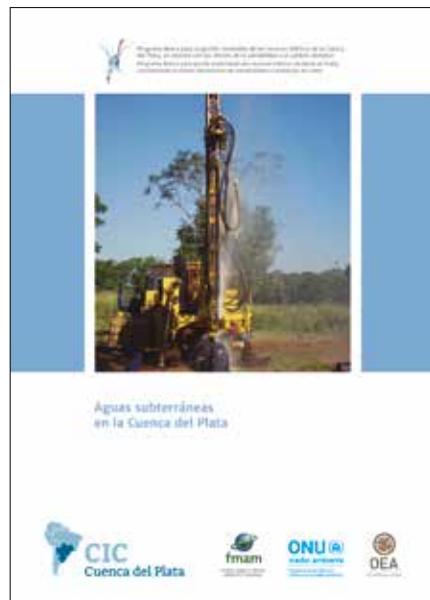
Inter-institutional Exchange meeting in Brazil's CPRM  
(Río de Janeiro, Brazil, 2012)



Meeting of the geological services of the five Basin countries (Buenos Aires, 2012)



Hydrogeological map of the La Plata Basin



Cover of the publication Groundwater in the La Plata Basin

### 3.2.7 Management of Aquatic Ecosystems in the La Plata Basin

#### **Background and context**

This subcomponent was aimed at the development of strategies and management plans to promote the conservation of the aquatic ecosystems in the La Plata Basin. Special attention was given to the large wetland corridors of the Basin affected by the land use transformation process of recent years; to the rich ichthyofauna, a key resource for the region, but with species under intense exploitation; and the impact of anthropogenic action, including pollution problems from different types of effluents, the construction of infrastructure works, and the drying up of wetlands.

Although the region has numerous studies and projects on the subject, information is usually scattered. In the same way, numerous efforts and initiatives are carried out in each country, and although they are important in their particular objectives, they represent isolated actions at the Basin level, lacking an overall vision. Therefore, it was considered necessary to make an effort to collectively diagnose the conservation status of the LPB ecosystems and establish joint strategies and plans for their management. To this end, an initial effort was made to compile the available information, seeking to integrate and systematize it to obtain an updated and consolidated diagnosis on the key aspects related to the biodiversity of the Basin, providing technical elements for the formulation of management guidelines to address major issues related to aquatic biodiversity (particularly habitat loss and fragmentation), and unsustainable use of fishery resources, and to develop a harmonized biodiversity management strategy for the whole of the La Plata Basin.

#### **Methodology**

The work was largely carried out by the corresponding Working Group, which was responsible for the direct planning and execution of the products within the framework of the guidelines of the project document, together with the directives arising from the Implementation Coordination and approved by the steering committee. For the diagnostic work, the WG representatives agreed on a common format to compile information in each country (type sheet, database format, delimitation of study regions, etc.), defining key aspects of greatest relevance for the Basin. In the case of wetlands, a workshop was organized and carried out to coordinate the inventory design and the methodology of the work, which was attended by the technical specialists of the WG and the representatives from the Ramsar focal points.

Information compilation was carried out with the support of junior consultants (or fellows) in each country, and then integrated at the Basin level through a specialized consultancy. The synthesis reports—including the results of the integrated diagnostic—impacts at the sub-basin level, and management recommendations were then put to the consideration of the WG for review and final approval.

In the same way, for the elaboration of the biodiversity strategy, each technical representative of the WG provided the corresponding information for their respective country. The information was then analyzed in an aggregated way to identify the similarities and differences, guiding the formation of harmonized recommendations, taking into account the United Nations Convention on Biological Diversity and the Mercosur biodiversity strategy.

Within the WG, an Editorial Committee was formed, which was in charge of defining the content and approach for the publications produced with the information gathered by the work in the subcomponent.

## Results

The work carried out under this subcomponent has made significant progress in achieving the objective of harmonizing biodiversity strategies at the Basin level, consolidating the national actions that countries are implementing under the United National Convention on Biological Diversity. In response to the problems identified, and on the basis of updated diagnoses in a common format, proposals were made for joint actions among the five countries to preserve and manage the biodiversity of the Basin, with special attention to wetlands, coastal ecosystems, conservation of biological corridors, the development of sustainable fisheries, and the control of exotic species. The development of the subcomponent also included the implementation of a priority project related to biodiversity conservation within the framework of Binational Itaipú's Cultivating Good Water program, which was implemented in pilot micro basins in the area of influence of the three binational hydroelectric plants (Itaipú, Yacyretá, and Salto Grande).

The specific outputs and results of the work carried out in this subcomponent include:

- *Inventory of fish, environments, and protected areas:* Diagnostic of the state of biodiversity/aquatic ecosystem conservation throughout the Basin, including basic thematic cartography and recommendations for biodiversity and ecosystem management in the La Plata Basin.
- *Inventory of exotic aquatic species, their primary impacts, and recommendations for their control:* An analytical study on the biological invasion problem in the Basin. The primary invasive species and their impacts at the sub-basin level were identified, formulating specific consensual recommendations for their control, within the framework of the La Plata Basin biodiversity conservation strategy guidelines.
- *Inventory of wetland regions in the La Plata Basin, identifying priority areas for protection:* Inventory and thematic cartography developed in line with the Ramsar regional strategy for the La Plata Basin, in compliance with the countries' commitment to the Convention to develop or update information on wetlands in each country. The inventory of wetland regions is a basic tool for aquatic ecosystem management planning and for designing the management strategy for the north-south wetland corridor (Pantanal-Delta del Paraná). From this work, priority conservation regions were identified based on a previously agreed upon prioritization index, considering multiple factors, including the number of threatened species in each region and the opportunities for existing management, among others.
- *Diagnosis of aquatic ecosystems and management guidelines for the conservation and management of aquatic biodiversity:* A diagnosis based on the information collected (reports, thematic cartography, and database information), with an emphasis on ichthyofauna. Identification and formulation of proposals for strategic actions to be undertaken for the conservation and sustainable management of the aquatic biodiversity of the La Plata Basin.

- *Biodiversity management strategy for the La Plata Basin*: Strategic guidelines to facilitate policy development and joint planning for biodiversity management throughout the Basin, based on the comparative analysis of national biodiversity strategies
- *System of ecological corridors for the La Plata Basin*: Proposal for a corridor composed of a main corridor (Parana-Paraguay-Uruguay axis) and multiple secondary corridors. The proposal was elaborated based on the collection of initiatives on existing ecological corridors—taking the north-south wetland corridor (Pantanal-Paraná Delta) as the main axis—and proposals for its implementation.
- *Geographic Information System (GIS) to support biodiversity management*: A geo-referenced database, created based on the information collected, used in generating biodiversity/aquatic ecosystems (including wetlands) and for the preparation of the aquatic ecosystem diagnostic. An analysis tool, with the ability to be integrated into the La Plata Basin's DSS, to be used by the countries as an information repository to support the formulation of projects and management plans.
- *Replication of the Cultivating Good Water program*: Implementation of the Binational Itapu's participatory methodology of basin management (recognized by the UN in 2015 as the best practice in watershed management worldwide) in six micro basins in the areas of influence of the binational dams of Yacyretá and Salto Grande. The implementation of this activity served to reinforce the joint work between teams of technicians from different countries and to promote the exchange of experiences between professionals and local actors that inhabit the pilot micro basins, including training and technical visits to transfer knowledge about best practices in management.
- *'Aquatic Ecosystems of the La Plata Basin' and 'Inventory of Wetland Regions in the La Plata Basin'*: Foundational material for consultation and reference on the state of aquatic biodiversity conservation in the La Plata Basin; and in the case of the inventory of wetland regions, a tool with potential use in the management of these environments in the Basin.

Table 3.2.7.1

### Institutions Participating in the Aquatic Ecosystem WG

Country	Institutions
<b>Argentina</b>	Under-secretariat of Water Resources (SSRH), Ministry of Environment and Sustainable Development (MAyDS), Mixed Technical Commission of Salto Grande (CTM-SG), Yacyretá Binational Entity (EBY)
<b>Bolivia</b>	General Directorate of Biodiversity and Protected Areas, Ministry of Environment and Water (MMAYA)
<b>Brazil</b>	Paulista State University (UNESP), Binational Itaipú (IB)
<b>Paraguay</b>	Secretary of the Environment (SEAM), Yacyretá Binational Entity (EBY), Binational Itaipú (IB)
<b>Uruguay</b>	National System of Protected Areas (SNA), Ministry of Livestock, Agriculture, and Fishing (MGAP), University of the Republic (UDELAR), National Directorate of Aquatic Resources (DINARA), Mixed Technical Commission of Salto Grande (CTM-SG)



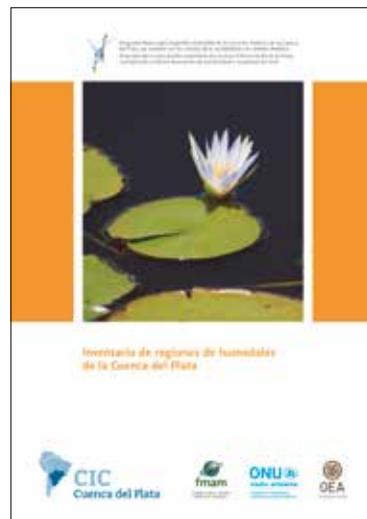
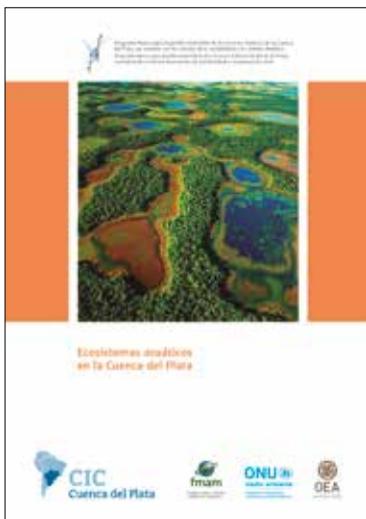
Visit to the Ramsar Site: Cuenca de Tajzara Wetland during the IV Meeting of Ramsar's Regional Initiative: Strategy for the Conservation and Wise Use of the Fluvial Wetlands of the La Plata Basin (Tarija, Bolivia, October 3rd, 2013)



Fish farming of native species in the Itaipú Dam.



Primary Wetlands of the La Plata Basin



Covers of the Aquatic Ecosystems and Inventory of Wetland Regions in the La Plata Basin publications

### 3.2.8 Land Degradation

#### **Background and context**

This subcomponent was aimed at improving the management of the Basin's land, to prevent and to mitigate land degradation processes. The advance of the agricultural frontier, clearing, burning of pastures, and indiscriminate use of agrochemicals, among other factors, have accentuated the land degradation problem, and to reverse this situation plans and joint management mechanisms coordinated between countries at the Basin level are needed, which also contemplate the incipient effects of climate variability and change. Thus, the overall objective of the subcomponent is to harmonize national measures related to land degradation control in the LPB through the consolidation of regional strategies under the United Nations Convention to Combat Desertification.

#### **Methodology**

The preparation of the reports and products was carried out through national consultancies (one per country) and integrators. These were supervised by the technical representatives in the WG, within the framework of the guidelines of the project document, together with the directives arising from the Implementation Coordination and approved by the steering committee. The format and content of the reports and products (maps, database) were defined by the Working Group prior to the completion of the national consultancies. Once the information was gathered at the national level, it was integrated throughout the entire LPB, through specialized consultancies. Such was the case in the preparation of the land use map, inventory of good land use practices, and maps of potential erosion, among other products.

A large part of the work was collecting available land information and integrating it throughout the LPB as a basis for defining a harmonized Basin-wide action plan, including identification of degraded critical areas, integrating water and land. Existing information related to ongoing projects (Bermejo, Pantanal, Gran Chaco, and Pilcomayo) and the Mercosur strategies on desertification were considered.

#### **Results**

The objective of the subcomponent was to harmonize national measures related to the control of land degradation in the La Plata Basin, consolidating regional strategies under the United Nations Convention to Combat Desertification. In this context, a diagnostic of land degradation was made for the whole Basin, including maps of soil types and land cover. Likewise, a Priority Project was carried out on the Selva Misionera Paranaense (Paranaense Forest).

- *National background reports on land degradation and desertification, information integration throughout the LPB:* National reports compiling and analyzing information on land degradation and desertification available in all five countries. This includes studies, pre-existing diagnostics, and national and regional/international projects carried out in the Basin countries. Integration of all information collected in the countries at Basin level as a basis for the diagnostic and the strategic action proposals for the LPB.
- *Identification of degraded areas and projects on soil conservation and desertification:* Identification of critical areas for soil degradation and desertification in the five countries of the Basin. Inventory of national, regional, and international projects that include land degradation

in the LPB among its core themes. This information is key to generating future proposals for projects or land management plans, as they should address the critical areas that have been identified by countries, as well as existing projects in order to establish synergies between these and new ones.

- *Diagnostic on the conservation status of the Selva Misionera Paranaense (SMP) and proposals for a management strategy:* Analysis of the state of ecosystem conservation and existing forest cover, and a comparison with previous periods on erosion and soil loss, identification and characterization of anthropic pressure factors, and other ongoing projects in the region, among other topics. The information collected in each country was integrated with data throughout the SMP and a diagnosis together with proposals for rehabilitation measures and guidelines for a management focused on the conservation of this forest area was formulated. The work carried out is an update to the baseline on the state of conservation of this ecoregion that will serve to plan new projects focused on mitigating deforestation and proposing rehabilitation measures.
- *Maps of soil types, current use, and land cover in the LPB:* Although there were existing soil maps in the five Basin countries before, they (in some cases) were at different scales, classifying the soil with different classification systems, and were not integrated. The importance of this product is that in planning meetings the WG agreed on a common scale and categories for a map that covers the entire Basin and is homogeneous in scale and classification. This product (the different maps produced) is a first step useful especially for the CIC as a tool for common planning. It requires a future adjustment stage in order to complete it and to agree on the work carried out.
- *Water erosion risk map (not controlled, based on USLE) for the LPB:* Estimation of water erosion (not controlled) with data provided by the Basin countries in risk of water erosion in different sectors, using the USLE (Universal Soil Loss Equation). The resulting map was used as part of the soil degradation diagnostic, identifying the sub-basins with the highest risk of this type of erosion. This product also represents a useful tool to identify areas susceptible to erosion and to implement soil management projects or plans in the LPB.
- *Identification of best practices in land use and management:* Inventory of best practices for soil use and management in the LPB countries, and recommendations for the control of land degradation through their implementation. This inventory is extremely important and should be taken into account in projects or management plans for areas of the LPB where land management is not adequate.
- *Diagnosis of land degradation in the LPB, including scenarios of climate variability and change:* Diagnosis of the causes of degradation processes with an emphasis on the risk of erosion, and the analysis of the different alternatives of soil use and management to mitigate those causes. In turn, the scenarios of climate variability and change with respect to the erosion resulting from the rains were also analyzed. Recommendations and management proposals to mitigate erosion and land degradation were included, considering adaptation to climate variability and change. This is a useful product for

the CIC and the countries to consider as a baseline for planning new projects or management plans in the LPB, as it also considers the effects of climate variability and change, as well as different land use scenarios.

- ‘*Land degradation in the La Plata Basin and Selva Misionera Paranaense*’ publications: Foundational material for consultation

and reference on the subject, including tools to potentially use in the management of these Basin environments.

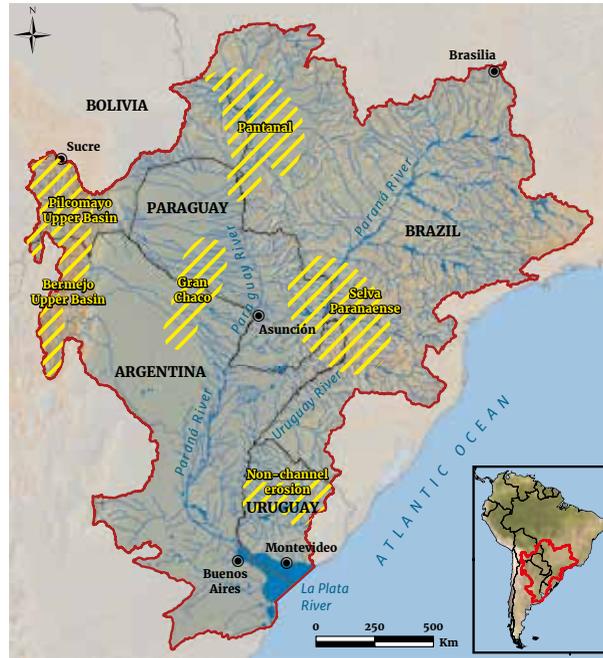
- ‘*Best Practices of Land Use*’ and ‘*Best Practices in Rice Cultivation in the La Plata Basin*’ publications: These documents will be consultation tools for institutions and organizations with an interest in the area and subject matter.

**Table 3.2.8.1**

### **Institutions Participating in the Land Degradation WG**

<b>Country</b>	<b>Institutions</b>
<b>Argentina</b>	Ministry of Environment and Sustainable Development (MAyDS)
<b>Bolivia</b>	Ministry of Land and Rural Development (MDRYT)
<b>Brazil</b>	The Brazilian Agricultural Research Corporation (EMBRAPA)
<b>Paraguay</b>	Secretary of the Environment (SEAM)
<b>Uruguay</b>	Ministry of Cattle Ranching, Agriculture, and Fishing (MGAP), Department of Agronomy at the University of the Republic (FAGRO-UDELAR)

Framework Program of the La Plata River Basin  
Implementation Process and Primary Outcomes



Areas of greater criticality associated with land degradation



Covers of the TG's publications

### 3.2.9 Opportunities for Sustainable Development

#### **Background and context**

The Framework Convention on Climate Change, signed at the United Nations (UN) summit in Rio de Janeiro (1992), seeks to limit the emission of greenhouse gases in order to stabilize the global climate. Likewise, in the Paris Agreement, signed at the XXI Conference on Climate Change (COP 21) in December 2015, it was agreed to "strengthen the global response to the threat of climate change" in order to "keep the average global temperature increase Below 2° C with respect to pre-industrial levels, and to continue efforts to limit that temperature rise to 1.5° C with respect to pre-industrial levels, recognizing that this would significantly reduce the risks and effects of climate change."

In order to comply with these agreements, it is necessary to develop and implement opportunities for sustainable development and for the mitigation of climate change and its effects at the regional level, among other things.

Therefore, this subcomponent focused on promoting initiatives aimed at identifying and implementing activities that are sustainable development opportunities for the Basin. In order to achieve the objective of the subcomponent, the activities focused on the use of clean technologies and recreation and ecotourism projects, in the context of a regional strategy that mobilizes financing for sustainable development considering environmental and cultural protection (in compliance with each domestic policy). Hydroelectricity was also included, as well as navigation as a means of sustainable transport in the Basin.

#### **Methodology**

The activities were developed for the most part by the corresponding Working Group, which was responsible for the direct planning and implementation of the products, within the framework of the project document. Regular meetings were held in which the WG agreed on the activities to be carried out, the methodology to be followed, and the corresponding budget.

The products were obtained through national and integration consultancies.

#### **Results**

Under this subcomponent, four comprehensive basin diagnoses were carried out on the use of clean technologies, ecotourism, hydroelectricity, and navigation.

- *Diagnosis of clean technologies and opportunities for their development in the La Plata Basin:* Compilation of basic information on clean technologies in the La Plata Basin, the identification and preparation of projects with significant development potential, and financing for sustainable development that encourages the use of clean technologies. The importance of this product is that it has generated updated, accurate, theoretical and technically consistent information that contributes to the implementation of concrete solutions to the problems related to environmental pollution throughout the Basin.
- *Diagnosis of ecotourism and opportunities for its development:* Another measure considered important to reduce the impacts of climate change is the promotion of responsible and sustainable tourism. For this reason, under this subcomponent a diagnosis of ecotourism in the La

Plata Basin was carried out, from which potential projects and public - private investment potential for ecotourism and sustainable development were identified. These projects were under consideration to be developed during the SAP implementation.

- *Diagnosis of Hydroelectricity:* A hydroelectricity diagnosis was carried out in the La Plata Basin with the objective of establishing cross-border actions based on an analysis of the supply and demand of hydroelectricity. The result was an analysis of the potential of the electricity sector, as a natural integrator among the Basin countries, and the prospect of complementary energy development between countries, promoting the expansion

of electricity generation based on renewable sources.

- *Navigation Diagnosis in the La Plata Basin:* Navigation is considered a sustainable transport alternative, so the use of river transport in the Basin and the advantages it offers in socio-economic terms were analyzed in order to promote its use and include related actions in the SAP.
- *'Hydroelectricity and Navigation in the La Plata Basin' and 'Clean Technologies and Ecotourism in the La Plata Basin' publications:* Foundational material for consultation and reference on the four topics addressed, which are tools which may be potentially used by public and private institutions for management.

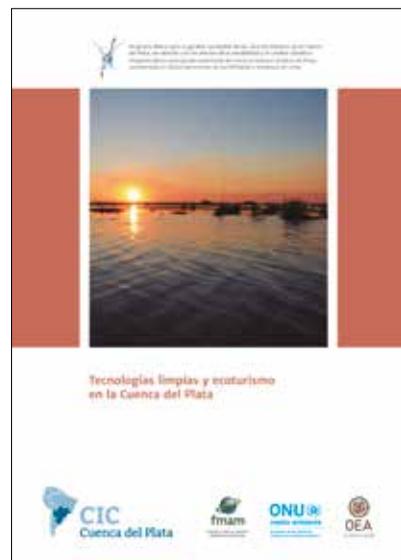
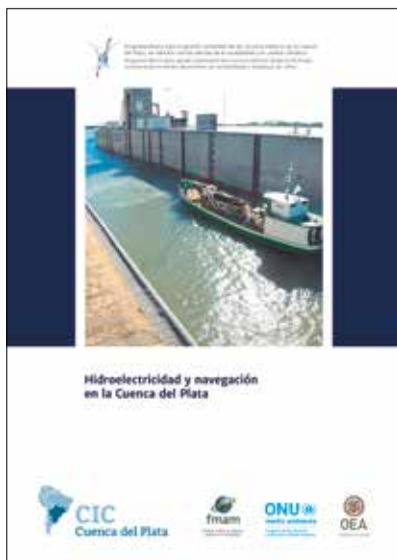
Table 3.2.9.1

### Institutions Participating in the Opportunities for Sustainable Development WG

Country	Institutions
<b>Argentina</b>	Ministry of Environment and Sustainable Development (MAyDS), Under-secretariat of Water Resources (SSRH)
<b>Bolivia</b>	Ministry of Foreign Relations (MRE)
<b>Brazil</b>	Ministry of Transportation, Secretary of Urban Environment and Water Resources (SRHU)
<b>Paraguay</b>	Secretary of the Environment (SEAM), Ministry of Foreign Relations (MRE), Secretary of Tourism
<b>Uruguay</b>	Ministry of Housing, Land Use, and Environment, Ministry of Foreign Relations (MRE), Ministry of Tourism



Waterways of the La Plata Basin



Covers of the publications on hydroelectricity and navigation, and clean technology and ecotourism

### 3.2.10 Biodiversity Demonstrative Pilot Project in the Regulated Zone of the Paraná River

#### **Background and context**

The Framework Program included joint actions by countries to conserve and manage the biodiversity in light of the effects of climate variability and change on hydrology in the Basin, with a particular focus on wetlands, coastal ecosystems and conservation of a biological corridor, sustainable fisheries, and control of exotic species. The stretch of the Paraná River between the confluence with the Paraguay River and the Guayra Falls has been identified as a priority area for biodiversity conservation due to the presence of an aquatic fauna that includes at least 220 species of great ecological and economic importance as well as the existence of the two largest transboundary dams in the Basin.

The objectives included the design of a regional strategy for biodiversity conservation, implemented through a model ecological (aquatic) corridor; an alien species monitoring system; and the implementation of sustainable fisheries management measures agreed on by all three countries (Argentina, Brazil, and Paraguay).

#### **Methodology**

The activities were carried out by consultants from the three countries participating in the project, which had the support and guidance of the guides for this subcomponent in each country. It also had the support of regional institutions such as Itaipu, and state and university ministries.

#### **Results**

The actions of this Pilot Project were aimed at generating a replicable experience in in-

vasive species conservation and sustainable use of the fishing resources. Its purpose was to contribute to the conservation of the biodiversity of fish resources in the Paraná River by promoting management capacity development in existing institutions in the Paraná River basin—including the confluence zone of the Paraguay and Paraná Rivers—to the Guayrá Falls, a section that includes the binational dams of Itaipú and Yacyretá.

This project complemented the efforts made by Binational Itaipú and the Yacyretá Binational Entity in aquatic species conservation and sustainable management of reservoirs. As a means of achieving species sustainability, the project sought to develop a harmonized regulatory framework, to strengthen the capacity of local actors, and to contribute to a better understanding of cross-border issues related to biodiversity changes and the sustainable use of fishery resources. The work also considered the Piraguazú Project carried out in the region with funding from the FAO as background.

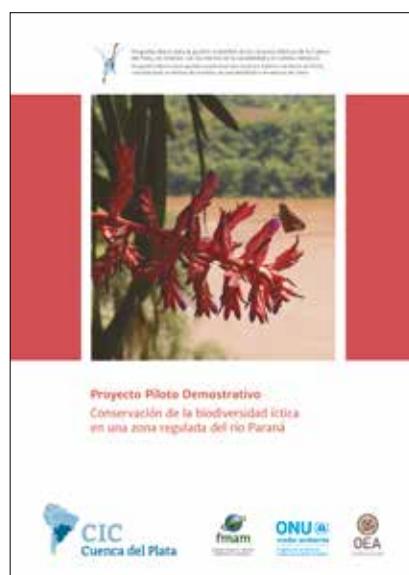
- *Inventory of fish diversity:* An inventory of species and primary factors associated with life cycles (patterns of migration, reproductive habitats, nutrition, water, etc.) was obtained.
- *Identification of strategic areas for conservation and vulnerable areas:* An inventory of wetlands and critical areas for conservation was obtained, which included the identification of breeding areas and migratory cycles.
- *Identification of exotic species:* A catalog of exotic species present in the project area was drawn up, which included a survey of the prevention measures adopted to control incoming new invasive species

- and the management of existing ones.
- *Collection of data on fish biology:* A summary of species and behavior of the fish fauna was obtained, with emphasis on species of economic and ecological importance.
- *‘Demonstrative Pilot Project. Biodiversity conservation in a regulated area of the Paraná River, with an emphasis on ichthyofauna’ publication:* This document will be a reference tool for institutions and agencies with an interest in the area and in the topic addressed.

Table 3.2.10.1

### Institutions Participating in the Biodiversity Demonstrative Pilot Project WG

Country	Institutions
<b>Argentina</b>	Under-secretariat of Water Resources (SSRH), National Water Institute (INA), Ministry of Environment and Sustainable Development (MAYDS), Provincial Water Coordinating Unit of Formosa (UPCA), Corrientes Institute of Water and Environment (ICAA), Corrientes Directorate of Natural Resources
<b>Brazil</b>	Paulista State University (UNESP), Binational Itaipú (IB), Secretary of Urban Environment and Water Resources (SRHU-MMA), National Water Agency (ANA)
<b>Paraguay</b>	Secretary of the Environment (SEAM), Yaciretá Binational Entity (EBY), Ministry of Foreign Relations (MRE)



### 3.2.11 Hydro–environmental Alert in the Confluence of the Paraguay and Paraná Rivers Demonstrative Pilot Project

#### **Background and context**

The 1982, 1983, 1992, 1995, 1997, and 1998 floods caused by rises in the Paraná, Paraguay, and Uruguay Rivers associated with the El Niño phenomenon severely punished seven provinces of the Argentine coast and the Ñeembucú region in southern Paraguay. Likewise, hydrological extremes like droughts, which recur more and more frequently, negatively impact the population, making it difficult to fulfill basic needs—such as the provision of drinking water—and hamper economic activity due to their impact on navigation. Thus, the need to precisely identify areas with flood risks to make possible adequate land use planning and the implementation of flood forecasting and warning systems capable of predicting extreme events far enough in advance to allow for the adoption of measures to mitigate damages to the population.

On the other hand, the impacts from accidental pollutant spills—which impact water quality—are not properly quantified due to the lack of tools to calculate the effects. This prevents contingency plans in coastal cities from including actions to be taken in the event of this type of episode, depending on their magnitude and location.

In order to address this problem, this Pilot Project implemented the general actions associated with consolidating capacities for integrated management, particularly considering hydro-climatic forecasting systems and adaptation to hydrological effects and climate variability and change. The project was located in one of the areas with increased flood risk in the La Plata Basin, due to extreme hydrological events, which

is the confluence of its two largest rivers: the Paraná and Paraguay.

#### **Methodology**

The activities were carried out by officials from local institutions and the Yacyretá Binational Entity, with the involvement of local actors from both the provincial and municipal governments as well as educational institutions and NGOs, among others. National coordinators and agencies were actively involved. In order to tackle specific issues, consultants from the two countries involved in the project area were recruited to consider national issues such as binational integration within the regional framework.

#### **Results**

The project sought mainly to generate synergies in the capacity of countries to observe, forecast, generate alerts, and adopt preventive measures against extreme hydrological events. For this reason, actions were promoted between the municipalities of Resistencia-Corrientes (Argentina) and Pilar-Paso de Patria (Paraguay), located near the confluence of both rivers. Public participation was also promoted through meetings and dissemination of information.

- *Basic information for forecasting and contingency plans:* A compilation of information was obtained for forecast and contingency plan generation was obtained, which included socio-economic surveys. The information was used to update and complete contingency plans in the four cities involved in the project.
- *Hydrological alert operating system in the La Plata Basin:* Institutional agreements were reached in the two coun-

tries, through which the systems for basic information exchange to generate forecasts and disseminate alerts were improved. The warnings from the alert system, the model for which was approved by all the countries through the project, will be published through the Decision-making Support System.

- *Operating system for contaminant spill warning:* A tool capable of predicting the level of contamination expected after contaminant spills, depending on the magnitude and location of the spill, was produced. It was incorporated into the contingency plans.
- *Strengthening local measurement systems:*

The hydrometric measurement network was improved at strategic points for the calibration of growth models and the validation of height forecasting results.

- *Training and dissemination actions:* Coastal residents were trained in the use of warning systems, and institutional officials in the use of forecasting tools.
- *‘Demonstrative Pilot Project. Hydro-environmental warning system at the confluence of the Paraguay and Paraná Rivers’ publication:* This document will be a consultation tool for institutions and organizations with an interest in the area and in the subject addressed.

**Table 3.2.11.1**

### **Institutions Participating in the Confluence Demonstrative Pilot Project WG**

<b>Country</b>	<b>Institutions</b>
<b>Argentina</b>	Under-secretariat of Water Resources (SSRH), National Water Institute (INA), Ministry of Environment and Sustainable Development (MAyDS), Provincial Water Coordinating Unit of Formosa (UPCA), Corrientes Institute of Water and Environment (ICAA), Chaco Provincial Water Administration (APA)
<b>Paraguay</b>	Secretary of the Environment, Yacyretá Binational Entity (EBY), Department of Engineering (FIUNA)

Programa Plata para la gestión sostenible de los recursos hídricos de la Cuenca del Plata, en relación con los efectos de la variabilidad y el cambio climático  
Programma Plata a para gestão sustentável dos recursos hídricos da Bacia do Prata, considerando os efeitos decorrentes da variabilidade e mudanças de clima



**Proyecto Piloto Demostrativo**  
Sistema de alerta hidroambiental en la  
Confluencia de los ríos Paraguay y Paraná



### 3.2.12 Water Use Conflict in the Cuareim/Quaraí River Basin Demonstrative Pilot Project

#### **Background and context**

The Cuareim–Quaraí River basin is a trans-boundary territory shared by Brazil and Uruguay with low population density and low development, far from the decision-making centers of both countries but with a good level of environmental preservation and great potential for sustainable development. The river and its tributaries are a fundamental input to the economic production in the area, mainly rice and livestock production, sand and fish extraction, and recreation.

On the other hand, the location of the cities in the floodplain makes them very vulnerable to floodwaters, often generating losses and destruction. Droughts also cause severe damage to crops and water supply for urban and rural communities. In addition, soil degradation by local brick production for construction and the indiscriminate use of water for rice irrigation, the main crop in this area, frequently generated conflicting situations among residents of both banks of the river.

In spite of the binational actions to improve cooperation for improved natural resource use that existed since 1991, arguments over water resource use were constantly provoked among the coastal population.

In order to address this problem, this Pilot Project implemented actions that aimed to contribute to the resolution or reduction of current and potential conflicts related to water use in this transboundary basin, and—due to its pilot status—other basins with similar challenges.

#### **Methodology**

The basis for the execution of the Cuareim PPD was the interdisciplinary, interinstitutional, and binational agreement reached to carry out the project, reformulating the conflict through the lens of integrated management of water resources.

The work strategy was based on three pillars: technical, public participation, and politico-institutional, whose support from the beginning was among the achievements.

With leadership from the Cuareim PPD, in 2013 the Cuareim River Basin Commission was established in Uruguayan territory, with an institutional structure mirrored on the Brazilian side. At the beginning of the project, key issues or problems in the basin were based on two workshops with key stakeholders from the three fundamental pillars. From this foundation, an agenda of short- and medium-term actions was formed.

#### **Results**

As a result of the activities carried out, the project made significant achievements in the following areas:

- *Sustainable land management:* For this, a technical evaluation was carried out on rice cultivation in rotation with pastures, and criteria was established for good irrigation practices. The extraction of aggregates in the Cuareim River was quantified. A land use management plan in the area was proposed.
- *Water quality and management:* A proposal was created, as well as an implementation program for binational monitoring and joint evaluation of water quality and

aquatic ecosystem indicators, including recharge areas of the Guaraní aquifer. Groundwater was characterized and the integrated water balance in the basin was carried out. The efficient use of water was promoted, as well as productivity improvement, including legal instruments to control water and land use. Progress was made in identifying hydraulic infrastructure to be implemented, such as evaluating the possibility of dam construction in the regulated upper and middle basins.

- *Ecosystem protection:* Ecological zoning of the basin was carried out, and ecological protection areas were proposed.
- *Institutional strengthening:* Formal coordination mechanisms between the Quaraí River Basin Committee (Rio Grande do Sul) and the federal state were established and made compatible, the Mixed

Binational Commission of the Cuareim/Quaraí River was strengthened, and the Cuareim River Basin Commission was created nationally (Uruguay). In addition, the local coordinating committee of the Uruguayan–Brazilian Joint Commission for the development of the Cuareim/Quaraí river basin, including local actors, was redefined.

- *Early Warning System:* A flood system was implemented for the cities of Artigas and Quaraí.
- *Training and Dissemination Actions:* An educational plan for environmental diffusion and water management among the villagers was designed and implemented.
- *‘Demonstrative Pilot Project. Water Use Conflict in the Cuareim/Quaraí River Basin’ publication*

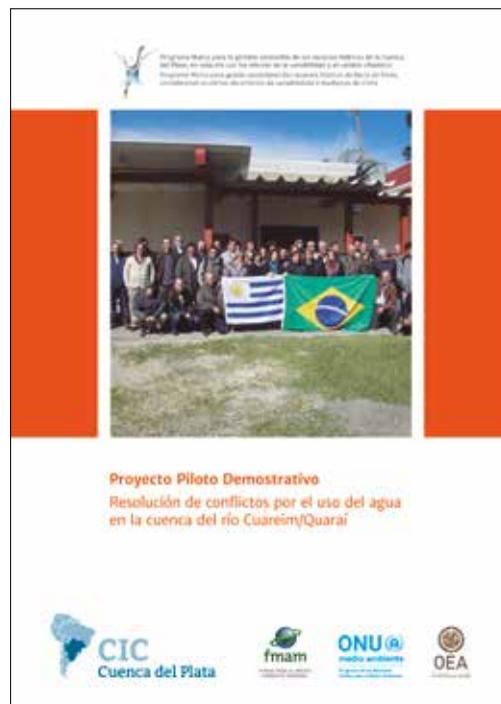


Table 3.2.12.1

### Institutions Participating in the Cuareim/Quaraí Demonstrative Pilot Project WG

Country	Institutions (*)
<b>Brazil</b>	National Water Agency (ANA), Brazilian Geological Service (CPRM National Institute of Meteorology (INMET), Department of Water Resources – Secretary of Environment of the State of Rio Grande do Sul (DRH-SEMA), State Foundation for Environmental Protection (FEPAM), University of Sao Paulo (USP), Santa Maria Federal University (UFSM), Hydraulic Research Institute – Federal University of Rio Grande do Sul (IPH-UFRGS), State Water Committee of the Quaraí River Basin – Brazilian delegation, Ministry of Environment, Rio Grande Rice Institute (IRGA)
<b>Uruguay</b>	Cuareim River Basin Commission – Uruguyan delegation, Secretary of Communications, Presidency, General Directorate for Border Issues, Land and Maritime (MVOTMA), National Directorate of Water (DINAGUA), National Environment Directorate (DINAMA), National Directorate of Aquatic Resources (DINARA), General Directorate of Rural Development (DGDR), General Directorate of Farming (DIGEGRA), National Institute of Agricultural Research (INIA), National Directorate of Mining and Geology (DINAMIGE), State Sanitary Works (OSE), Uruguayan Institute of Meteorology (INUMET)

(\*) Other institutions from both countries have participated in this DPP: Brazil: Quaraí City Hall, Quaraí City Council, Rio Grande Sanitation Company (CORSAN), Civil Defense, Quaraí Fire Department, Pampa Federal University (UNIPAMPA), Polo Open University of Brazil (UAB), Association of Uruguayan Rice Producers, Rural Union of Quaraí, Rural Union of Barra do Quaraí, Technical Assistance and Rural Extension Company (Emater), Bairro Saladeiro Resident Association, Quaraí Lions Club, Quaraí Fishermen's Colony, Quaraí Fishermen's Cooperative (COOPESQ), Atelier Saladeiro NGO of Barra do Quaraí, Farroupilha Federal Institute, Women's Association of Saladeiro, Emilio Calo- Vila do Saladeiro Municipal School, Colony of fishermen and fish farmers z-27 "Rio das Garças"; Municipal Secretary of Education, Environmental Brigade, COOPERGEMA, Scout Group. Uruguay: Renewable Natural Resources (RENARE), Directorate of Education, MSP, MIDES, MDN, MINT-Community Police, MINTUR, National Hydrography Office (MTOP-DNH), MTSS, National Institute of Employment and Professional Training for the Private Sector (INEFOP), Public Employment Center, Artigas Intendance, Artigas Departmental Board, University of the Republic (Departments: Engineering, Agronomy, Sciences, Architecture, Northern Region), Teacher Training Center, Professional Technical Council, Primary Education Council, Secondary Education Council, UTU, Tacubé School, Agrarian School, Artigas Agricultural Association, Bella Union Sugar Cane Association, Community of sanders, Community of fishermen, Artigas 86, Eco-guardians of Artigas Group, Sustainable Estiva Civic Association, SOCAT San Miguel, Artigas Photography Club.

### 3.2.13 Contamination and Erosion Control in the Pilcomayo River Demonstrative Pilot Project

#### **Background and context**

Pollution caused by mining activities and sedimentation of channels due to erosion constitute an environmental problem affecting the waters of the Pilcomayo River. The main impacts of this problem are the high concentration of heavy metals in the water, soil contamination on the river banks, reduction in the area suitable for cultivation, loss of aquatic biodiversity, and runoff generated by sediment deposits.

In the area chosen for the execution of this pilot project there are two issues that are of particular interest: firstly, the pollution risks posed by the existence of large deposits of mining waste that can add a lot of heavy metals to water; and secondly, agricultural practices conducted in the Basin, which gradually increase the erosion processes and increase the amount of sediment transported by the river. The expected consequences of this situation are an increase in water contamination and sedimentation of the channel. These impacts not only affect the upper basin, but also the lower basin, which is why they become transboundary problems that affect parts of the Bolivian, Paraguayan, and Argentine territory.

#### **Methodology**

The activities were carried out by officials from the Vice Ministry of Water Resources of Bolivia. In order to tackle specific issues, consultants from Bolivia were hired who deepened the development at the local level. In the final stretch of project development, the activities were accompanied by

the downstream countries (Argentina and Paraguay).

#### **Results**

In order to address the above problems, the pilot project proposed the implementation and proof of effectiveness of pollution and erosion control practices that reduce the risk that the existing environmental liabilities presuppose and control the soil erosion processes. The basin chosen for the conduct these experiments was the Cotagaita River, located in the upper basin of the Pilcomayo River. As a final objective, the project proposed to develop an operational and replicable strategy for the control and monitoring of water pollution generated by mining activity and water erosion, which contributes to a better quality of life for the inhabitants.

- *Follow-up and support for the management and control of the environmental liabilities from mining districts in the Cotagaita river basin:* Results from monitoring pollution and erosion were obtained, periodic measurements of sediment content and water quality based on biological indicators were carried out. The plan was implemented by the Vice Ministry of Water Resources and Irrigation from the Ministry of Environment and Water of the Plurinational State of Bolivia, which included training plans for the population with special instruction to carry out monitoring tasks at the local level.
- *Actions to control and reduce soil erosion and river clogging:* Practical demonstrative erosion control experiences were obtained, consisting of fencing sites to avoid livestock activities (especially goats) and constructing civil structures in stone designed to stop processes of localized erosion, which manifested in the form of

gullies. The results of the experiment indicated that both measures were effective to control erosion locally, although to achieve significant effect it would be necessary to implement similar measures throughout the watershed area.

- *Contributions to the LPB's strategic plan:* The results of the monitoring campaign and the pilot experiences in erosion and pollution control carried out in Boliv-

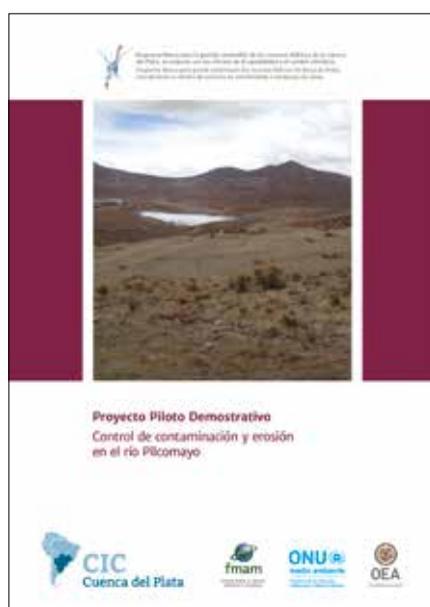
ia were shared with project participants from Argentina and Paraguay in a workshop held at the close of the project in Tarija in July 2016.

- *'Demonstrative Pilot Project. Pollution and Erosion Control in the Pilcomayo River' publication:* This document will be a consultation tool for institutions and organizations with an interest in the area and in the subject matter.

Table 3.2.13.1

### Institutions Participating in the Pilcomayo Demonstrative Pilot Project WG

Country	Institutions
<b>Argentina</b>	Under-secretariat of Water Resources (SSRH), Secretary of Water Resources of Salta, Ministry of Environment and Sustainable Development
<b>Bolivia</b>	Ministry of Foreign Relations, Pilcomayo Trinational Commission, Ministry of Environment and Water(MMAYA)
<b>Paraguay</b>	Secretary of the Environment (SEAM)



### 3.2.14 Hydro-climatic Models and Adaptation Scenarios

#### **Background and context**

In order to better understand the risks, as well as the opportunities that changes in rainfall and runoff may represent, it is essential to perfect the global climate models that have been used to date in developing scenarios. For this purpose, an important aspect of the Framework Program was the acquisition of more complete data on the current hydro-meteorological conditions of the La Plata Basin, since these data will contribute to the development of specific models for the Basin that aim to develop an integrated analysis and hydro-climatic forecasting capable of generating scenarios that will allow for the adoption of risk management actions in extreme situations, such as floods and droughts. Developing this integrated system is based on the establishment of a technical cooperation network in the area for the implementation of cross-border contingency plans.

#### **Methodology**

The work collecting pre-existing information in the countries was carried out through national consultancies supervised by the technical representatives in the WG. This group was the one which, within the framework of the guidelines of the project document, together with the directives arising from the Implementation Coordination and approved by the steering committee, carried out the planning of the tasks to be carried out in order to reach the required products. In the case of diagnostic reports, WG representatives agreed on a common format for the compilation of information in each country (standard form, database format, delimitation of study areas, etc.), defining the key aspects of great-

est importance in the Basin. In this component, the role of the INPE was vital for developing climate change scenarios for the Basin through the ETA model, and the role of the IPH-UFRGS for the hydrological modeling of the Basin from the MGB model was also of vital importance. The participation of the meteorological and hydrological services of the five countries in multiple planning and coordination activities is also highlighted.

The workshops served as a timely forum for interaction among different national, regional, and global institutions and organizations to discuss issues of common interest and to propose plans and management mechanisms for issues related to the hydro-climatic problems of the Basin.

#### **Results**

- Interaction with the meteorological and hydrological bodies of the Basin that are carrying out the WIGOS (Integrated Global Observing System of WMO) program as an integrated proposal to improve and develop the WMO observing system, which will foment the evolution of current observing systems, operated by their member countries, in an integrated, intelligent, and coordinated observation system.
- *National hydro-climatic background reports*: Updated baseline reports on the status of hydro-climatic knowledge in LPB countries and at the regional level. These reports served as a basis for the development of the status of hydro-climatic issues for the entire LPB.
- *Georeferenced inventory of monitoring stations*: Inventories were carried out with the existing monitoring stations in the countries and their integration into a

consolidated database, georeferencing the location of the stations and indicating their registration periods. This product is extremely useful for the design of the LPB monitoring and alert network and, therefore, key in its planning and optimization.

- *Flood frequency, impact, and vulnerability maps:* Maps that were produced through national consultancies and later integrated at the level of the entire Basin. In the case of the flood maps, they were done following the methodology proposed by the ANA (Brazil), for which a training course was given to the consultants from each country that did the work. In the case of water surplus/deficit, the WG representatives chose to use the Standardized Precipitation Index (SPI) as an indicator. These maps provide useful information for risk planning and management against extreme events. They are a good starting point for implementing or proposing management measures.
- *Estimates of drought conditions:* Analysis of drought conditions using the Standardized Precipitation–Evapotranspiration Index (SPEI) and incorporating the climate change scenarios generated by the INPE and the ETA model. This product is useful in planning, for the forecasting of water extremes, and to be taken into account in the elaboration of forward-looking management plans. In turn, these types of products are key inputs to propose adaptation measures and/or measures for the mitigation of climate variability and change.
- *Climate change scenarios:* Modeling climate change scenarios using the ETA (INPE) regional climate model, with 10km and 20km resolutions, taking the boundary conditions of the global model HadGEM2-ES (IPCC) for the scenario RCP 4.5 (Representative Concentration Pathways 4.5) (moderate) in the period 1960–2100. This product prepared by the INPE, Brazil, represented the basic and main input on which the adaptation and mitigation recommendations and associated to climate variability and change were made.
- *Reports with workshop results:* Conclusions gathered during the workshops on monitoring, alert, and radar networks carried out during the project period. These conclusions, which also include recommendations, for example for the improvement of the monitoring and alert network, are important inputs for the SAP design at the CIC level and for the countries to take into account for formulating new projects.
- *Transfer and training associated with networks, alert systems, and models:* The technical representatives from the five countries carried out training and technical visits, through which the exchange of experiences, knowledge, and technology on the ETA model was promoted. Special emphasis was placed on the installation of the ETA Climate software in the meteorological services and research centers of the five countries and the provision of training for its use. These activities encourage the strengthening of the participating institutions through the training of their human resources, as well as the provision of technology through the project (hardware and software to run the ETA model).
- *Hydrological modeling for the LPB:* Hydrological modeling of the LPB from the MGB hydrological model, based on satellite data and other data provided by the countries from monitoring stations. This con-

sultancy was carried out by IPH-UFRGS, from Brazil, which also provided training in the use of the model to technical representatives of institutions linked to the hydrological modeling of the five countries. This is a tool that is available to the LPB (and the CIC) on which to base and plan new watershed management projects. As in the previous case, the strengthening of the institutions represented through the participation of their technicians, the exchange of experiences, and the contributions of technology (MGB software) are also highlighted.

- *Hydrological modeling for the LPB incorporating climate change scenarios:* This product, related to the previous one, was produced by the IPH-UFRGS of Brazil from

the climatic scenarios generated by the INPE with the ETA model. The results of this modeling are useful to make future projections of potential flows in the different rivers of the Basin and to identify adaptation and mitigation measures, which include developing contingency plans for areas vulnerable to flooding, for example.

- *'Hydroclimatology in the La Plata Basin' publication:* This document was edited and published as a base material for consultation and reference on the subject, as a tool for technicians and those responsible for hydro-climatological organisms of different state levels and other organizations that carry out measurements in the five countries.

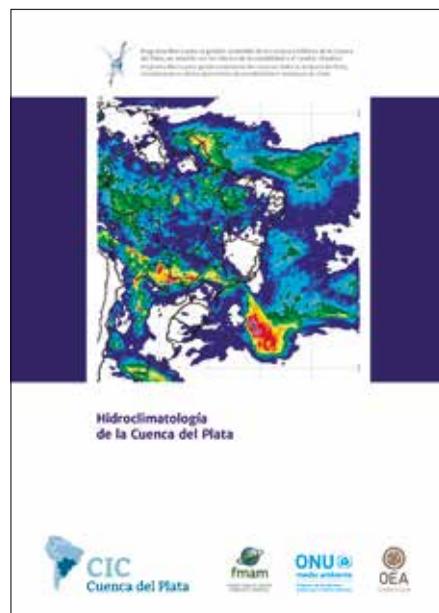
Table 3.2.14.1

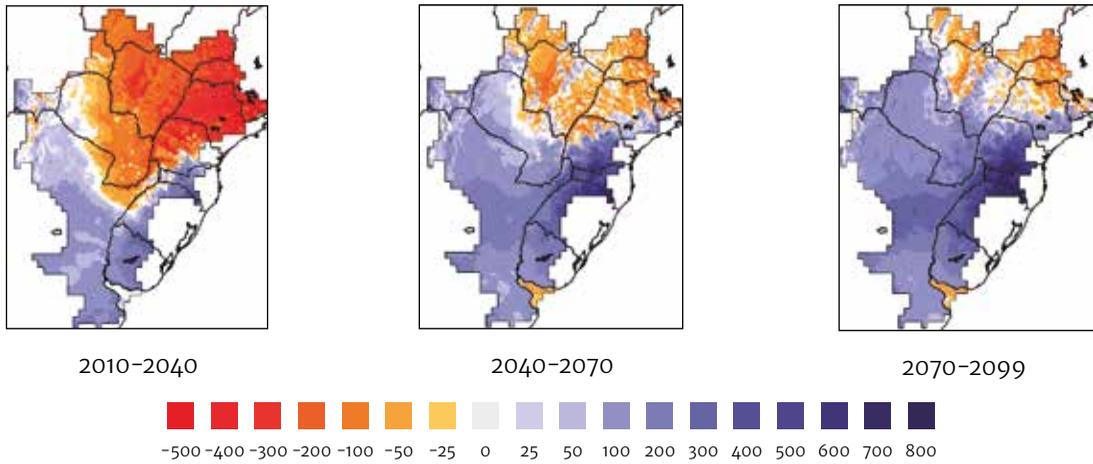
### Institutions Participating in the Climate Modeling WG

Country	Institutions
<b>Argentina</b>	Under-secretariat of Water Resources (SSRH), National Weather Service (SMN), Mixed Technical Commission of Salto Grande (CTM-Salto Grande), National Water Institute (INA), Yacyretá Binational Entity (EBY)
<b>Bolivia</b>	National Meteorology and Hydrology Service (SENAMHI), National Naval Hydrography Service (SMHN)
<b>Brazil</b>	National Water Agency (ANA), Institute of Hydraulic Research – Federal University of Rio Grande do Sul (IPH-UFRGS), National Center of Monitoring and Natural Disaster Alert – National Spacial Research Institute (INPE), Binational Itaipú (IB)
<b>Paraguay</b>	Directorate of Meteorology and Hydrology, Politechnical Department of the National University of Asunción (UNA), Yacyretá Binational Entity (EBY), Binational Itaipú (IB), Nuestra Señora de la Asunción Catholic University (UCA)
<b>Uruguay</b>	Uruguayan Institute of Meteorology (INUMET), Institute of Fluid Mechanics and Environmental Engineering of the University of the Republic (IMFIA-UDELAR), Mixed Technical Commission of Salto Grande (CTM-Salto Grande), Ministry of Housing, Land Use, and Environment (MVOTMA), National Environmental Directorate

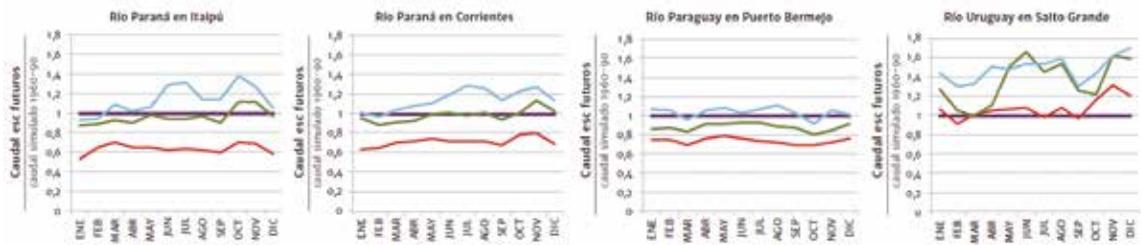


WMO Integrated Global Observing System  
Illustration of a few of the multiple observing systems used to monitor weather, climate, water and other environmental variables taking place in the land, the ocean, the atmosphere and space





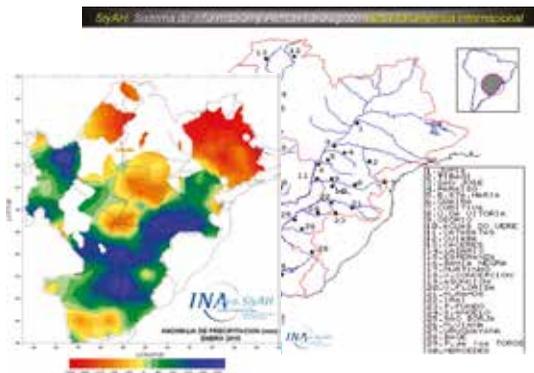
Precipitation anomalies for 3 future scenarios – ETA-CPTEC Model.



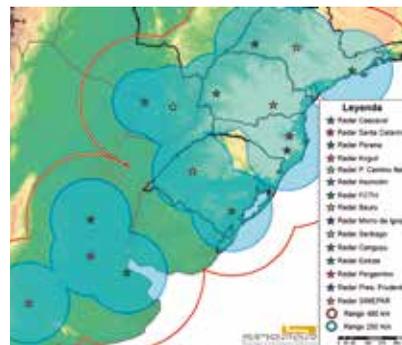
Ratio between simulated mean monthly flows that belong to three future scenarios and the present situation



Density of rain gauge measurements per sub-basin



Information and Hydrological Warning System of Argentina's National Water Institute that includes the La Plata Basin



Hydroclimatological Radars in the La Plata Basin



Workshop on climate change scenarios. Knowledge integration between countries and the different research centers in the La Plata Basin region.

Workshop on hydrological models. Presentation of successful cases in use in the region. Defining suitable models for the La Plata Basin: ETA and MGB.  
(Sao Jose dos Campos-BR, 2012)



Workshop on alert systems, integration of monitoring and radar networks in the La Plata Basin  
Participation of the Meteorological and Hydrological Services of the 5 countries  
(Asunción-PY 2014)



Centro de Situaciones de la Agencia Nacional  
del Agua de Brasil  
Intercambio y Capacitación



Integration of Meteorological Radar in the La Plata Basin coinciding with the Symposium on Radar and Hydro-meteorological Warning Systems of the Southern Cone  
Buenos Aires, Argentina, 2012

### 3.2.15 Elaboration of the TDA and SAP

#### **Background and context**

During the first phase of the Framework Program for the La Plata Basin, which took place between 2003 and 2005, a preliminary Transboundary Diagnostic Analysis (TDA) was created, in which the main problems, information gaps, proposals for strategic actions, and current and emerging Critical Transboundary Issues (CTI) were identified in the La Plata Basin, as presented in detail in item 2 of this document.

Based on this preliminary TDA, Phase 1 of the Framework Program (2011 to 2016) was designed, the overall objective of which was to strengthen cross-border cooperation between the governments of Argentina, Bolivia, Brazil, Paraguay, and Uruguay to ensure integrated and sustainable water resource management in the context of climate variability and change, capitalizing on opportunities for development. As a result of this stage, an updated Transboundary Diagnostic Analysis (TDA) would be created exposing the characteristic problems by sub-basin (Figure 3.2.15.1), as well as a Strategic Action Program (SAP) for the La Plata Basin.

At the global level, the TDA and the PAE for the La Plata Basin, one of the largest river basins on the planet, will probably be one of the most significant manifestations of IWRM to date, where the studies and analysis of surface and groundwater will contribute to its joint management and the development and implementation of climate change mitigation strategies.

The objective of this subcomponent was to elaborate a Strategic Action Program (SAP) for the La Plata Basin, agreed on by all countries, defining more precisely the

priority actions identified in the Framework Program based on a TDA focused on sub-basins and critical themes. This component consisted of two elements: (i) updating the TDA, including new specific studies on priority issues not considered and an analysis of the effects of climate variability and change, and (ii) preparation of the SAP based on the collection and analysis of the technical and scientific elements of the activities carried out in the project.

#### **Methodology**

The documents were elaborated based on the work and studies carried out in all sub-components of the project, by hiring more than 40 professionals, and by facilitating participation among all five countries. During its elaboration, a process of socialization and continuous validation with the Basin countries was carried out. In the consultation process, the relevant institutions in each country were involved, seeking to define the goals, objectives, and management recommendations. In particular, an international meeting was held in which more than 70 professionals participated and reviewed the content of the document and the management recommendations that had been identified.

As a management experience, the TDA has managed to identify more than 1500 specialists and more than 150 institutions in the Basin, contributing in a concrete way to the construction of policies aimed at strengthening cross-border cooperation, recognizing that shared problems can only be resolved by the coordinated action and joint work of the Basin countries.

The SAP was defined through a consolidated participation process in each country and within the La Plata Basin. It was designed as an instrument to coordinate

Figure 3.2.15.1

### Problems Characteristic of the Sub-basins



policies for water resource management and associated environmental issues, within the framework of present and future challenges related to climate variability and change in the La Plata Basin. It

has a long-term vision and considers the main Critical Transboundary Issues identified as barriers to be overcome to promote sustainable development. The Program is the result of the consolidation of

numerous studies and works developed to characterize present and emerging Critical Transboundary Issues, their main causes and impacts, and the projected climate variability and change scenarios. These works, due to the fact that they were carried out with the active involvement of authorities from various governmental institutions, specialists, and the academic sector related to water resource management, the environment, and the climate of each country, laid the groundwork for the future joint execution of the policies at the national and regional levels in the institutional framework of the CIC as coordinating entity and articulator of the actions at the Basin level.

### Results

- *Updated TDA of the Plata Basin:* The TDA contains an integrated diagnosis of the environmental aspects addressed in the project in relation to the effects of climate variability and change. It was developed based on each of the Transboundary Critical Issues (CTI), which allows for the understanding of the hydro-environmental behavior of the La Plata Basin, both from the historical point of view and the projected future one. Based on the analysis of the main CTI causes identified and on the recommendations arising from this phase of the project, general recommendations for the Strategic Action Program (SAP) are proposed, grouped into technical, economic-managerial, political-institutional, and socio-cultural categories.

The development of the TDA has allowed for the creation of an integrated document that contains a detailed analysis of the critical environmental problems existing in the La Plata Basin, their causes, and recommendations for

their mitigation. The TDA has served not only to update and give depth to the analysis of the CTI that affect the development of the Basin, but also to provide the technical-scientific and legal-institutional basis for the formulation of the Strategic Action Program (SAP).

- *SAP of the La Plata Basin:* Developed based on the recommendations identified in the TDA, and based on the vision and objective of the SAP established by the countries. The PAE structure was designed through three consultancies and organized into six strategic areas, 13 components, and 28 action items, with a planning horizon of 20 years (Figure 3.2.15.2).

The strategic areas of the SAP are positively related with the Sustainable Development Goals—which constitute the global agenda for the next few years—by carrying out actions that strengthen development at the global, national, local, and individual levels, enhancing improvements in thematic areas such as food security, drinking water, energy, urban infrastructure, consumption, and sustainable production, among others.

Figure 3.2.15.3 relates each of the strategic areas of the SAP with the seven Sustainable Development Goals on which the execution of the SAP will have an impact.

- Publication of the document *Transboundary Diagnostic Analysis of the La Plata Basin*: published in Spanish, Portuguese, and English.
- Publication of the document *Strategic Action Program of the La Plata Basin*: published in Spanish, Portuguese, and English.

Figure 3.2.15.2

**Interrelation of the Strategic Areas Proposed for the SAP**

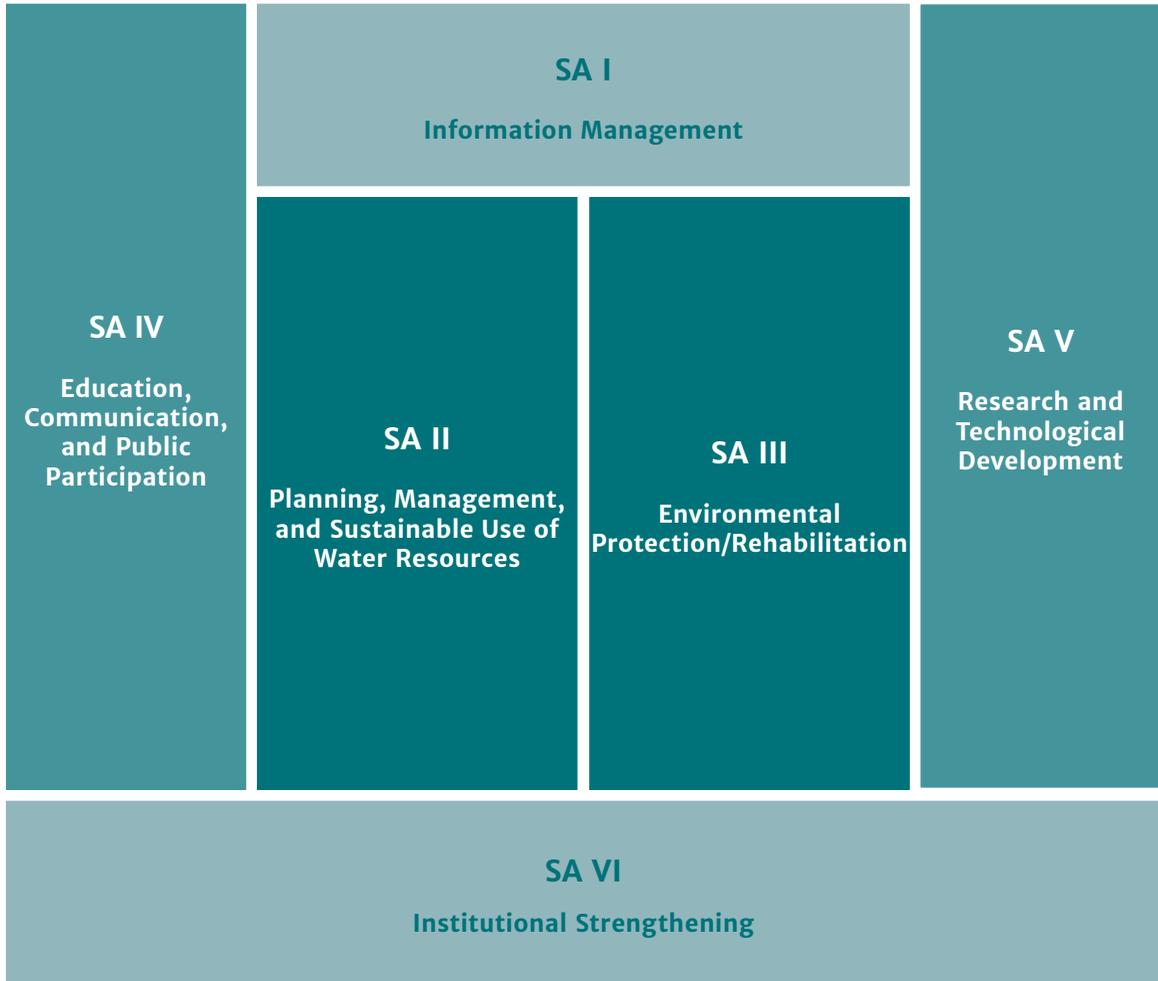


Figure 3.2.15.3

**Strategic areas of the SAP are positively related to the fulfillment of the Sustainable Development Goals**





# Chapter 4: Lessons Learned

The experiences of the Framework Program provided a series of lessons learned, which are summarized as follows:

## **a. Project Design**

- In a project involving multiple countries, it is necessary to define and come to an agreement from the initial design stage, reaching consensus on the project execution structure and clearly defining the missions, functions, and responsibilities of each hierarchical level involved in the management and supervision of the activities.
- The number of activities and indicators should be adequately defined. It is important to select indicators that clearly represent the progress of the project and the expected results, without over-extending the number and expectations to be reached by each one of them.
- It is important to recognize and address the expectations and needs of each country with respect to the project, integrating them with the common purpose.
- Existing baseline information and conditions of availability should be clearly

identified. Lack of clarity as to how information is made available can lead to delays in project implementation.

- Clearly identifying the institutional framework (agencies of each country that should be involved) and legal framework (norms, competencies, etc.) during project design is essential for proper project execution to achieve the expected results and enhance its impact.
- In the case of considering pilot projects to carry out local experiences, they must be spatially balanced between all the countries involved.
- The contributions of each project component and subcomponent to the TDA and SAP formulation should be clearly defined and agreed upon at the beginning of the project, establishing coherent approaches between the different working groups and a common vision towards achieving a central objective.

## **b. Project management**

### **b.1 Architecture of project governance**

- Steering Committee, Implementation Co-ordination, and Working Groups: A hierarchical pyramid structure was developed to consolidate a high level of institutional involvement of countries and agencies (implementation and execution).
  - The roles of all hierarchical levels of the project and institutional actors should be defined, reviewed, and confirmed (functions and responsibilities) to ensure compliance with project implementation.
  - To have an Implementation Coordination (National Coordinators, Director, Executing Agency, and Coordination Unit) is a key instrument to consolidate the common vision of the countries during the progress of the project and to jointly evaluate the progress in project execution, but the responsibilities should be clear with regard to an efficient decision-making process, as well as its consequences. The technical representatives of the countries involved in this coordination should be of the highest hierarchical level, and that the highest authority of the organization participate to ensure the coherence of decisions at the various levels.
  - The simplification of coordination and approval instances should probably be assessed.
  - The execution of the various subcomponents through working groups composed of national high-level technical representatives generates strong national ownership of the project, which translates into a greater role of national institutions in the execution of the project's activities. This fact—although in and of itself represents a very positive achievement and reflects a strong commitment on the part of the countries—can imply more complex and slow execution modalities. Therefore, coordination must be very strong and proactive in order to facilitate the achievement of the objectives of each subcomponent, depending on the project as a whole.
  - The accompaniment of the National Coordinator as a national technical leader coordinating and articulating the activities of the representatives of his country in the different working groups is essential, as execution of the project is at a global level.
  - Heightened institutional participation and greater national involvement in project implementation allows for greater support from countries in terms of national contributions to fund activities.
  - Political discrepancies between countries are normal in this type of project; however, it is an important challenge to maintain the decision-making process under various institutional contexts.
  - The role of management and administrative supervision and technical assistance by the executing agency (OAS) was positive.
- b.2 Implementation strategy:**
- A high level of national ownership at all levels allows for greater sustainability of future implementation of project results/proposals.
  - At the national level, the active participation of institutions through the Working Groups (organized with high-level government personnel, including the academic sector) and the participation of National Coordina-

tors in the decision-making process helped to internalize the project decisions in the national context, improving the execution of strategic actions at the Basin level and the sustainability of results within the framework of cooperation between countries.

- Execution through Working Groups (WG) acting at the specific level of each subcomponent facilitates the interest of the technical representatives involved in continuing to interact beyond the reach of the project, which gives greater sustainability to the executed actions.
- The combination of specific information integration consultancies and the consolidation of the expected results is necessary to ensure products within the terms foreseen in the project, so as not to depend on the scarce time availability of country staff and technical personnel assigned to collaborate with project development.
- The participation of the social actors involved in the TDA and SAP formulation was very important both in project development and in the sustainability of the planned actions. The active inter-ministerial participation ensures the inclusion of national interests and objectives in SAP design.
- The specific and outstanding support of the academic sector in activities related to hydrogeological diagnostic studies, integrated water balance, and land degradation, among others, provided valuable experiences and lessons, helping to establish and strengthen the links of the scientific community in the decision-making process at the political/governmental level.

### **c. Project implementation and results**

#### **c.1 Start of the project**

- It is important that the beginning/review stage is as short as possible. Having an extended start-up period can lead to a change in country representatives and/or product availability, leading to a necessary updating of project documents and redefinition of planned actions.
- It is necessary to fill in the information gap that may occur during the preparation/design stage and the beginning of the execution stage as quickly as possible, in order to have an up-to-date and reliable baseline.
- If the time between the design and the effective start of the project exceeds several years, the revision and appropriation work will be much more complicated because others will be involved and new expectations will have to be considered. Minimizing approval time to expedite the rapid start of execution is key to ensuring that the results planned in the design stage are valid at the start of execution.
- The participation process is key to ensuring ownership of the project by the countries. Participation must include all stakeholders defined by each country.

#### **c.2 Institutional strengthening:**

- The treatment of cross-border issues in the framework of an Intergovernmental Committee in which the Ministries of Foreign Affairs participate ensures the consensus of the agreements reached at the highest institutional level.

- The spaces for joint work in the national units in the framework of an international project are a positive experience of inter-ministerial interaction within each country.
- The spaces for joint work in working groups with representatives of the countries involved generate a space for capacity exchanges at a regional level that goes far beyond the scope of the project and expands toward a strengthening in the relationships between institutions and academia in the area of study (e.g. hydrological services, hydro-meteorological services, Engineering Academy, etc.).
- The high levels of project ownership in the implementation by the governmental and academic agencies of the countries generates a tangible strengthening of the cross-border cooperation between the countries involved.
- The possibility of financing multiple institutional meetings between the countries with economic weakness is essential for these activities to create a dialogue between technicians and institutions of the five countries, allowing for trust- and consensus-building for common policies at the middle and upper levels.

### ***c.3 SAP and TDA development process:***

- The project implementation strategy should emphasize the cooperation process between different actors as a mechanism for obtaining and securing project results that are appropriate at the national level, in addition to cross-border consensus. However, this strategy should be complemented by specialized consultancies to coordinate

and complete the expected outputs of the project.

### ***c.4 Involvement of different social actors:***

- The participation of actors involved in the management and ownership through the participatory process, contrasting the local visions with the expected results of the project, must be balanced to achieve a product that meets the expectations of all involved.
- The combination of specific consultancies to integrate information and produce expected results helps to reduce the potential effects of limited participation of national technical staff and officials.
- The involvement of local governments in IWRM improves the joint response to emergency situations, such as those occurring during extreme events.

### ***c.5 Monitoring systems and joint campaigns:***

- The integration of information from national networks (for example, hydro-climatic monitoring networks, water quality, forecasting and alert systems, etc.), available and accessible to all countries, generates a space for exchange that strengthens current and future common action.
- Defining common methodologies for hydro-meteorological measurement, water quality sampling and analysis, well drilling, and the exercise of joint fieldwork, among other things, generates common benefits for building capacities and exchanging experiences during the campaigns, and benefits later work by allowing for the comparison of results obtained under a common vision.

***c.6 Climate models and the construction of future scenarios:***

- Regional meteorological and hydrological models merged and implemented at the Basin level as hydro-meteorological management tools strengthen the technical capacities of the countries and improve adaptation capacity to climate variability and change throughout the Basin.
- Successful and sustainable management is that which considers climate variability and change in integrated water resource management.

***c.7 Decision-making support system:***

- It is important to establish a common database system for access to integrated information on multisectoral issues in the Basin to support future decision-making in integrated water resources management in a way that is sustainable over time.
- In order to ensure the sustainability of the system, it must be implemented considering the coordination of institutional framework at the Basin level, or any other regional entity that is responsible for operations.

***d. Sustainability of joint strategic actions***

- The participatory approach is a key factor for country ownership, while providing institutional strengthening and regional integration. A coordinated and integrated approach addresses issues related to water management in the context of climate change and variability that goes beyond GEF intervention and is reflected in the long term in national and regional policies with jointly defined strategic actions.
- The execution of the SAP—with the support of multilateral agencies—is key to continuing with the common actions, and its implementation with budgets and associated schedules must be agreed upon.
- The strategic areas of the SAP are positively related to the achievement of the Sustainable Development Goals, which is why countries will support these regional and national actions that promote improvements in topics such as food security, drinking water, energy, urban infrastructure, consumption, and sustainable production, among others.



# Chapter 5:

## Final Considerations

The Framework Program was able to tangibly and concretely strengthen the joint work of the countries through the competent national institutions in each of the topics covered in the preparation of the Transboundary Diagnostic Analysis and the formulation of a Strategic Actions Program for the La Plata Basin, as a planning instrument agreed upon by the countries, aimed at coordinating policies for water resource management and related environmental issues, within the framework of current and future challenges related to climate variability and change.

The set of strategic actions and activities constitute the intervention response and management recommendations to resolve or mitigate the impacts of the main Critical Transboundary Issues affecting the Basin, and to promote its sustainable development.

The strategic areas and specific components of the SAP can be developed and executed according to the specific topics (hydro-meteorological monitoring and alert, water supply, ecosystem management, reduction of pollutant sources, etc.). The timing and implementation of these actions, within the framework of the Program as

a whole, will depend on obtaining the financing necessary for their execution. In the short term, the priority is procuring financing to execute selected projects in each of the strategic areas, addressing the most relevant aspects for the solution of the Basin's critical issues, and catalyzing new sources of financing that will facilitate the implementation of the other PAE actions.

The strategic actions of the SAP will encompass various territorial areas, covering in some cases the entire Basin, and other specific areas located in certain sub-basins. Just as the scope of intervention will be diverse, the agencies and institutions that will take charge of the implementation of the actions will also be diverse. The multiplicity of actors involved in the execution of the actions, each with its own timelines, priorities, interests, and mechanisms, raises the need to establish an organizational framework that facilitates the coordination, functionality, and sustainability of the program. In this sense, it is a priority to develop an institutional framework and harmonize legal frameworks as essential instruments for the coordination, programming, and control of the strategic actions of the Program, taking into account

the regional nature of its objectives and stimulating the participation of different local actors at the national level through

the representatives of each country, and at the regional level within the framework of the CIC.





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# List of Acronyms

<b>ANA</b>	National Water Agency ( <i>Agência Nacional de Águas / Agencia Nacional de Aguas de Brasil</i> )
<b>CAB</b>	Cultivating Good Water ( <i>Cultivando Agua Boa / Cultivando Agua Buena</i> )
<b>CIC</b>	Intergovernmental Coordinating Committee of the Countries of La Plata Basin ( <i>Comité Intergubernamental Coordinador de los Países de la Cuenca del Plata</i> )
<b>CIH</b>	Intergovernmental Committee of the Paraguay-Parana Waterway ( <i>Comité Intergubernamental de la Hidrovía Paraguay-Paraná</i> )
<b>CIH</b>	International Center for Hydroinformatics ( <i>Centro Internacional de Hidroinformática</i> )
<b>COHIFE</b>	Federal Water Council ( <i>Consejo Hídrico Federal, de Argentina</i> )
<b>CPRM</b>	Brazilian Geological Service ( <i>Serviço Geológico do Brasil / Servicio Geológico de Brasil</i> )
<b>CPTEC</b>	Center for Weather Forecasting and Climate Studies ( <i>Centro de Previsão de Tempo e Estudos Climáticos / Centro de Predicción del Tiempo y Estudios Climáticos de Brasil</i> )
<b>CTI</b>	Critical Transboundary Issue ( <i>Tema Crítico Transfronterizo- TCT</i> )
<b>CTM</b>	Mixed Technical Commission of Salto Grande ( <i>Comisión Técnica Mixta de Salto Grande, Argentina-Uruguay</i> )
<b>DINAGUA</b>	National Directorate of Water ( <i>Dirección Nacional de Aguas de Uruguay</i> )
<b>DINAMA</b>	National Environment Directorate ( <i>Dirección Nacional de Medio Ambiente de Uruguay</i> )
<b>DINARA</b>	National Directorate of Aquatic Resources ( <i>Dirección Nacional de Recursos Acuáticos de Uruguay</i> )
<b>DMH</b>	Direction of Meteorology and Hydrology ( <i>Dirección de Meteorología e Hidrología de Paraguay</i> )
<b>DPP</b>	Demonstrative Pilot Projects ( <i>Proyectos Piloto Demostrativos- PPD</i> )
<b>DSS</b>	Decision-making Support System ( <i>Sistema Soporte para la Toma de Decisiones- SSTD</i> )
<b>EBY</b>	Yacyretá Binational Entity ( <i>Entidad Binacional Yacyretá, Argentina-Paraguay</i> )
<b>EMBRAPA</b>	The Brazilian Agricultural Research Corporation ( <i>Empresa Brasileira de Pesquisa Agropecuária / Empresa Brasileña de Investigación Agropecuaria</i> )
<b>FMAM</b>	Global Environment Fund ( <i>Fondo para el Medio Ambiente Mundial, see GEF</i> )
<b>FP</b>	Framework Program for the Sustainable Management of La Plata Basin's Water Resources, with respect to the effects of climate variability and change ( <i>Programa Marco para la Gestión Sostenible de los Recursos Hídricos en la Cuenca del Plata, en relación con los efectos de la variabilidad y el cambio climático- PM</i> )
<b>FPPP</b>	Fund for Promoting Public Participation ( <i>Fondo para la Participación Pública</i> )
<b>GAS</b>	Guaraní Aquifer System ( <i>Sistema Acuífero Guaraní- SAG</i> )
<b>GDP</b>	Gross Domestic Product ( <i>Producto Bruto Interno- PBI</i> )
<b>GEF</b>	Global Environment Fund / Fondo para el Medio Ambiente Mundial – FMAM (cited in the document by its Spanish acronym)
<b>IB</b>	Binational Itaipú ( <i>Itaipú Binacional, Brasil-Paraguay</i> )

<b>IBGE</b>	Brazilian Institute of Geography and Statistics ( <i>Instituto Brasileiro de Geografia e Estatística / Instituto Brasileño de Geografía y Estadística de Brasil</i> )
<b>IGAM</b>	Mineiro Institute for Water Management ( <i>Instituto Mineiro de Gestão das Águas / Instituto Mineiro de Gestión de Aguas del Estado de Minas Gerais, Brasil</i> )
<b>INA</b>	National Water Institute ( <i>Instituto Nacional del Agua de Argentina</i> )
<b>INDEC</b>	National Institute of Statistics and Census ( <i>Instituto Nacional de Estadística y Censos de Argentina</i> )
<b>INE</b>	National Institute of Statistics ( <i>Instituto Nacional de Estadística de Bolivia</i> )
<b>INE</b>	National Institute of Statistics ( <i>Instituto Nacional de Estadística de Uruguay</i> )
<b>INIA</b>	National Institute of Agricultural Research ( <i>Instituto Nacional de Investigación Agropecuaria de Uruguay</i> )
<b>INMET</b>	National Institute of Meteorology ( <i>Instituto Nacional de Meteorologia / Instituto Nacional de Meteorología de Brasil</i> )
<b>INPE</b>	National Spatial Research Institute ( <i>Instituto Nacional de Pesquisas Espaciais / Instituto Nacional de Investigaciones Espaciales de Brasil</i> )
<b>INTA</b>	Institute of Agricultural Technology ( <i>Instituto Nacional de Tecnología Agropecuaria de Argentina</i> )
<b>INUMET</b>	Uruguayan Institute of Meteorology ( <i>Instituto Uruguayo de Meteorología</i> )
<b>IPTA</b>	Paraguayan Institute of Agrarian Technology ( <i>Instituto Paraguayo de Tecnología Agraria</i> )
<b>IWB</b>	Integrated water balance ( <i>Balance Hídrico Integrado – BHI</i> )
<b>IWRM</b>	Integrated Water Resource Management ( <i>Gestión Integrada de los Recursos Hídricos- GIRH</i> )
<b>LPB</b>	La Plata Basin ( <i>Cuenca del Plata- CdP</i> )
<b>MAYDS</b>	Ministry of Environment and Sustainable Development ( <i>Ministerio de Ambiente y Desarrollo Sustentable de Argentina</i> )
<b>Mercosur</b>	<i>Mercado Común del Sur</i>
<b>MMA</b>	Ministry of Environment ( <i>Ministério do Meio Ambiente do Brasil / Ministerio de Medio Ambiente de Brasil</i> )
<b>MMAyA</b>	Ministry of Environment and Water ( <i>Ministerio de Medio Ambiente y Agua de Bolivia</i> )
<b>MVOTMA</b>	Ministry of Housing, Land Use, and Environment ( <i>Ministerio de Vivienda, Ordenamiento Territorial y Medio Ambiente de Uruguay</i> )
<b>OAS</b>	Organization of American States ( <i>Organización de los Estados Americanos- OEA</i> )
<b>OSE</b>	Administration of State Sanitary Works ( <i>Administración de las Obras Sanitarias del Estado de Uruguay</i> )
<b>PCU</b>	Project Coordination Unit ( <i>Unidad de Coordinación de Proyecto- UCP</i> )
<b>PHI</b>	International Hydrological Program ( <i>Programa Hidrológico Internacional</i> )
<b>PNUMA</b>	United Nations Environment Program- UNEP / <i>Programa de las Naciones Unidas para el Medio Ambiente</i> (cited in the document by its Spanish acronym)
<b>SAP</b>	Strategic Action Program ( <i>Programa de Acciones Estratégicas- PAE</i> )
<b>SEAM</b>	Secretary of the Environment ( <i>Secretaría del Ambiente de Paraguay</i> )

<b>SEGEMAR</b>	Argentine Geological Mining Service ( <i>Servicio Geológico Minero Argentino</i> )
<b>SENAMHI</b>	National Meteorology and Hydrology Service ( <i>Servicio Nacional de Meteorología e Hidrología de Bolivia</i> )
<b>SERGEOMIN</b>	Geological and Mining Service ( <i>Servicio Nacional Geológico de Minas de Bolivia</i> )
<b>SHN</b>	Naval Hydrography Service ( <i>Servicio de Hidrografía Naval de Argentina</i> )
<b>SIMEPAR</b>	Paraná Meteorological System ( <i>Sistema Meteorológico do Paraná/ Sistema Meteorológico del Estado de Paraná, Brasil</i> )
<b>SINARAME</b>	National System of Meteorological Radar ( <i>Sistema Nacional de Radares Meteorológicos de Argentina</i> )
<b>SMHN</b>	National Naval Hydrography Service ( <i>Servicio Meteorológico e Hidrológico Nacional de Bolivia</i> )
<b>SMN</b>	National Weather Service ( <i>Servicio Meteorológico Nacional de Argentina</i> )
<b>SNHN</b>	National Naval Hydrography Service ( <i>Servicio Nacional de Hidrografía Naval de Bolivia</i> )
<b>SNIRH</b>	National System of Information on Hydraulic Resources ( <i>Sistema Nacional de Informações sobre Recursos Hídricos / Sistema Nacional de Informaciones sobre los Recursos Hídricos de Brasil</i> )
<b>SRHU</b>	Secretary of Urban Environment and Water Resources ( <i>Secretaria de Recursos Hídricos e Ambiente Urbano / Secretaria de Recursos Hídricos y Ambiente Urbano de Brasil</i> )
<b>SSRH</b>	Under-secretariat of Water Resources ( <i>Subsecretaria de Recursos Hídricos de la Nación de Argentina</i> )
<b>TCP</b>	La Plata River Basin Treaty ( <i>Tratado de la Cuenca del Plata</i> )
<b>TDA</b>	Transboundary Diagnostic Analysis ( <i>Análisis Diagnóstico Transfronterizo- ADT</i> )
<b>UN</b>	United Nations ( <i>Organización de las Naciones Unidas- ONU</i> )
<b>Unasur</b>	Unión de Naciones Suramericanas
<b>UNEP</b>	United Nations Environment Programme / <i>Programa de las Naciones Unidas para el Medio Ambiente – PNUMA</i> (se cita en el texto por su sigla en español)
<b>Unesco</b>	<i>Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura</i>
<b>UNESP</b>	Paulista State University ( <i>Universidade Estadual Paulista “Júlio de Mesquita Filho”/ Universidad Estatal Paulista “Julio de Mesquita Filho”</i> )
<b>UNP</b>	National Project Units ( <i>Unidades Nacionales de Proyecto</i> )
<b>WG</b>	Working Group ( <i>Grupo de Trabajo- GT</i> )
<b>WIGOS WMO</b>	Integrated Global Observing System ( <i>Sistema Integrado de Observación Global de la Organización Meteorológica Mundial</i> )
<b>WMO</b>	World Meteorological Organization ( <i>Organización Meteorológica Mundial- OMM</i> )
<b>YTTAS</b>	Yrendá Tobá Tarijeño Aquifer System ( <i>Sistema Acuífero Yrendá Toba Tarijeño- SAYTT</i> )



# Institutional References

## Representatives of the countries in the Directing Council of the Framework Program

Political Representative	Technical Representative	Second Technical Representative
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### Argentina

#### Principals

Ambassador  
Natalio Marcelo Jamer  
(2016)

Ambassador  
Mónica Rosa Troadello  
(2011-2015)

Pablo Bereciartua  
(2016)

Edgardo Bortolozzi  
(2012-2015)

Fabián López  
(2011)

Osvaldo Fernandez  
(2016)

Roberto Adaro  
(2015, 2013 and 2012)

Julio Nasser  
(2014)

Miguel Gomez  
(2011)

#### Alternates

Minister  
Eugenio Garcia Santos  
(2012-2016)

Marcelo Gaviño Novillo  
(2016)

Andrés Rodríguez  
(2011-2015)

Miguel Gomez  
(2014)

### Bolivia

#### Principals

Ambassador  
Juan Carlos Alurralde  
(2013-2016)

Ambassador  
Pablo Guzman Lougier  
(2011-2013)

Carlos Ortuño  
(2014-2016)

Luis Marka Saravia  
(2012-2013)

Oscar Cespedes Montaña  
(2014-2016)

#### Alternates

Juan Carlos Seguro Tapia  
(2014-2016)

Mayra Montero Castillo  
(2011-2016)

Clarems Endara Vera  
(2011)

Oscar Céspedes  
(2014-2016)

### Brazil

#### Principals

Ambassador  
Eugenia Barthelmess  
(2015-2016)

Ambassador  
João Luiz Pereira Pinto  
(2011-2013)

Julio Thadeu Silva Kettelhut  
(2011-2016)

Political Representative	Technical Representative	Second Technical Representative
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### Brazil

#### Alternates

Minister-Counselor  
Gisela Padovan (2013-2016)  
First Secretariat  
Rodrigo de Macedo Pinto (2016)  
Second Secretariat  
Joaquim Araújo (2016)  
Secretariat Filipe Lopes  
(2014-2015)  
Secretariat Felipe Antunes  
(2014-2015)  
Minister  
Philip Fox-Drummond Gough (2013)  
Second Secretariat Patricia Soares  
(2011)

### Paraguay

#### Principals

Ambassador Didier Olmedo (2014-2016)	David Fariña (2014-2016)
Ambassador Luis Fernando Avalos (2012-2014)	Sofía Vera (2013-2014)
Ambassador Gabriel Enciso Lopez (2011)	Daniel González (2013)
	Silvia Spinzi (2012)
	Daniel Garcia (2011-2012)

#### Alternates

First Secretariat Blas Felip (2013-2016)	Rafael Gonzalez (2011)
Minister Miguel Lopez Arzamendia (2012)	
Counselor Alfredo Nuñez (2011-2012)	
First Secretariat Eliana Abigail Vergara (2011-2013)	

### Uruguay

#### Principals

Martín Vidal (2016)	Daniel Greif (2015-2016)	Alejandro Nario (2015-2016)
Minister Juan Remedi (2011-2015)	Daniel Gonzalez (2012-2013)	Jorge Rucks (2011-2015)
	José Luis Genta (2011)	

#### Alternates

Javier Vidal (2016)	Silvana Alcoz (2015-2016)
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## National Units of the Framework Program

### National Coordinators

Argentina	Bolivia	Brazil	Paraguay	Uruguay
<b>Principals</b>				
Miguel A. Giraut (2011-2016)	Mayra Montero Castillo (2011-2016)	Julio Thadeu Silva Kettelhut (2011-1016)	David Fariña (2014-2016) Sofia Vera (2013-2014) Daniel Gonzalez (2013) Silvia Spinzi (2012) Daniel Garcia (2011-2012)	Silvana Alcoz (2011-2016)

### National Coordinator Assistants

Argentina	Bolivia	Brazil	Paraguay	Uruguay
Susana Minatti (2011-2016)		Aureliano Cesar (2011-2016)	Julieta Gauto (2011-2016)	Ana Laura Martino (2011-2016)

## National Units of the Framework Program

### Thematic Groups of the Framework Program

Argentina*	Bolivia	Brazil	Paraguay	Uruguay
<b>Legal and Institutional Framework</b>				
Ministerio de Relaciones Exteriores y Culto (Mónica Troadello, Natalio Marcelo Jamer)	Ministerio de Relaciones Exteriores (Juan Carlos Alurralde, Pablo Guzmán Lougier, Mayra Montero Castillo)	Ministerio de Relaciones Exteriores (Eugenia Barthelmess, Joa Luiz Pereira Pinto); Ministerio do Medio Ambiente/ Secretaría de Recursos Hídricos y Ambiente Urbano (Julio Thadeu Silva Kettelhut)	Ministerio de Relaciones Exteriores (Didier Olmedo, Luis Fernando Avalos, Blas Felip)	Ministerio de Relaciones Exteriores (Juan Antonio Remedi)
<b>Decision-making Support System</b>				
Subsecretaría de Recursos Hídricos de la Nación (Federico Scuka, Carla Lupano)	Ministerio de Medio Ambiente y Agua (Lizet Sullcata)	Agencia Nacional de Aguas (Sergio Barbosa)	Secretaría del Ambiente (Julián Cáceres); Facultad de Ingeniería de la Universidad Nacional de Asunción (Federico Ferreira, Nestor Cabral)	Ministerio de Vivienda, Ordenamiento Territorial y Medio Ambiente (Virginia Fernández); Instituto Uruguayo Meteorología (INUMET) (Víctor Marabotto); Comisión Técnica Mixta de Salto Grande (CTM-SG) (Ignacio Corrales)
<b>Public Participation, Communication and Education</b>				
Secretaría de Ambiente y Desarrollo Sustentable de la Nación (Silvia Freiler, Daniela García)	Ministerio de Relaciones Exteriores (María del Sagrario Urgel Aguilar, Consuelo Ponce) Ministerio de Educación	Ministerio de Medio Ambiente/ Secretaría de Recursos Hídricos y Ambiente Urbano (Franklin de Paula Júnior)	Universidad Nacional de Pilar (Ernila Vera); Secretaría de la Información y Comunicación (César Palacios); Secretaría del Ambiente (María Coronel)	MVOTMA (Luján Jara); Ana Laura Martino; Ministerio de Educación y Cultura (Laura Barcia); Secretaría Comunicación Presidencia (Carolina Echavarría)
<b>Integrated Hydraulic Balance</b>				
Instituto Nacional del Agua/Centro Regional Litoral (Carlos Paoli)	Servicio Nacional de Meteorología e Hidrología (Luis Noriega)	Instituto de Investigaciones Hidráulicas (André Silveira, Walter Collischonn)	Secretaría del Ambiente (Andrés Wehrle); Universidad Nacional de Asunción (Juan Pablo Nogués); Itaipú Binacional (Pedro Domaniczky)	Universidad de la República (UDELAR) (Luis Silveira, Christian Chreties, Magdalena Crisci, Jimena Alonso); UDELAR-Regional Norte (Pablo Gamazo); CTM-SG (Nicolás Failache); MVOTMA (Rodolfo Chao)

\*Consejo Hídrico Federal Argentina (2011– 2016).

Dirección de Hidráulica de Entre Ríos (Oscar Duarte). Instituto Correntino del Agua y del Ambiente (Mario Rujana).

## Thematic Groups of the Framework Program

Argentina	Bolivia	Brazil	Paraguay	Uruguay
<b>Water Quality</b>				
Subsecretaría de Recursos Hídricos de la Nación (Marina Jakomin)	Ministerio de Medio Ambiente y Agua (Geovana Rocabado)	Agencia Nacional de Aguas (Maurrem Ramon Vieira)	Universidad Nacional de Asunción (Inocencia Peralta); Secretaria del Ambiente (Sofía Vera, Aida Olavarrieta)	MVOTMA (Luis Reolón)
<b>Groundwater</b>				
Subsecretaría de Recursos Hídricos de la Nación (Jorge Santa Cruz, Lida Borello)	Servicio Geológico Minero (Jorge Bellot)	Departamento de Aguas y Energía Eléctrica (Gerônimo Rocha); Servicio Geológico de Brasil (João Alberto Diniz, Fernando Feitosa, Roberto Kircheim)	Facultad de Ingeniería de la Universidad Nacional de Asunción (Andrés Wehrle); Secretaria del Ambiente (Daniel García Segredo)	MVOTMA (Lourdes Batista, Ximena Lacués); CEREGAS (Alberto Manganelli) Ministerio de Industria, Energía y Minería (MIEM) (Enrique Massa, Javier Techera); Obras Sanitarias del Estado (OSE) (Pablo Decoud, Andrés Pérez)
<b>Aquatic Ecosystems</b>				
Secretaría de Ambiente y Desarrollo Sustentable de la Nación (Sara Sverlij); Subsecretaría de Recursos Hídricos de la Nación (Laura Pertusi)	Dirección General de Biodiversidad y Áreas Protegidas (Sharbel Gutierrez)	Universidad Estadual Paulista (Marcos Nogueira, Danilo Naliato)	Secretaría del Ambiente (Mirta Medina, Nora Neris, Reinilda Duré)	MVOTMA (Guillermo Scarlato); Ana Laura Martino; Ministerio de Agricultura, Ganadería y Pesca (Alfredo Pereira); UDELAR (Alejandro Brazeiro)
<b>Environmental Degradation</b>				
Secretaría de Ambiente y Desarrollo Sustentable de la Nación (José Cuevas; Pablo Viegas Aurelio)	Ministerio de Desarrollo Rural y Tierra	Empresa Brasileña de Investigación Agropecuaria (Celso Vainer Manzatto)	Secretaria del Ambiente (David Fariña, José Silvero)	Ministerio de Ganadería, Agricultura y Pesca MGAP (Carlos Clerici); Facultad de Agronomía de la Universidad de la República - UDELAR (Mario Pérez Bidegain, Fernando García Prechac)
<b>Development Opportunities</b>				
Secretaría de Ambiente y Desarrollo Sustentable de la Nación (Martín Reymúndez)	Ministerio de Relaciones Exteriores	Ministerio de Transportes (Luiz Eduardo García)	Secretaría Nacional de Turismo (Antonio Van Humbeeck)	Ministerio de Turismo (Marcelo Canteiro)

## National Units of the Framework Program

### Thematic Groups of the Framework Program (continuation)

Argentina	Bolivia	Brazil	Paraguay	Uruguay
<b>PPD Biodiversity</b>				
Subsecretaría de Recursos Hídricos de la Nación (Laura Pertusi); Secretaría de Ambiente y Desarrollo Sustentable de la Nación (Sara Sverlij)	Ministerio de Medio Ambiente y Agua	Universidad Estadual Paulista (Marcos Nogueira); Itaipú Binacional (Carla Canzi)	Secretaria del Ambiente (Darío Mandelburger)	
<b>PPD Confluence</b>				
Administración Provincial del Agua del Chaco (Patricia Parini)		Itaipú Binacional (Jair Kotz, Carla Canzi)	Entidad Binacional Yacyretá (Lucas Chamorro)	
<b>PPD Cuareim</b>				
		Comité de las Aguas Estadales de la cuenca del río Quaraí (Ivo Lima Wagner); Secretaria do Ambiente e Desenvolvimento Sustentável do Rio Grande do Sul; Departamento de Recursos Hídricos (Fernando Meirelles)		Referente Local (Laura Marcelino); Comisión Cuenca Río Cuareim; MVOTMA (Silvana Alcoz); Ana Laura Martino
<b>PPD Pilcomayo</b>				
Unidad Provincial Coordinadora del Agua de Formosa (Horacio Zambón); Secretaría de Recursos Hídricos de Salta (Alfredo Fuertes)	Ministerio de Relaciones Exteriores (Juan Carlos Segurola, Mayra Montero Castillo); Ministerio de Medio Ambiente y Agua (Oscar Cespedes)		Secretaria del Ambiente (Rosa Morel, Daniel García)	
<b>Hydroclimatic Scenarios</b>				
Instituto Nacional del Agua (Dora Goniadzki)	Servicio Nacional de Meteorología e Hidrología (Gualberto Carrasco)	Instituto Nacional de Investigaciones Espaciales (Gilvan Sampaio de Oliveira)	Dirección de Meteorología e Hidrología (Julián Baez); Facultad Politécnica de la Universidad Nacional de Asunción (Benjamín Grassi)	UDELAR (Rafael Terra, Gabriel Cazes, Marcelo Barrierro); INUMET (Mario Bidegain)

## Thematic Groups of the Framework Program

Argentina	Bolivia	Brazil	Paraguay	Uruguay
<b>Monitoring and Early Warning</b>				
Instituto Nacional del Agua (Juan Borús)	Servicio Nacional de Hidrografía Naval (Luis Miguel Carrasco)	Agencia Nacional de Aguas (Valdemar S. Guimarães, Augusto Bragança)	Entidad Binacional Yacyretá (Lucas Chamorro); Universidad Católica Nuestra Señora de la Asunción (Cristián Escobar)	UDELAR (Luis Silveira, Jimena Alonso); MVOTMA (Luis Reolón, Gabriel Yorda, Javier Martínez, Juan Carlos Giacri, Adriana Piperno) CECOED Artigas (Juan José Eguillor)
<b>Radar</b>				
Subsecretaría de Recursos Hídricos de la Nación (Juan Carlos Bertoni, Carlos Lacunza)	Servicio Nacional de Meteorología e Hidrología (Gualberto Carrasco)	Centro Nacional de Monitoreo y Alertas de Desastres Naturales (Carlos Frederico de Angelis)	Dirección de Meteorología e Hidrología (Julián Baez)	UDELAR (Gabriel Cazes); INUMET (Daniel Bonora, Néstor Santayana); CTM-SG (Juan Badagian)
<b>Great Basin Models</b>				
Instituto Nacional del Agua (Juan Borús)	Servicio Nacional de Hidrografía Naval (Luis Miguel Carrasco)	Instituto de Investigaciones Hidráulicas (Walter Collischonn)	Universidad Católica Nuestra Señora de la Asunción (Cristián Escobar, Pedro Takahashi)	UDELAR (Christian Chreties)



## **GLOBAL ENVIRONMENT FACILITY – GEF**

The GEF promotes international cooperation and fosters actions to protect the environment of our planet. Since its inception, it has become a catalyst and source of funding to consider global environmental issues in the development process in an integrated way, which is crucial to achieving a sustainable balance between man and nature. It provided the grants which funded the Framework Program.



## **UNITED NATIONS ENVIRONMENT PROGRAMME – UN ENVIRONMENT**

UN Environment directs and encourages participation in caring for the environment by inspiring, informing and giving nations and peoples the means of improving their quality of life without endangering future generations. In the organizational structure of the Framework Program, it has been the GEF implementing agency, and its goal has been to ensure that the project is implemented for the benefit of the global environment. Member of the Project Board.



## **ORGANIZATION OF AMERICAN STATES – OAS**

The OAS has maintained a historical relationship of technical cooperation with the La Plata River Basin and the CIC on issues related to sustainable development, natural resources and management of water resources. For the preparation of the Framework Program for the La Plata Basin, it was the regional organization selected both by UN Environment and by the CIC, as the executing agency with technical and administrative responsibility for GEF funds. Member of the Project Board.

## **Framework Program**

### **GEF – FMAM**

Christian Severin  
Senior Environment Specialist

### **UN ENVIRONMENT**

Isabelle Van Der Beck  
Program Manager

### **OAS – OEA**

Cletus Springer  
Director of the Department of  
Sustainable Development (DDS)

Maximiliano Campos  
Senior Chief, Integrated Water Resources  
Management Division

Enrique Bello  
Adjunct Chief of the Technical and Administrative  
Unit GS/OAS Argentina

### **PROJECT DIRECTOR**

Miguel Ángel López Arzamendia (2010–2011)  
José Luis Genta (2011–2015)  
Alejandro Peyrou (2015–2016)

### **INTERNATIONAL TECHNICAL COORDINATOR**

Silvia Rafaelli (2011–2016)

### **ADJUNCT TECHNICAL COORDINATOR**

Elena Benitez Alonso (2011–2013)  
Ana Maria Castillo Clerici (2013–2016)

### **TECHNICAL ASSISTANTS**

Ignacio Masson (2011–2014)  
Julia Lacal Bereslawski (2011–2016)  
Eduardo Roude (2011–2016)  
Valeria Rodríguez Brondo (2011–2014)  
Fabián Riveros (2011–2012)  
Romina Morbelli (2013–2016)  
Marta Ayala (2014–2016)  
Martín Ribeiros (2014)  
Roberto Montes (2015)

### **SECRETARIES**

Aliene Zardo Ferreira (2011)  
Danielle Carvalho (2011–2012)  
Lourdes Martins (2012–2015)  
María Paula Giorgieri (2015–2016)



# Publications of the Framework Programme

## Main Documents

*Versions in Spanish, Portuguese and English*

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**Transboundary Diagnostic Analysis of the La Plata Basin TDA**



**Strategic Action Program for the La Plata Basin SAP**



**Transboundary Diagnostic Analysis (TDA) and Strategic Action Program (SAP) of the La Plata Basin Executive Summary**



**Framework Program of the La Plata River Basin Implementation Process and Primary Outcomes**

## Thematic Documents

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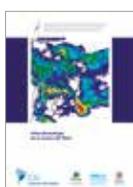
**Sistema soporte para la toma de decisiones de la Cuenca del Plata**



**Marco institucional y legal para la gestión integrada de los recursos hídricos en la Cuenca del Plata**



**Participación pública, comunicación y educación**  
Proyectos del Fondo de Participación Pública  
Réplica del Programa Cultivando Agua Buena



**Hidroclimatología de la Cuenca del Plata**



**Balance hídrico en la Cuenca del Plata**  
Disponibilidad y usos, considerando escenarios futuros  
Modelos de gestión



**Calidad del agua  
en la Cuenca del Plata**



**Aguas subterráneas  
en la Cuenca del Plata**



**Ecosistemas acuáticos  
en la Cuenca del Plata**



**Inventario de Regiones  
de Humedales de  
la Cuenca del Plata**



**Degradación de tierras  
en la Cuenca del Plata**



**Selva Misionera  
Paranaense**



**Hidroelectricidad  
y navegación en  
la Cuenca del Plata**



**Tecnologías limpias  
y ecoturismo  
en la Cuenca del Plata**



**Buenas prácticas  
en el uso del suelo  
en la Cuenca del Plata**



**Boas práticas  
para o cultivo do arroz  
na Bacia do Prata**



**Proyecto Piloto Demostrativo  
Conservación de la biodiversidad  
íctica en una zona regulada  
del río Paraná**



**Proyecto Piloto Demostrativo  
Resolución de conflictos por  
el uso del agua en la cuenca  
del río Cuareim/Quaraí**



**Proyecto Piloto Demostrativo  
Sistema de alerta hidroambiental  
en la confluencia de los ríos  
Paraguay y Paraná**



**Proyecto Piloto Demostrativo  
Control de contaminación  
y erosión en el río Pilcomayo**







The Framework Program for the Sustainable Management of La Plata Basin's Water Resources, with respect to the effects of climate variability and change



**CIC**  
Cuenca del Plata



GLOBAL ENVIRONMENT  
FACILITY



United Nations  
Environment Programme



**OAS**

For a better world