

LATIN AMERICA  
Environmental Protection and Sustainable Development of the Guarani Aquifer System Project

## Project Appraisal Document

Latin America and Caribbean Region  
LCSES

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<b>Project ID:</b> P068121	<b>Sector(s):</b> VM - Natural Resources Management
	<b>Theme(s):</b> Environment; Water
<b>Focal Area:</b> I - International Waters	<b>Poverty Targeted Intervention:</b> N

### Project Financing Data

**Loan**     **Credit**     **Grant**     **Guarantee**     **Other:**

#### For Loans/Credits/Others:

**Amount (US\$m):** 0

<b>Financing Plan (US\$m):</b>	<b>Source</b>	<b>Local</b>	<b>Foreign</b>	<b>Total</b>
BORROWER/RECIPIENT		7.46	4.64	12.10
GLOBAL ENVIRONMENT FACILITY		1.30	12.10	13.40
LOCAL: BENEFICIARIES		0.51	0.75	1.26
<b>Total:</b>		9.27	17.49	26.76

**Borrower/Recipient:** MULTI-COUNTRY PROJECT ARG-BRA-PAR-URU

Republic of Argentina - Federative Republic of Brazil - Republic of Paraguay - Oriental Republic of Uruguay

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**Estimated Disbursements ( Bank FY/US\$m):**

FY	2003	2004	2005	2006				
<b>Annual</b>	1.61	4.02	4.64	3.13				
<b>Cumulative</b>	1.61	5.63	10.27	13.40				

**Project implementation period:** 4 years

OCS PAD Form: Rev. March, 2000

## **A. Project Development Objective**

### **1. Project development objective:** (see Annex 1)

The long-term objective is the sustainable, integrated management and use of the Guarani Aquifer System. The Guarani Aquifer System is situated in the eastern and south central portions of South America, and underlies parts of Argentina, Brazil, Paraguay, and Uruguay. This project is a first step toward achieving the long-term objective. It is to support the four countries in jointly elaborating and implementing a common institutional and technical framework for managing and preserving the Guarani Aquifer System for current and future generations. To provide such support, seven project components are envisaged: (i) expansion and consolidation of the current scientific and technical knowledge base regarding the Guarani Aquifer System; (ii) joint development and implementation of a Guarani Aquifer System Management Framework, based upon an agreed Strategic Program of Action; (iii) enhancement of public and stakeholder participation, social communication and environmental education; (iv) evaluation and monitoring of the project and dissemination of project results; (v) development of regionally-appropriate groundwater management and mitigation measures in identified “Hot Spots”; (vi) consideration of the potential to utilize the Guarani Aquifer System’s “clean” geothermal energy; and, (vii) project coordination and management. These are elaborated in Annex 2.

### **2. Key performance indicators:** (see Annex 1)

The principal performance indicator against which the Project will be measured is the existence of an overall Guarani Aquifer System Management Framework (Strategic Action Program), including technical, scientific, institutional, financial, and legal aspects, for the sustainable management and protection of the Guarani Aquifer System in the four countries. Key performance indicators with regard to this overall framework will include process indicators, stress reduction indicators, and environmental status indicators:

#### Process Indicators

- the existence of a multi-country agreement on the institutional and technical framework for the management of the Guarani Aquifer System;
- the existence of a Transboundary Diagnostic Analysis, identifying the primary threats to the structure, function, and sustainable use of the Guarani Aquifer System, including the location of areas under current threat and in need of immediate attention (i.e., “hot spots”);
- the existence of a Strategic Action Program for the sustainable management of the aquifer, including programs for:
  - the operation and maintenance of the data acquisition and monitoring system;
  - the implementation and sustainable operation of the legal-institutional framework once such a framework is approved and adopted by the countries;
  - investments in pollution prevention and mitigation measures;
  - investments in geothermal energy use;
  - support to the resolution or mitigation of existing and potential conflicts;

- the existence of a consensus proposal for a joint legal framework for the management of the Guarani Aquifer System;
- the existence of a functioning monitoring network.

#### Stress Reduction Indicators

- an operational communications campaign, with a defined percentage of the target population reached;
- identified and quantified water quality threats and their evolution;
- existence of norms for well design, construction and maintenance at a regional scale, taking into account sub-regional variations;
- identified and documented pollution mitigation and groundwater depletion together with management measures implemented and monitored in specific “hot spots”.

#### Environmental Status Indicators

- agreed goals, criteria and standards for the transboundary diagnostic analysis and sustainable management of the Guarani Aquifer System, including quantitative and qualitative indicators upon which priority actions can be identified and implemented;
- defined western and southern boundaries of the aquifer system, as well as defined recharge and discharge areas, surge zones as well as vulnerable areas, including those with higher degrees of environmental risk;
- completed conceptual and mathematical models of the aquifer system, including its water quality, quantity, and hydrodynamic behavior;
- implementation of an up-to-date, functioning Information System, shared among the four countries, as a mechanism for transboundary information-dissemination, decision-making support, and management of the Guarani Aquifer System.

## B. Strategic Context

### 1. Sector-related Country Assistance Strategy (CAS) goal supported by the project: (see Annex 1)

**Document number:**      **Date of latest CAS discussion:**

Argentina CAS	20354-AR	09/08/00
Brazil CAS	20160-BR	03/06/00
Paraguay CAS	16346-PA	03/06/97
Uruguay CAS	20355-UR	05/05/00

Water resources management issues are prominent in the four Country Assistance Strategies (CASs). For each country, the water sub-sectors (water supply and sanitation, irrigation, etc.) are recognized as being sustainable in the long run only if the resource base itself is managed sustainably. The World Bank and respective governments recognize this, within an appropriate context for each country, through the respective CASs. This project, through its catalytic effect, will incorporate groundwater issues into the water resources management agendas of the four countries, including specific steps with regards to the Guarani Aquifer System. The integration of the proposed project into the CAS objectives for each country is highlighted below.

Argentina CAS: One of the main development challenges within Argentina is water resources

management. Serious water quality problems are emerging due to aquifer “mining” and vertical contamination of water tables that could have economic consequences within the next 15 to 25 years. The CAS gives special attention to water resources management and envisages future support that will focus initially on institutional capacity building, including development of tradable water rights with incentives for efficient and sustainable water use, and a watershed approach to the integrated management of water, soils, and cultivation. The CAS also specifically states that the World Bank will continue to seek opportunities to expand the use of GEF grants as a complement to national programs and stimulate innovation with respect to global water resources issues. In a recent Water Resources Sector Study, groundwater was identified as one of the critical water resource issues in Argentina. The Guarani Project would contribute to capacity building in the fields of both groundwater management and sustainable management of water resources in the country, as envisaged in the CAS.

Brazil CAS: The World Bank would continue its strong involvement in water resources management. This involvement aims to support ongoing development of the legal and institutional framework for efficient, integrated, and decentralized water resources management in Brazil. In this context, however, groundwater has generally been neglected. The proposed project, in addition to addressing an important aquifer system (providing water for domestic and industrial purposes to more than 500 municipalities in eight states), is expected to contribute to the integration of groundwater management issues into Brazil’s overall water resources agenda of Brazil and to enhance an integrated water resources management and protection vision.

Paraguay CAS: The World Bank has agreed to prepare a Natural Resources and Environmental Management Strategy for Paraguay in order to increase the likelihood of sustainable economic growth. This Strategy will assist in defining priority environmental pollution problems, and suggest possible policies for reducing pollution from the industrial, transportation, and water and sanitation sectors. It also will reassess priorities for natural resources management and prioritize future assistance for environmental management. Such actions will definitely strengthen the rather weak water management scenario that prevails, where groundwater plays a low-key role. In addition, the Government has expressed an interest in preparing a GEF country program to enhance capacity building within the water resources sector, with an emphasis on groundwater and natural resources management.

Uruguay CAS: The CAS identifies a number of local and global environmental issues on the policy agenda. Inadequate natural resource management could jeopardize the otherwise promising performance within the livestock and agricultural sectors. Poor water resources management is widespread, leading to inefficient water use and increased pressure on water resources. There are water quality problems in some sub-sectors. For these reasons, water resources management is a priority of the Government. The CAS identifies water resources management as a cross-cutting theme, extending across the agricultural and livestock sectors, the marine fisheries sector, and the tourism sector, particularly in the coastal zone. The Guarani Aquifer System underlies about 25% of Uruguay and constitutes about 40% of the country's groundwater resources. It is of importance to the different water-using sectors identified in the CAS. The on-going Uruguay water resources sector study complements the proposed project which would contribute to groundwater conservation in Uruguay.

### **1a. Global Operational strategy/Program objective addressed by the project:**

The Guarani Aquifer System is a strategic water resource within the MERCOSUR region. It can be preserved if adequately protected and managed. The main threats to the resource stem from uncontrolled abstraction, and pollution in the extraction and recharge areas. Given that groundwater recharge is restricted, and that groundwater pollution is reversible only at very high cost, if at all, there is considerable merit in protecting the Guarani Aquifer System for current and future generations.

The Guarani Aquifer System is a clear example of an international (*transfronterizo*) waterbody threatened by environmental degradation through over use and pollution, as defined and included in the GEF Operational Program Number 8. In the absence of a strategic intervention, supported by the GEF, the likelihood of “business-as-usual” prevailing in the four countries is high. At the aquifer’s current rate of use, and considering the growing use of groundwater for human consumption, it is easy to foresee an increasing threat of pollution and depletion in the not too distant future. Uncontrolled use, without rules or regulation, can alter the status of the Guarani Aquifer System from that of a strategic reserve of drinking water to that of a degraded waterbody that is the source of conflict among the countries. If nothing is done, the future of the Guarani Aquifer System, could, at least in certain areas, be the same as that of other shallow aquifers that have tended to become both polluted and over-exploited.

The global benefit of the proposed project is in terms of the preservation of this transboundary resource for current and future generations. In the specific case of the Guarani Aquifer System, there is the opportunity to exploit the advantages of preventive activity. The project would ensure that, in the face of increasing scarcity and pollution of surface water sources in the beneficiary countries, this resource is managed today so as to be available as a strategic reserve when needed in the future. An important issue to be considered in this regard is the fact that an international legal framework for the management of transboundary groundwater resources currently does not exist. Annex 13 sets forth a consideration of the potential root causes of the issues facing the Guarani Aquifer System, based on information gathered during project formulation. This latter assessment will be refined through the development of a Transboundary Diagnostic Analysis under Component II of the proposed project (see Annex 14 for a description of the GEF process).

It should also be noted that the World Bank, for example, does not have a specific policy on groundwater resources. This issue is being addressed in the ongoing evaluation of the World Bank Water Resources Policy Paper of 1993. It is generally recognized that transboundary groundwater issues need to be addressed, as projects are often proposed and implemented in areas where a situation of scarcity and competition for groundwater resources already exists (e.g., in North Africa and the Middle East). In the case of the Guarani Aquifer System of South America, the World Bank, through the GEF, could make a significant contribution to shaping an institutional framework regarding transboundary groundwaters that could serve as a replicable model in other countries and regions. In addition, the experience derived from this project would be expected to contribute to GEF and World Bank policy with regard to transboundary groundwater issues.

## **2. Main sector issues and Government strategy:**

### **Characteristics of the Guarani Aquifer System**

The importance of groundwater, especially of large, deep aquifers, stems mainly from the fact that these resources constitute a strategic reserve for water supply. Such groundwaters rarely need to be treated prior to consumption. Natural biogeochemical filtering processes within the aquifers generally achieve a quality far beyond that which could be obtained, in technical or economic terms, by the available water treatment methods applied to waters withdrawn from rivers, lakes, or impoundments. Groundwater is frequently the most viable water supply alternative, especially where surface waters are polluted by domestic and industrial effluents, solid waste, or contaminated agricultural runoff. Consequently, sustainable use, development and recharge, and diligent conservation, consistent with the protection of the aquifers from pollution, should be important concerns.

The Guarani Aquifer System, named in honor of the Guarani Indigenous Nation, is one of the largest groundwater reservoirs in the world. It is located under the four MERCOSUR countries: Argentina, Brazil, Paraguay and Uruguay. Until recently, the Guarani Aquifer System was known as the Botucatu Aquifer in Brazil, the Tacuarembó Aquifer in Uruguay and Argentina, and the Misiones Aquifer in Paraguay.

The Guarani Aquifer System extends from the central-west region of Brazil into Paraguay and the southeastern and southern regions of Brazil, and into northeastern Argentina and central and western Uruguay (see area map). It has an estimated total surface area of approximately 1.2 million square kilometers (839,800 km<sup>2</sup> in Brazil, 225,500 km<sup>2</sup> in Argentina, 71,700 km<sup>2</sup> in Paraguay, and 45,000 km<sup>2</sup> in Uruguay). The portion within Brazil encompasses about two-thirds of the total areal extent of the System, and includes parts of eight Brazilian states—an area equal to that of England, France and Spain combined. An estimated fifteen million people live within the aquifer's area of surface influence.

About 40,000 km<sup>3</sup> of freshwater are contained within the Guarani Aquifer System. About 90% of this volume is estimated to be potable, although, locally, potability can be reduced due to salinity and elevated fluoride content (affecting less than 10% of the volume). The volume of water in the system is equivalent to the total volume of water conveyed by the Paraná River over a period of almost 20 years (based upon a median flow rate of 10,000 m<sup>3</sup>/sec). It is estimated that the aquifer could meet the water demands of 360 million people on a sustainable basis, based on a per capita water use of 300 liters/day. Only about 10% of the total freshwater reserves would be depleted after a period of 100 years. Current usage, from deep wells, sustains a per unit rate of abstraction of up to 1 million liters/hour. The Guarani Aquifer System has an average thickness of 250 meters varying from lenses of a few meters at the borders of the groundwater basin to about 600 m in its central parts, such as in the northern parts of the States of São Paulo, Paraná and the southern parts of Mato Grosso do Sul in Brazil. Its depth below the land surface varies from zero in outcropping areas and their vicinity to more than 1,000 meters in Argentina.

Besides the excellent quality of the water (which is very suitable for consumption) another

important characteristic of the Guarani Aquifer is the thermal quality of the waters. In a number of regions, the water emerges naturally at temperatures of between 33 and 50 degrees Celsius, at a flow rate of about 100,000 liters/hour. At present, this water is used principally for water supply and tourism, although it could potentially be exploited as an alternative energy source, substituting for non-renewable energy sources in the project area.

Despite large surface water reserves, the drinking water supply in this heavily populated region of the MERCOSUR is increasingly dependent on groundwater. Future problems may occur if groundwater use is not managed in a sustainable manner or if the groundwater becomes polluted. In São Paulo State, Brazil, more than 60% of the water supply needs in urban centers are served totally or partially from groundwater sources, supplying a population of about 5.5 million people. Demands for groundwater are increasing, due to both demographic growth and economic expansion, and as a consequence of the pollution of surface water sources (although governments are also increasingly tackling surface water pollution).

Legal and regulatory mechanisms for the management of groundwater resources are lacking throughout the MERCOSUR region. Both in Argentina and Brazil, for instance, significant pollution of shallow groundwater resources is occurring.

### **Water Quantity Aspects**

The use of the Guarani Aquifer System's water has increased significantly in the last decades, as a consequence of the extreme urbanization pattern of some areas on one hand and developments in large scale agriculture schemes on the other. In some areas of the aquifer system there is a high concentration of wells whose water is used for different purposes. Maps produced based on the assessments undertaken during project preparation show the spatial distribution of water uses (77% urban household use, 11.5% industrial use and 11.5% agricultural use), as well as maps with location of wells and their respective depths.

Some of the conflicts related to water quantity are already well identified. These include, among others, the reduction of potentiometric and phreatic levels, and the interference between wells experienced in the highly urbanized areas around Ribeirão Preto and Bauru, in São Paulo State (Brazil) and the transboundary thermal sites between Uruguay and Argentina, particularly in the area of Salto (Uruguay) and Concordia (Argentina).

Preliminary studies carried out during project preparation estimated that water abstractions in the Brazilian states of Minas Gerais, São Paulo and Paraná – if not managed - will surpass the aquifer's local recharge rates by 2025. Some regions in Argentina and Paraguay, where the aquifer's potential has only recently been discovered, are now undergoing groundwater exploitation with an increasing number of wells being drilled. The actual number of wells tapping the aquifer system in those regions is still unknown. It is important to keep in mind that due to the anticipatory character of the present project, data on the aquifer system are scarce. One of the major activities will be to collect and analyze data for the Guarani Aquifer System.

### **Water Quantity Aspects**

As in the MERCOSUR region in general, in most areas of the aquifer system, the countries' legal

frameworks for managing and monitoring groundwater use have not accompanied the rates of extraction and expansion of groundwater use. The lack of control over the quality design of the wells seems to have caused wells to have acted in some cases as drainage channels for surface contamination.

In regions of the aquifer system where water quality monitoring data are being collected systematically (like in CETESB's well-functioning monitoring network in São Paulo State), some cases of organic contamination (high nitrate content) and anomalous pesticide traces have been detected. This is also assumed to be occurring in other regions of the aquifer, particularly in recharge areas showing high natural vulnerability, and in semi-confined areas which show an effective connection with underlying unconfined and contaminated aquifers.

The Hot Spot area of Santana do Livramento – Rivera, at the Brazil/Uruguay border, is a case in point, with one of the largest urban concentrations in the southern aquifer system's outcropping area (around 200.000 inhabitants), and with a water supply system that relies almost entirely on groundwater extracted from about 160 tube wells with depths between 40 m and 160 m. Here, the aquifer faces the threats of lacking sanitation infrastructure (60% of the population served by inadequate sanitation schemes – septic tanks and drains), industrial plants, and an increasing use of pesticides and fertilizers in agriculture.

A similar situation applies to the Eastern Paraguay region, a vulnerable non-confined area that is experiencing booming urban and agricultural expansion. Particularly in this region the stratigraphy of the aquifer formations is not very well defined, which makes the task of determining managerial needs and actions even more challenging.

In Ribeirão Preto, Brazil, a city with 421,000 inhabitants mainly using Guarani aquifer waters, 12% of water users do not have access to the sewerage system, generating a potential nitrate load of 200,000 tons per year, which is considered rather elevated. A comprehensive and detailed survey about the groundwater's chemistry, considering regional potential contaminants is one of the main tasks of Component 1 of the project. It will be a guide for further activities such as the-set up of a water quality monitoring network and advanced hydrochemical research.

As a transboundary aquifer with thermal qualities, the Guarani Aquifer System touches upon three sectoral areas; namely, sustainable water management (of groundwater in particular), transboundary water management, and energy use. These areas are elaborated below.

**Sustainable (Ground)water Management:** In the four countries overlying the Guarani Aquifer System, water sector issues include: institutional arrangements for integrated water resources management, and investments in water infrastructure and sustainable management of that infrastructure. An important issue in all four countries is water pollution. With respect to groundwater, this issue translates into a package of topics related to: (i) the recognition of groundwater as a resource in need of far more attention than it has been given to date; (ii) integration of groundwater management concerns into overall water resources legislation (which tends to focus on surface water); (iii) assessment of groundwater availability (related to quantification and modeling of the resource, including availability and demand scenarios); and (iv)

groundwater protection measures (zoning, water rights, well design, construction, extraction and pollution controls). Overall, these issues have not been adequately addressed in any of the countries, although the governments are now moving toward completing assessments.

**Transboundary Waters:** The beneficiary countries have long-standing experience in collaborating on transboundary water issues, most notably with regard to the Plata River basin which has had a general treaty and an Intergovernmental Committee since the 1960s. In addition, bilateral projects and specific treaties exist with respect to other water systems, such as the Uruguay River (Uruguay and Argentina), and the Paraná River (Brazil and Paraguay). To date, the success of these agreements has been mixed, especially with respect to hydrological allocation and pollution control issues. The countries do recognize, however, the importance of cooperation in transboundary waters issues. The attempt to reach an agreement on groundwater is a historical first and will certainly enhance the dialogue on other waterbodies within the region and may contribute to improved water management at a transboundary level. Among other things, a new La Plata initiative is developing, with potential GEF financing.

**Energy Use:** In the context of this project, aspects related to energy use are of relevance. First, the four countries use different types of resources to satisfy their energy needs, ranging from hydropower to petroleum and gas. With increasing economic growth in the Region, energy demands are rising, too, leading the countries – to varying degrees – to look for more efficiency in the use of their current sources and also for substitutes. This is especially the case for heavily hydropower-dependent Brazil, which is currently passing through an energy crisis due to drought and increased energy demands. Concurrently, all four countries are signatories of the Kyoto Protocol for Global Warming, and, as such, have made commitments to look for alternative, “clean” energy sources. In this context, a careful assessment of the potential for the use of the Guarani Aquifer System waters for low-enthalpy energy may provide alternatives to fossil-fuel based energy sources, and opportunities for local energy savings for industry, irrigation, and/or domestic hot water supply.

### 3. Sector issues to be addressed by the project and strategic choices:

The available reference documents, including those prepared during the project preparation phase and summarizing the available knowledge on the Guarani Aquifer System, are listed in Annex 8. The importance of, and current knowledge about, the Guarani Aquifer System in the four countries is summarized in Table 1, which shows that actions in one country may affect the other countries. For example, uncontrolled drilling and extraction in one country, combined with pollution, may affect not only that country but also its neighbors. Therefore each country needs to jointly participate in the sustainable management of the resource to preserve its own share for the future.

**Table 1:** Current Knowledge and Importance of the Guarani Aquifer System  
in Argentina, Brazil, Paraguay and Uruguay

Characteristic	Argentina	Brazil	Paraguay	Uruguay
Approximate Extent of the	225,500 km <sup>2</sup>	839,800 km <sup>2</sup>	71,700 km <sup>2</sup>	45,000 km <sup>2</sup>

<b>Aquifer</b>	<b>(19.1 %)</b>	<b>(71%)</b>	<b>(6.1%)</b>	<b>(3.8%)</b>
<b>Percent of Territory Occupied</b>	<b>6</b>	<b>10</b>	<b>18</b>	<b>25.3</b>
<b>Characteristics of the Aquifer</b>	Supply source	Recharge and supply area	Recharge and supply area	Recharge and supply area
<b>Extent of Exploitation</b>	9 deep wells for thermal use	300 to 500 cities partially or entirely supplied by the Aquifer System (70% of household use); industrial uses (25%), irrigation and recreational uses (5%)	About 200 wells, mainly for domestic water supply	135 wells for public water supply, 7 of which are for thermal use
<b>Principal Environmental Issues</b>	1. Potentially uncontrolled drilling and extraction  2. Subject to pollution from other countries	1. Point and nonpoint source pollution  2. Uncontrolled drilling and extraction  3. Subject to pollution from other countries	1. Point and nonpoint source pollution  2. Uncontrolled drilling and extraction  3. Subject to pollution from other countries	1. Point and nonpoint source pollution  2. Uncontrolled drilling and extraction  3. Subject to pollution from other countries
<b>Level of Information</b>	Limited information available, especially about the western extent of the Guarani Aquifer System	Considerable information available but dispersed in different states and institutions	Limited information available	Considerable information available

**Sustainable (Ground)water Management:** The general sector issue affecting all four countries is the current lack of a management and administrative mechanism governing groundwater in the region. Recommendations for controlling drilling, extraction, and pollution would be an outcome of this project. Sub-sectoral issues relate to water supply, industry, and tourism, as well as environmental management within recharge areas. To manage these issues, both over-utilization and pollution of groundwater will need to be addressed.

The extent of available technical information, legal instruments, and institutional planning is very uneven within the four countries. Brazil is the only country that has legislation relating to the sustainable use of water resources, including groundwater. However, the legal basis is still relatively fragile and needs to be further developed together with improving law enforcement. Uruguay is operating under its 1979 Water Code, which does not include an economic value for water. In Argentina, the federal Constitution explicitly reserves ownership of natural resources within their jurisdictions to the provinces. The Argentine institutional framework, therefore, distributes responsibilities and decision-making authorities at different levels, creating significant overlaps between provincial authorities. In Paraguay, the situation is similar, although some

attempts are being made by the Ministry of Planning to improve the coordination and regulatory framework for water resources management. Thus, not only must the sectoral issues be addressed in terms of the lack of a transboundary framework for groundwater management, but also jurisdictional issues must be clarified with respect to transboundary groundwaters in Brazil and Argentina. In addition, groundwater management arrangements at the national and subnational level must be addressed.

This project is expected to contribute to better groundwater management by raising awareness regarding groundwater issues, building local capacity for groundwater management, and strengthening national legislation for groundwater management. In the case of Brazil, a specific outcome of the project preparation activities has been the creation, during June 2000, of the Permanent Technical Committee for Groundwater (*Câmara Técnica Permanente de Águas Subterrâneas*) within the National Water Resources Council. Subsequently, the Council adopted a resolution establishing guidelines for the inclusion of groundwater within Brazil's Integrated Water Resources Management System. As a complement, the Brazilian Government launched a National Groundwater Program in early 2001. In Argentina, as a specific outcome of project preparation, the National Government created the Interministerial Committee for Groundwaters, to help improve integrated water management. In the case of Uruguay, the Government issued a decree controlling the drilling of wells in the Guarani Aquifer System area, providing a basis for management activities once the proposed project is underway. These actions show both the commitments of the countries to integrate groundwater into their overall water resources legislation, and the impact that this high-profile project is having on an otherwise largely neglected resource.

**Transboundary Waters:** The proposed project should be viewed not only within the context of the previously mentioned agreements on surface water resources, but also with regard to their future. Early actions to address issues such as pollution, communication, conflict management, and water allocation, among others, are priorities in the context of the Guarani Aquifer System. These preventive actions will take advantage of the joint water resources agreements and treaties that currently exist, while adding the groundwater perspective. A consequent light but effective, joint management framework will provide a basis for enhancing transboundary collaboration between the countries concerned.

**Energy:** The project will consider the thermal characteristics of the waters of the Guarani Aquifer System. Based upon current information, the thermal waters are located within pockets in some localities. Current indications are that these thermal waters are unlikely to provide significant energy generating potential due to their relatively low temperature (less than 50 degrees Celsius). However, a variety of other uses may be possible, ranging from district heating and provision of warm tap water, to thermal tourism (already highly important in northwestern Uruguay), to industrial uses. The proposed project will review alternatives for the use of thermal waters as a "clean" energy source, and, depending on the outcome of these investigations, will identify opportunities to modify local energy use and policies so as to substitute for the use of fossil fuels.

## **C. Project Description Summary**

### **1. Project components** (see Annex 2 for a detailed description and Annex 3 for a detailed cost breakdown):

The project is comprised of six components, supported by an administrative component. GEF: US \$ 13.40 million; co-funding: US \$ 13.36 million; total: US \$ 26.76 million.

#### **COMPONENT I: Expansion and Consolidation of the Current Scientific and Technical Knowledge Base on the Guarani Aquifer System**

Component I develops a sound scientific and technical basis for the determination of the priority transboundary issues and associated strategic remedial actions for the protection of the Guarani Aquifer System. It is essential for the determination of an appropriate joint management framework. GEF: US \$ 4.57 million; co-funding: US \$ 5.34 million; total: US \$ 9.91 million.

#### **COMPONENT II: Joint Development and Implementation of the Guarani Aquifer System Management Framework**

Component II is the core of the project and provides for an agreed technical, institutional, financial, and legal framework for management of the Guarani Aquifer System. Component II includes (i) harmonization and enhancement of data gathering networks, (ii) creation of a data management system serving the Guarani Aquifer System, (iii) development of joint institutional arrangements for the management of the Guarani Aquifer System, and (iv) formulation of strategic actions leading to the integration and optimization of development initiatives and proposals within the Guarani Aquifer System region. GEF: US \$ 3.49 million; co-funding: US \$ 3.52 million; total: US \$ 7.01 million.

#### **COMPONENT III: Public and Stakeholder Participation, Education and Communication**

Component III provides for the practical involvement of stakeholders in decision-making affecting the Guarani Aquifer System through both formal and informal educational and informational programming. A Guarani Aquifer System Citizens' Fund designed to provide cost-sharing funding to NGOs and academic institutions is an integral feature of this Component. GEF: US \$ 0.77 million; co-funding: US \$ 0.54 million; total: US \$ 1.31 million.

#### **COMPONENT IV: Project Monitoring and Evaluation, and Dissemination of Project Results**

Component IV consists of: (i) tracking evolution of agreed indicators, including GEF-IW process, stress reduction, and environmental status indicators - comprised of goals, criteria, and standards, and implementation of a monitoring and evaluation system to oversee and evaluate Project progress in addressing and achieving said goals; and (ii) dissemination of project results within and outside of the Guarani Aquifer System region, including the implementation of measures for consultation and coordination between GEF-IW project managers working in the Latin American region (See Annex 19). GEF: US \$ 0.26 million; co-funding: US \$ 0.22 million; total US \$ 0.48 million.

#### **COMPONENT V: Development of Management and Mitigation Measures within Identified "Hot Spots"**

Component V develops practical mechanisms and measures for the mitigation of current priority problems in four Hot Spots: (i) two identified transboundary localities within the Guarani Aquifer System area; (Argentina/Uruguay and Uruguay/Brazil); (ii) one recharge/discharge area of the Guarani Aquifer System (Paraguay); and (iii) a heavily urbanized area of the Guarani Aquifer System (Brazil), supporting ongoing mitigation and protection measures being undertaken by the Government of Brazil and State of São Paulo. The objective of Component V is to develop and test effective means and costs of quantifying, analyzing, managing, and remediating the impacts of known threats affecting specific, representative areas within the Guarani Aquifer System region (See Annex 18 for detailed description). GEF: US \$ 2.31 million; co-funding: US \$ 1.42 million; total US \$ 3.73 million.

## **COMPONENT VI: Assessment of Geothermal Energy Potential**

Component VI explores potential future geothermal energy uses of the Guarani Aquifer System. The objective of Component VI is to quantify and determine the potential value of the Guarani Aquifer System as a source of “clean” geothermal energy, and to communicate this assessment and appropriate guidelines with respect to sustainable development and utilization of any potential geothermal energy output of the Guarani Aquifer System to the respective stakeholders, including the energy ministries within the Guarani Aquifer System region. GEF: US \$ 0.20 million; co-funding: US \$ 0.08 million; total US \$ 0.28 million.

## **COMPONENT VII: Project Coordination and Management**

Component VII supports project management and coordination. Component VII comprises the activities to be carried out by the Guarani Secretariat and the operational activities of the coordinating and executing units in the respective countries, as described in Section E.4. GEF: US \$ 1.80 million; co-funding: US \$ 2.24 million; total US \$ 4.04 million.

**Table 2:** Guarani Project costs and financing sources

Component	Sector	Indicative Costs (US\$M)	% of Total	Bank financing (US\$M)	% of Bank financing	GEF financing (US\$M)	% of GEF financing
1) Expansion of the Knowledge Base		9.91	37.0	0.00	0.0	4.57	34.1
2) Development of a Joint Management Framework		7.01	26.2	0.00	0.0	3.49	26.0
3) Public and Stakeholder Participation		1.31	4.9	0.00	0.0	0.77	5.7
4) Monitoring, Evaluation and Dissemination		0.48	1.8	0.00	0.0	0.26	1.9
5) Development of Management and Mitigation Measures in Hot Spots		3.73	13.9	0.00	0.0	2.31	17.2
6) Assessment of Geothermal Energy Potentials		0.28	1.0	0.00	0.0	0.20	1.5
7) Project Coordination and Management		4.04	15.1	0.00	0.0	1.80	13.4
<b>Total Project Costs</b>		26.76	100.0	0.00	0.0	13.40	100.0
		0.00	0.0	0.00	0.0	0.00	0.0

<b>Total Financing Required</b>	26.76	100.0	0.00	0.0	13.40	100.0
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<b>Detailed Counterpart and other Co-financing Sources</b>	<b>Components (US\$ Million)</b>							<b>Total</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	
Counterpart financing provided by the governments of the four participating countries	4.87	3.40	0.49	0.22	1.01	0.08	1.92	<b>11.99</b>
Co-financing provided by the IAEA*	0.30	-	-	-	-	-	-	<b>0.30</b>
Co-financing provided by the BGR**	0.14	0.05	-	-	0.41	-	-	<b>0.60</b>
Co-financing provided by the World Bank Netherlands Water Partnership	0.03	0.07	-	-	-	-	-	<b>0.1</b>
Co-financing provided by the OAS	-	-	-	-	-	-	0.32	<b>0.32</b>
Co-financing provided by Beneficiaries	-	-	0.05	-	-	-	-	<b>0.05</b>
<b>Total Co-financing</b>	<b>5.34</b>	<b>3.52</b>	<b>0.54</b>	<b>0.22</b>	<b>1.42</b>	<b>0.08</b>	<b>2.24</b>	<b>13.36</b>

\*Co-financing by the IAEA includes \$300,000 in a first phase of two years, with another \$300,000 envisaged for a second phase.

\*\* Co-financing by the BGR has been confirmed. Finalization of this contribution depends on agreement between the GOP and BGR.

## 2. Key policy and institutional reforms supported by the project:

The key policy and institutional reforms specifically sought with regard to the Guarani Aquifer System are: (i) recognition of the Guarani Aquifer System as a valuable transboundary resource; and (ii) creation of a framework for the shared management of the Guarani Aquifer System, including joint institutional-legal arrangements and data sharing. The proposed project would contribute to advancing policies relating to transboundary groundwaters in the four countries, especially with respect to a transboundary legal and institutional framework that is currently lacking, and national groundwater institutional and legal frameworks that are rather disparate or missing. Specifically, the project will elaborate a Strategic Action Program encompassing, *inter alia*, a specific management and institutional framework for the Guarani Aquifer System. This framework could be expected to influence legislation regarding groundwater resources at the national level - and will eventually influence provincial or state levels, where applicable - within the participating countries and give impetus to improved groundwater management generally. In developing the institutional framework the particular characteristics of the four countries' political organization will be taken into account.

## 3. Benefits and target population:

About 15 million people live in the Guarani Aquifer System region. While not all of these are supplied with Guarani Aquifer waters, increasing numbers of users can be anticipated to utilize this resource as a result of population growth and increased industrial consumption. This trend will be enhanced as a result of the increasing pollution of surface waters, which - even if the countries are making efforts to remediate the situation - makes water from the Guarani Aquifer System more attractive. Therefore, target beneficiaries are the current and future populations within the Guarani Aquifer System region in the four countries.

In the long term, the expected benefits include: (i) a sustainable supply of safe water for human populations; (ii) high-quality water for industry; (iii) a sustainable supply of thermal water for

tourism, industrial, and municipal uses; and (iv) reduced conflict potential due to the use of Guarani Aquifer System waters in transboundary areas.

In the short and medium terms, beneficiaries also are the individuals and institutions who are active in the management of the Guarani Aquifer System. Through training and educational programs their capacity to contribute to the sustainable management of the Guarani Aquifer System will be greatly enhanced. The project is designed to internalize the experience generated by the project into the know-how of the four countries.

Global benefits to be derived from the improved management of the Guarani Aquifer System relate to the integrated management and use of this transboundary resource in a sustainable manner. Without this GEF-financed project, it is highly likely that the countries would not take measures at this stage to protect the transboundary water resources of the Guarani Aquifer System. Use of water resources at the national and sub-national levels would most likely continue until a crisis arises, at which point the reversal of negative effects would be difficult and costly. Actions taken jointly at this stage by all four countries will provide a basis for considerable global (transboundary) benefit through effective pollution and overdrafting controls, especially in recharge and abstraction areas, and improved land management, including, for instance, erosion control. In this regard, the development of specific, land use-related management and mitigation measures (through the targeted pilot demonstration projects), contributing to both global benefits and specific target groups, forms an important output of this project.

The primary goal of the project is to reach a four-country joint management framework for the Guarani Aquifer System and achievement of this objective will create the most benefits. At the same time there are significant benefits to be realized by the project also through all other project components. These benefits will be valid with or without a four-country agreement and they will relate to the strengthening and involvement of subnational entities, including state/provincial agencies, water supply utilities, academia and NGOs in project implementation. Their involvement will ensure that aquifer management can take place in a decentralized and sustainable manner once the project is concluded. This specifically includes the Provinces in Argentina, which have the legal responsibility for water resources management, and the States in Brazil.

Specifically, Components 1, 3, 5 and 6 will create immediate benefits in this regard and their outputs can be used by the countries, their subnational entities and stakeholders in national and transboundary groundwater management, independently of the formalized agreement. This is of particular importance because a formalized agreement is depending on the sovereign legislative processes in each country and cannot readily be programmed to coincide with project completion. In this context it will be important, however, to make the Strategic Action Program realistic and feasible in order to go forward even in the event that formalization of the joint management framework should take time to materialize.

#### **4. Institutional and implementation arrangements:**

Given the multinational character of the proposed project, institutional and implementation arrangements were discussed in detail during project preparation. Since the project is intended to bring about significant institutional change (from the current lack of coordinated management of the Guarani Aquifer System to its sustainable long-term management), the future institutional arrangements to be developed as a component of this project are an essential element that will determine its long-term success. All the proposed activities will be driven by a Project Steering Committee (CSDP: *Consejo Superior de Direccion del Proyecto*), with coordination of the technical aspects of the project being provided by a Coordinating Council (CC: *Coordinacion Colegiada*). The day-to-day activities of the Project will be managed by the General Secretariat (SG: *Secretaria General del Proyecto Sistema Acuífero Guarani*) under the direction of the OAS, with oversight from the CC. Activities within each country will be carried out by country-based project executing units (NPEU - National Project Executing Unit - *Unidad Nacional para la Ejecucion del Proyecto*), the heads of which (the four National Technical Coordinators, one from each country) will form the CC. Details are elaborated in Section E4 and Annex 11.

### **D. Project Rationale**

#### **1. Project alternatives considered and reasons for rejection:**

Project alternatives considered were: (i) to do nothing (*laissez-faire*), or (ii) to carry out the project in only one or two countries. Alternative (i) was rejected due to the fact that the Guarani Aquifer System is clearly showing signs of initial stress. Thus, by taking preventive measures now, negative effects on groundwater quality and quantity can be mitigated and, perhaps, largely avoided. Given that groundwater pollution is very expensive and in some cases almost impossible to reverse, this opportunity to prevent damage to the aquifer obviates the do nothing alternative. By completing a relatively low-cost preventive project, embodied within a Strategic Action Program, the longer-term costs can be minimized in an effective manner. Similarly, groundwater overdrafting severely endangers any aquifer's sustainability, may reduce its capacities, affect present uses and restrain future developments as well. Again, a low-cost preventive water management framework, within the SAP, may prove to be crucial in solving or mitigating such problems. Likewise, Alternative (ii) was rejected because of the transboundary nature of the waterbody, which, by definition, implies that degradation of the resource in one country will have an impact on the other riparian countries. Agreements to preserve this type of waterbody need to be mutual and mutually enforced. Work within one or two countries to create a management system for the Guarani Aquifer System was therefore deemed to be suboptimal.

#### **2. Major related projects financed by the Bank and/or other development agencies (completed, ongoing and planned).**

Sector Issue	Project	Latest Supervision (PSR) Ratings (Bank-financed projects only)	
		Implementation Progress (IP)	Development Objective (DO)
<b>Bank-financed</b> Irrigation	Uruguay Loan 3697: Irrigation	S	S

Water Supply, Sanitation and Water Resources Management	and Natural Resources Project Brazil Loan 3505 (Paraná): Water Quality and Pollution Control	S	S	
Natural Resources Management	Paraguay Loan 3708: Natural Resource Management I	S	S	
Water Supply and Sanitation	Paraguay Loans 4222 and 4223: 4th Rural Water Supply and Sanitation	S	S	
Natural Resources Management	Paraguay – Mbaracayu Biodiversity (under preparation - no ratings available yet)			
Natural Resources Management	Brazil Loan 4060: Rural Poverty – Paraná Land Management	S	S	
Natural Resources Management	Brazil Loan 3160: Land Management II – Santa Catarina	S	S	
Natural Resources Management	Brazil Loan 4148: Natural Resources Management	S	S	
Water Supply and Sanitation	Uruguay Loan 4556: OSE-Modernization and System Rehabilitation	S	S	
<b>Other development agencies</b>				
International Water Resources Management	Implementation of the Strategic Action Program for the Bermejo River Binational Basin (Argentina and Bolivia), GEF/OAS/UNEP			
International Water Resources Management	Implementation of Integrated Watershed Management Practices for the Pantanal and Upper Paraguay River Basin, GEF/OAS/UNEP			
Transboundary Aquifer Research Project (includes Guarani Aquifer)	UNESCO			

IP/DO Ratings: HS (Highly Satisfactory), S (Satisfactory), U (Unsatisfactory), HU (Highly Unsatisfactory)

### **3. Lessons learned and reflected in the project design:**

The Project incorporates lessons learned in two strategic ways: first, by using experience gained in the water and related sectors within each of the four countries, and, second, by using the lessons learned by the World Bank and OAS with regard to GEF International Waters Projects.

**National experience in the countries.** Good institutional policies are essential to good water resources management, be they surface or ground waters. Experience in Brazil, particularly in recent years, has illustrated that policy dialogue is especially fruitful in the context of the preparation of specific projects (e.g., the Pollution Control Projects in Minas Gerais, Paraná and

São Paulo, which have led to significant institutional change in each State; in Ceará where PROURB was a major catalyst in the implementation of the State's Water Resources Law; and in PROAGUA, which uses a two-track approach of demonstration projects and institutional change). Notwithstanding, groundwater has been largely neglected in all four countries, in spite of its overriding importance for water supply, especially in Uruguay and in certain regions of Argentina, Brazil and Paraguay. In Paraguay, the World Bank-financed 4th Water and Sanitation Project relies exclusively on groundwater. In this sense, the Guarani Project can have, and already has had, a catalytic effect on groundwater management in the countries in general. In this context, ongoing projects in the region and the furtherance of the sectoral dialogue on (ground)water resources management will be taken into consideration.

**GEF International Waters Projects.** A number of issues relating to GEF International Waters Projects were highlighted at two recent events: the World Bank stakeholder consultation held during June 2000, and the GEF International Waters Conference held during October 2000. The latter event included the then three GEF Implementing Agencies (IAs: the World Bank, United Nations Development Programme, and United Nations Environment Programme) as well as project staff and policy makers from around the world. The messages emerging from these events underlined the need for commitment from the countries and local demand for the project, both of which exist with respect to the proposed project. In addition, it was deemed essential that other agencies (multilateral and donors), having a stake or on-going projects in the region, be involved. In the case of the Guarani Project:

- the General Secretariat of the Organization of American States (OAS), which has been active as Executing Agency for UNEP-implemented GEF International Waters Projects, including projects on the Bermejo, Upper Paraguay, and San Juan River Basins, served as the executing agency for the preparation of this project as will serve as the executing agency for its implementation;
- the United Nations Education, Scientific, and Cultural Organization (Unesco), under the auspices of their Transboundary Aquifer Project, participated in Guarani workshops during the project formulation period;
- the International Atomic Energy Agency (IAEA), which has previously been active in all of the four countries, will contribute to the geohydrological aspects of the Guarani Project at the invitation of the participating countries; and,
- the German Government, which has provided long-standing support to groundwater research in the Paraguayan Chaco and, recently, also in the Zona Oriental, has confirmed the provision of technical and institutional development assistance to the Paraguayan portion of the project through the German Geological Survey (*Bundesanstalt fuer Geowissenschaften und Rohstoffe*).

An important aspect of project design is the multilateral agreement on the institutional framework for the conduct of the transboundary waterbody project and Strategic Action Program formulation. Communication among the different parties is essential, and the project coordination units in each country (UNPPs: *Unidades Nacionales de Preparación del Proyecto*), created during project preparation, are proposed to be continued as a mechanism by which stakeholders from governments, subnational-level governments, and civil society (including NGOs and universities) will participate in the project. A number of workshops at both the national and

regional level are included as a means of bringing together the actors from the four countries. The regional level meetings will be facilitated by the Project Steering Committee (CSDP: *Consejo Superior de Dirección del Proyecto*). Use will be made of World Bank multi-country video facilities, as a practical means of bringing stakeholders to the table without incurring high transaction and financial costs of international travel. The hitherto positive experience in this regard is reflected in the design of the institutional arrangements for project implementation.

GEF experience shows that reliance on heavy administrative structures for the management of GEF International Waters Projects is not necessary, and may even be counterproductive due to the elevated recurrent cost. In elaborating the institutional framework for the management of the project, institutional arrangements have been designed to be as pragmatic and light as possible. To this end, the day-to-day execution of the project will be undertaken by a small but effective Guarani Aquifer System Secretariat, which will serve as the executive element of the CSDP and coordinate the activities carried out by the National Project Executing Units.

The project also includes a number of pilot projects in identified Hot Spots. Experience in other World Bank projects has shown that such projects, to serve their purpose, need good baseline data and well-designed monitoring and evaluation. Complementary components to accommodate this need have been designed.

Finally, GEF experience has indicated that a significant lag time may occur between the preparation of the Strategic Action Program (SAP) and its implementation. For this reason, this project has been designed as the first phase of a larger Program for the Protection and Sustainable Management of the Guarani Aquifer System. Therefore, the elaboration of projects to implement the SAP will take place during the last year of the proposed project. Such projects may be financed from a variety of sources, including national governments, the World Bank, other multilateral banks, donors and the private sector.

#### **4. Indications of borrower and recipient commitment and ownership:**

Annex 15 provides a list of the stakeholders that participated in the preparation of this project. Their participation is summarized below. In addition, Letters of Endorsement of the project from the designated GEF country-based Focal Points are appended hereto as Annex 16.

**National level.** At the national level the project has received strong support from governmental institutions that have actively participated in project preparation activities and workshops. The Secretariat of Water Resources (SRH), Brazilian Ministry of Environment, sponsored, with its own resources, the meeting held in Foz do Iguaçu (Brazil), where the Guarani Project was first identified and discussed with the different partners as a project concept for GEF support. Subsequently, the Secretariat of Water Resources of Argentina, the National Hydrographic Directorate of Uruguay, and the Ministry of Energy and Mining and the Ministry of Public Works of Paraguay as well as the recently-created Paraguayan Secretariat of Environment have sponsored project workshops in Santa Fé (Argentina), Asunción (Paraguay), and Salto (Uruguay), respectively. Staff from all four countries have participated in project preparation activities. All four governments have created and staffed their respective project preparation units using local financial resources. Representation of the national governments in official meetings has

been strong, including representation at the secretarial and ministerial levels. The preparation of the project, using PDF/B funds, received the full endorsement of the GEF focal points in all four countries during 2000, and during March 2001 with respect to complementary PDF/B funding. - In addition the four Ministries of Foreign Affairs have reached an agreement to elaborate a first joint document indicating the countries' agreement with the objectives of the project and developing some first basic principles for collaboration regarding the Guarani Aquifer System.

**Subnational/non-governmental level.** At the subnational and/or non-governmental levels, the project has received support from state governments in Brazil and provincial governments in Argentina (e.g., the State of São Paulo, the State of Paraná, and the Province of Santa Fé). Strong support and full collaboration also has been forthcoming from the universities in the region (e.g., Universidad Nacional del Litoral and Universidad de Buenos Aires, Argentina; Universidade Federal do Paraná, Brazil; Universidad Nacional de Asunción, Paraguay; and Universidad de la República Oriental del Uruguay). Similarly, the project has been supported by a number of nongovernmental organizations (NGOs) that have been actively involved in the project preparation activities (e.g., Brazilian Groundwater Association - ABAS, Brazilian Water Resources Association - ABRH, among others). Information-sharing, collaboration, and involvement by large numbers of stakeholders (which have often exceeded all expectations) have generated many quality interventions and suggestions which have contributed to project preparation. Social interest and support for the project was equally high, as demonstrated by the large number of articles published in national magazines, newspapers and on-line within the region, and number of special television reports. The high level of interest of stakeholders at the local level provides positive evidence of the commitment of the four governments at national and local levels. Awareness by all of the governments that transaction costs of this project are relatively high has not been a major obstacle to project preparation.

**Supranational level.** Both MERCOSUR—the Southern Common Market—through its Subgroup 6 (Environment), and the OAS, have supported project preparation. The MERCOSUR had been contemplated as the Executing Agency for the project. One of the reasons why this option was rejected was due to the fact that the MERCOSUR at this point does not have a legal personality, which would permit it to receive grant resources.

##### **5. Value added of Bank and Global support in this project:**

The World Bank has operations and long-standing policy dialogues regarding different aspects of water management in each of the four countries. A large number of water projects have been implemented with World Bank support in the region. In Brazil, the Bank has conducted an extensive review of the water resources, irrigation, and water supply and sanitation sectors, leading to the development of an integrated water supply and water resources management strategy for its operations in Brazil. Jointly with the Government of Argentina, the World Bank has recently completed a comprehensive review of the water sector, and the final report of this study is being disseminated. During 2001, the World Bank was conducting a similar comprehensive review of the water sector together with the Government of Uruguay. The combination of the sectoral knowledge of the World Bank and its experience in financing projects in the region is particularly supportive of this project.

The recent First Biennial GEF International Waters Conference, held in Budapest (Hungary) between October 14-18, 2000, demonstrated the World Bank to be a leading agency in implementing GEF International Waters Projects. Considerable in-house expertise and internationally-based knowledge of the main issues relating to such initiatives has been developed. Currently, the Bank is involved in the implementation and/or preparation of some twenty-three GEF International Waters Projects in Latin America, Europe, Africa, South East Asia, and the Middle East. In addition, the World Bank is involved in fifteen other, related GEF projects dealing with coastal and marine issues, and nine aquatic biodiversity projects, having International Waters aspects.

Global support to the Project is essential due to the nature of transboundary waterbodies. The Guarani Aquifer System is unique in the world due to its size, good water quality, and thermal energy potential. It therefore constitutes an important strategic transboundary reserve in the region. Nevertheless, without global support for this project, short-term needs may supersede the strategic, integrated management of the resource, and the countries might decide to continue unilateral exploitation of the resource. To address this concern, GEF support, in this case, should focus primarily on the development and implementation of mechanisms and an institutional framework to prevent over-exploitation and degradation of this transboundary resource—the preventive focus of this project is unique within the GEF International Waters Program. In addition, this project would be the first groundwater project supported by the World Bank and GEF, further contributing to the global importance of this initiative.

## **E. Summary Project Analysis** (Detailed assessments are in the project file, see Annex 8)

### **1. Economic (see Annex 4):**

- Cost benefit      NPV=US\$ million; ERR = % (see Annex 4)
- Cost effectiveness
- Incremental Cost
- Other (specify)

The economic evaluation methodology is the GEF incremental cost analysis. Although a number of baseline activities touch upon the proposed project, the incremental costs are substantial. Project investment will generate and bring together new data of interest to all four countries, and would put in place a joint institutional arrangement for aquifer management that would otherwise not exist. Thus, baseline investment is limited to some monitoring activities currently in place in Brazil and Uruguay, and nonpoint source pollution control activities and the implementation of groundwater legislation in Brazil.

The benefits to be expected from the project are of both a national and global nature, and mainly relate to the avoidance of future costs. Groundwater pollution is extremely costly and difficult to remediate. By putting in place a preventive mechanism, damage, and, thus, clean-up costs, can be avoided. A further benefit would be the preservation of a strategic reserve to supplement other water supply options within the region. This benefit is transboundary in that the preservation and rational use of the Guarani Aquifer System will preserve a multi-national natural resource for future generations, of apparently ‘unlimited’ quantity and high quality. Groundwater overdrafting effects are also extremely difficult to remediate. Implementing water management specific schemes as a preventive mechanism is very cost effective. It will contribute to preserve the

Guarani Aquifer System as a strategic reserve, with its benefits being of transboundary nature, helping preserve and rationalizing water abstractions from the Guarani Aquifer System. Although its actual capacity is currently unknown, the studies supported by this project will form the basis for establishing the capacity of the Guarani Aquifer System and rationally planning its future potential uses on a sustainable basis. Preliminary investigations suggest that, in the absence of the proposed project, the countries are not taking, or planning to take, any specific actions with regard to preservation of the Guarani Aquifer System in its transboundary dimension.

All four countries currently benefit from its use. All four countries use its waters for human consumption. More than 300 cities use the Guarani Aquifer waters for domestic supply (Table 1). In this regard, the Uruguayan Water and Sanitation Agency (OSE) estimates, for example, that it is cheaper to pump clean Guarani Aquifer water from significant depths than to abstract and treat contaminated water from surface sources. It can be expected that if other sources become more polluted, the Guarani Aquifer System will increasingly become the economically viable source of choice. Likewise, all four countries make limited use of its waters for agricultural irrigation purposes. Uruguay also uses its thermal waters for tourism, and Argentina has recently started using its waters for the same purpose. As these uses intensify, conflicts are likely to result in the absence of an agreed transboundary water management framework. For example, the Uruguayan authorities have already expressed concern that the availability of thermal waters on the Uruguayan side may have been reduced since the opening of the Argentina thermal site. Most of the possible associated benefits, which might ultimately be found to be substantial, are considered to be incremental for the four countries, given the current state of knowledge of the Guarani Aquifer System.

## **2. Financial (see Annex 4 and Annex 5):**

**NPV=US\$ million; FRR = % (see Annex 4)**

An important financial issue to be addressed is the sustainability of project intervention. While the project will have very limited infrastructure investments, a monitoring system and database will be designed and implemented. To be of use in the monitoring and management of the Guarani Aquifer System, the monitoring and management systems will have to be adequately maintained. In addition, it is anticipated that a long-term coordinating mechanism, such as the proposed General Secretariat of the project, would be sustained. The recurrent cost of such a structure would have to be financed in a sustainable manner. To this end, Component II, Creation of a Joint Management Framework for the Guarani Aquifer System, includes a specific activity aimed at the definition of a sustainable financing mechanism for the long-term management of the Guarani Aquifer System, including consideration of water and concession fees. At the same time, given that the Guarani Aquifer System is mainly confined and that well drilling is very costly, long-term monitoring (transaction) costs will be far lower than would be the case for a surface water system of the same extension. The expected financial burden on the countries is therefore expected to be manageable.

### **Fiscal Impact:**

The fiscal impact of the project is estimated as the cash contribution of the four countries to the project minus taxes. The total counterpart contributions by the countries to the project are estimated to be about US \$ 11.99 million, as both cash and in-kind contributions. Of these, US \$

2.14 million are taxes foregone (since the OAS has been exempted from tax by the countries), leaving a total fiscal impact of US \$ 9.86 million, including in-kind contributions, which are financed by the countries.

### **3. Technical:**

#### **(see Annex 17: GEF STAP Review)**

On the scientific and technical front, the activities and tasks selected are designed to generate that information regarded as essential to underpin effective groundwater management and to guide sustainable resource development and aquifer protection requirements. It must be recognized that some of this information is more efficiently acquired at local scale through pilot sub-projects (Component V), whilst other parts have to be generated at sub-regional (aquifer) scale (Component I). It will be essential to achieve a careful balance and close coordination between these two components. In addition, Component I is relatively large, containing numerous, closely-linked sub-components and tasks. These will require integrated planning and sensitive supervision by the General Secretariat to ensure on-time completion of the main deliverables of these Components - key hydrogeological information and the numerical models of the Guarani Aquifer System - needed to formulate the Strategic Action Program and Management Framework.

It is also important to recognize that groundwater investigations and development best proceed as a phased and iterative process, and that close monitoring of aquifer response to water-supply development is normally the most cost-effective way of reducing uncertainty in numerical modeling of aquifers and groundwater resource estimation. Therefore, Components I and V are deliberately phased to allow an element of re-focusing and prioritization, in the light of the results generated during the first 18 to 24 months, at the time of the project mid-term review.

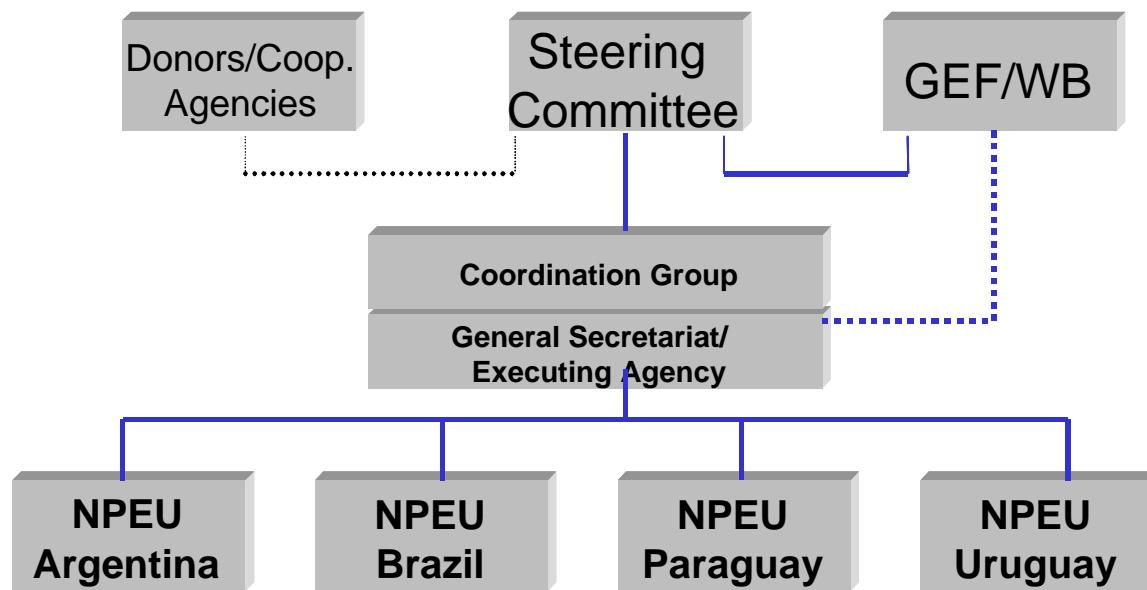
### **4. Institutional:**

A four-country, transboundary project has high transaction costs, and an appropriate mechanism for implementation is required. The project will utilize a similar management mechanism to that employed during project preparation. For project preparation, one national project coordination unit (UNPP) was created in each country, supported by eight State-level units (UEPPs) in the case of Brazil. These Units functioned as technical entities. Overall policy-level decision-making was through the Steering Committee (CSPP), comprised of representatives of the respective national agencies with responsibility for water resources, foreign affairs, and environment, as well as representatives of the Organization of American States (OAS) and the World Bank. During the project preparation phase, the four countries indicated the OAS as the executing agency for the project, due to the multi-country character of the project. The OAS supported the project from its Washington Headquarters, through its country-based offices, as well as through contracted staff, including a Project Coordinator (*Secretario General*) and two technical staff, funded with GEF project preparation funds. The Government of Uruguay placed offices in Montevideo at the disposition of the project.

Since these arrangements worked well for project preparation, few changes will be made during project implementation. As shown in the diagram below, the Project Steering Committee (CSDP: *Consejo Superior de Direccion del Proyecto*) is anticipated to have overall charge of the project, supported by a Coordination Group (CC: *Coordinacion Colegiada*) comprised of the four

National Technical Coordinators appointed to head the four country-based Project Executing Units (NPEU) - *Unidad Nacional para la Ejecucion del Proyecto*). This Coordination Group would provide oversight and direction to the Project Coordinator (*Secretario General*) and General Secretariat (SG) staff, who would serve as liaison on a day-to-day basis between the NPEUs, the OAS and the World Bank. The General Secretariat will be based in Montevideo.

A further institutional issue is the development of an operational institutional and legal framework for Guarani Aquifer System management. An operational institutional framework will be an output of the project. An appropriate process to arrive at a commonly agreed technical proposal for such a framework will be part of the Project Implementation Plan. Partners and countries are aware, however, that the final framework to be proposed would need to be light in order to be efficient and sustainable in the long run.



#### 4.1 Executing agencies:

The OAS will be the Executing Agency for the project and will act on behalf of the four countries. The OAS will be responsible to the World Bank (as Implementing Agency) and GEF to ensure that applicable rules and procedures are adhered to. In addition, the OAS will – with prior agreement by the CSDP – contract the Project Coordinator (*Secretario General*), the technical support team of three professionals, a procurement specialist and an office manager to staff the General Secretariat, and provide general administrative oversight.

In addition to the OAS, national (local) executing agencies have been confirmed in each of the four countries. The national executing agencies for the project will be the Subsecretariat for Water Resources in Argentina, the National Water Agency in Brazil, the Secretariat for Environment in Paraguay, and the National Directorate for Hydrography in Uruguay. These local executing agencies will assist the National Technical Coordinators in the conduct of the project

activities, and assist the NPEUs through provision of office space and support services to the extent that these are required. Such support is considered within the counterpart contributions to the project. Representatives of the local executing agencies will also serve on the CSDP as indicated below.

#### **4.2 Project management:**

All the proposed activities will be driven by a Project Steering Committee (CSDP: *Consejo Superior de Direccion del Proyecto*). The Project Steering Committee will be comprised of three members from each country. These will be representatives of the respective national agencies with responsibility for foreign affairs, water resources, and environment. The four National Coordinators will participate *ex officio* in the meetings of the CSDP. In addition, one representative each of the World Bank and OAS may be invited to participate in meetings of the CSDP. The other GEF Implementing Agencies, and participating donor countries and agencies, will be informed of, and may participate in, meetings of the Project Steering Committee in an *ex officio* capacity. The Project Steering Committee will meet at least two times per year; the Committee may make use of the World Bank video-conferencing facilities for additional meetings as may be necessary. The Project Steering Committee will have a rotational chairmanship (*presidencia*). The first chairmanship will be held by the delegation of Paraguay.

The technical program of the project will be supervised by a Coordination Group (CC: *Coordinacion Colegiada*) comprised of the four National Technical Coordinators appointed by their countries' Project Executing Agencies to head the four country-based NPEUs. This Coordination Group will provide oversight and technical direction, as agreed by the CSDP and through the work plans elaborated in the project operational program, to the Project Coordinator (*Secretario General*) and General Secretariat (SG) staff, who will serve as liaison on a day-to-day basis between the NPEUs and the OAS and the World Bank.

A General Secretariat of the Guarani Aquifer System Project, comprised of the General Secretary, technical staff members, their support staff, and the OAS, will manage the day-to-day operations of the project, as agreed by the CC and elaborated in the project operational program. The General Secretary and Secretariat staff will be contracted by the OAS and will coordinate the conduct of project activities through the NPEUs. The Secretariat will endeavor to ensure the technical quality of the project, prepare project documents and reports, and support the monitoring, evaluation and reporting requirements of the World Bank. The Secretariat will also be responsible for drafting the Transboundary Diagnostic Analysis and the Strategic Action Program, with inputs from the NPEUs and project consultants. Further, the General Secretariat will facilitate the flow of information and inputs from stakeholders with respect to the project at the regional level. In particular, the Guarani Secretariat will ensure that adequate attention is given to the views and concerns of indigenous community organizations and other CSOs active at the regional level. In addition, utilizing the IWRN and related mechanisms, the General Secretariat will participate in regional communication and coordination opportunities among GEF-IW projects and programs being executed within the Latin American region.

Within each of the participating countries, a National Project Executing Unit (NPEU) will be established by each country according to country priorities and rules. The national Technical

Coordinator for each country will manage the activities of the project executing units in each country. These units will be responsible for recommending short-listed nominees for consultancies and the conduct of the project activities to the OAS. In addition, during project execution, the NPEUs will provide general oversight and assistance to the consultants so as to facilitate timely completion of project activities and the necessary degree of quality control/quality assurance with respect to the conduct of project tasks. The NPEUs will also facilitate the flow of information and inputs from stakeholders with respect to the project at the national and subnational levels. In particular, the NPEUs will ensure that adequate attention is given to the views and concerns of indigenous community organizations and other CSOs active at the national and subnational levels as envisioned in Component III of the project.

At its first meeting, the Project Steering Committee will adopt operating procedures for the conduct of its business. The Project Steering Committee will agree administrative and reporting procedures consistent with World Bank standards and operating procedures as set forth in the Project Implementation Plan (PIP). Finally, the Project Steering Committee, at its inaugural meeting, shall conduct any other such business as may be required to initiate project Components, and set a date for the second meeting of the Project Steering Committee. Subsequent meetings of the Project Steering Committee shall be scheduled by the Project Steering Committee but shall be held at least every six months during the project period.

Activities of national personnel, with the support of the national executing agencies, will be based upon preparatory work and Terms of Reference agreed with and approved by the Project Steering Committee, and consistent with the bidding and other procurement practices of the World Bank. The General Secretary and OAS will coordinate field activities, as directed by the Project Steering Committee and supported by the General Secretariat. All project activities will be conducted within the Guarani Aquifer System area.

#### 4.3 Procurement issues:

A procurement capacity assessment has been carried out by a World Bank Procurement Specialist, with satisfactory findings, and approved by the Regional Procurement Advisor. Details regarding procurement arrangements are described in Annex 6. The full assessment is included in the list of project documents on file.

#### 4.4 Financial management issues:

A financial management assessment has been carried out by a World Bank Financial Management Officer, with satisfactory findings, and approved by a Regional Financial Management Specialist. Details regarding disbursement arrangements are described in Annex 6. The full assessment is included in the list of project documents on file.

## **5. Environmental:**

## Environmental Category: B (Partial Assessment)

5.1 Summarize the steps undertaken for environmental assessment and EMP preparation (including consultation and disclosure) and the significant issues and their treatment emerging from this analysis.

This is an environmental project. Its objective is to ensure the sustainable management of the extensive Guarani Aquifer System. The project seeks to prevent the environmental damage, linked to groundwater pollution and depletion, that would otherwise come about because of poor

knowledge and lack of policy coordination between the four countries (and their local governments) which share the aquifer. In addition to improving planning and policy formulation, the project supports specific environmental protection measures, including: (i) improved control of water pollution (from point and nonpoint sources); and (ii) designation of critical groundwater recharge areas requiring conservation or other special management. Although some future uses of the water resources of the Guarani Aquifer System might involve adverse environmental impacts, the project would study these potential impacts and promote plans and policies to adequately control them. The project is expected to be highly positive from an environmental standpoint.

The project itself will not include any infrastructure investments. It may take advantage of some wells to be constructed by private or public utilities for other purposes. However, the location of any such wells to be used for project scientific purposes would be chosen in the context of promoting the environmentally sustainable use of the aquifer.

Likewise, Component VI is designed to assess the potential economic uses of the thermal waters of the Guarani Aquifer System. Depending upon the results of this assessment, concepts for future utilization of these thermal waters may be designed. The potential post-project development of thermal water resources might require mitigation of possible adverse environmental effects related to access road construction, thermal and chemical discharges, and noise. Additional measures to protect specialized aquatic biodiversity in thermal springs or pools may be required. Any needed or recommended environmental mitigation measures for potential future thermal water development will be identified through the environmental assessment (to be carried out in parallel with the other pre-feasibility studies), an integral part of Component VI.

Key stakeholders—the national and sub-national governments in the four countries, the population in the Guarani Aquifer System region, local communities, NGOs, and academic institutions interested in sustainable groundwater use in the region—have been, and continue to be, involved in the project design and institutional arrangements for project implementation (see Section 6). Provision is made within the project management process to continue to engage key stakeholders in the SAP formulation process.

### **5.2 What are the main features of the EMP and are they adequate?**

The Environmental Analysis of this project is incorporated within the PAD.

### **5.3 For Category A and B projects, timeline and status of EA:**

Date of receipt of final draft:

### **5.4 How have stakeholders been consulted at the stage of (a) environmental screening and (b) draft EA report on the environmental impacts and proposed environment management plan? Describe mechanisms of consultation that were used and which groups were consulted?**

Key stakeholders include: the national and sub-national governments of the four countries, the population in the Guarani Aquifer System region, farmers (from the perspective of the generation of nonpoint source pollution from agrochemicals), industries (from the perspective of the generation of point source pollution), water supply companies, local communities, environmental NGOs, and academic institutions interested in groundwater management and research. These stakeholders were, and will continue to be, involved in the project through the appropriate design

of institutional arrangements for project implementation.

#### 5.5 What mechanisms have been established to monitor and evaluate the impact of the project on the environment? Do the indicators reflect the objectives and results of the EMP?

Component I of the project is designed to strengthen and harmonize the monitoring and information systems for the Guarani Aquifer System, including the creation of a shared data network between the four countries. The project itself is not expected to have an impact on the aquifer system, rather it is designed to provide the monitoring capacity (in technical, social and human resources terms) with which to assess the possible impacts of other activities on the environment. In addition, Component IV of the project is designed to provide for the monitoring and evaluation of project progress, and disseminate the results of the project.

With regard to the management and mitigation projects to be completed under Component V, the measures developed and implemented will have the objective of improving the management within specific, vulnerable local and sub-regional areas within the aquifer system. These measures will initiate a process of mitigating negative impacts from land use activities and industrial pollution. It will be important to monitor their effectiveness in order to determine if the measures developed and implemented are feasible and cost-effective, and worthy of dissemination more widely throughout the region. Monitoring systems, and appropriate indicators, to be developed under Components I, II, IV and V will contribute to this assessment activity.

### **6. Social:**

#### 6.1 Summarize key social issues relevant to the project objectives, and specify the project's social development outcomes.

The primary aim of the project is to develop a sustainable management framework for the Guarani Aquifer System, given its importance as a water source for current and future generations. The social development outcome consists of preserving the natural resource base, rather than encouraging its immediate exploitation and use. Complementary interventions to improve soil and water utilization and management in its recharge areas, for example, will have relevance to the social development objective of benefiting local populations through these interventions. For these pilot projects, social assessments would be carried out as part of their preparation. Further, Component III is designed to provide a practical mechanism to develop, disseminate, and deliver appropriate informational programming to youth and communities to facilitate social communication, public participation and sustainable involvement in this project.

#### 6.2 Participatory Approach: How are key stakeholders participating in the project?

Key stakeholders in the project are the national governments and sub-national entities in the four countries, universities, and local communities (especially in the pilot project areas). In terms of the institutional framework for project implementation, it will be important to ensure that key stakeholders have a voice. The conduct of frequent workshops is seen as an important means of bringing the different stakeholders together. Governments, through their relevant ministries and agencies, will continue to be represented on the Project Steering Committee and local executing agencies, while nongovernmental organizations and individuals will be integrated into the project through participation in the NPEUs and possible citizen advisory committees at national levels. (see point 6.3).

#### 6.3 How does the project involve consultations or collaboration with NGOs or other civil society

organizations?

Academic institutions and NGOs are involved in the project through their respective national coordinating units. Since they constitute a self-selected group of stakeholders, a number of workshops are proposed to be organized to bring together NGOs that are active in the water/environment nexus in the four countries. During project preparation, NGOs from the four countries were invited to an NGO-organized water event in Caxambú, Brazil, in order to receive information about the project and provide input to the project preparation process. The NGOs participating in this meeting were requested also to identify other NGOs that might be interested in the project. This was followed up by a specific consultancy to identify key civil society stakeholders, as part of the project development activities. The stakeholder participation plan is appended hereto as Annex 15.

For Project implementation, provision has been made to engage key national stakeholders according to the structures of the respective NPEUs in order to receive specific input from the private sector, and to encourage and facilitate participation by, *inter alia*, indigenous community organizations. In addition, the inclusion of a special, small grants fund (Guarani Citizens' Fund) to support small projects related to the Guarani Aquifer, to be implemented by NGOs, is included within Component III. Important activities in this regard would be community-based public education and awareness campaigns.

Key universities form an important nongovernmental constituency within the Guarani Aquifer System region. The project concept initially was identified within the four countries by academic institutions. Due to their extensive research experience, these organizations are anticipated to continue providing vital knowledge about the aquifer. It is anticipated that the components related to the expansion of the knowledge base, development of monitoring systems, and capacity building activities will strongly involve the academic community. The participation of the academic community in these portions of the project is critical to ensure the sustainability of the project in the longer term, through their role in providing trained professionals to communities and the regulatory agencies within the region. Therefore it is expected that key universities, as well as other academic and research institutions that have carried out investigations on the Guarani Aquifer System, will continue to be involved in the project during implementation (see also Annex 2, Component 2 d) for information about the Capacity Building Fund currently under development).

Indigenous communities were specifically considered during project preparation following their expressed wish to be informed and incorporated into the project. An Indigenous Peoples Strategy has been specifically designed into Component III to both inform indigenous groups in the Guarani Aquifer System region and seek appropriate mechanisms to best incorporate their voice and views into the project. Since the project does not include any investments, it would not have any physical impacts on indigenous communities. However, as a stakeholder group with an interest in the preservation of the Guarani Aquifer System, the project intends to ensure their adequate representation.

#### 6.4 What institutional arrangements have been provided to ensure the project achieves its social development outcomes?

The implementation arrangements for the project include regular meetings of the project Steering Committee. These meetings are intended to provide the Governments, World Bank and other co-financiers with information on the progress of the project, and to provide them with the opportunity to modify project activities to best accomplish the overall project goals. As noted, one of these goals is community empowerment through appropriate informational programming, as embodied in Component III.

#### **6.5 How will the project monitor performance in terms of social development outcomes?**

Component IV is designed to provide information on project progress and success in achieving project outcomes through the regular and ongoing monitoring and evaluation of the project. The key performance indicators include an operational communications campaign designed to facilitate public involvement in the management of the Guarani Aquifer System.

#### **6.6 Monitoring and Evaluation arrangements**

Given the decentralized nature of project activities, adequate monitoring will be essential for effective project implementation. A comprehensive Operational Monitoring and Evaluation System (OM&E) will be established to ensure effective supervision of activities, as well as assessment of the outcomes and possible impact of project interventions. This includes the development and tracking of GEF IW indicators (process, stress reduction, and environmental status). Operation of the system will be coordinated by a special area at the central level within the Guarani Secretariat that would undertake responsibility for overall project M&E. This area will work in close coordination with the NPEUs and other implementing agencies for data recording and project monitoring at the local level. A computerized management information system (MIS) will be set in place to provide the necessary technical support for efficient data recording and information processing and sharing, including counterpart contributions by the four governments.

The MIS will encompass not only the informational support for the operational aspects of project implementation but would also provide links with the project GIS and aquifer monitoring systems, so that the information generated by those systems will be readily available to all parties involved. From an operational point of view, the structure of the MIS will cover three different areas: programming and administration; physical and financial monitoring; and performance evaluation. The OM&E system will enable tracking of inputs and outputs from project activities, as well as their outcomes. This will be accomplished based on the use of a set of indicators, belonging to two main groups: process and performance indicators. The quantitative and temporal elements of process indicators will allow the Secretariat in coordination with the NPEUs to prepare annual operation plans, and control adequate and timely completion of activities and delivery of project products. Additionally, efficacy (efficiency and effectiveness) indicators could be developed, thus completing the conceptual basis for the M&E framework. M&E activities will be based on the first two groups of indicators, while the third group can be developed and used for management purposes by the area within the General Secretariat responsible for the technical oversight of the project.

*Monitoring.* Tracking of project implementation progress will be based on a group of physical-financial (input-output) indicators. The MIS programming and administration module

will support preparation of the Annual Operating Plans (POAs), budgets and work programs, based on the Project Implementation Plan, to provide the necessary background information to assess implementation progress. The MIS physical and financial monitoring module will provide up to date information to allow monitoring of project physical and financial implementation.

*Evaluation.* Evaluation of overall project implementation performance and development impact will be coordinated by the General Secretariat, and its inputs and outputs will be contained in the MIS performance evaluation module. Evaluation will involve different areas of activity, including assessment of physical and financial implementation performance based on the comparison of target and actual values of a set of input and output indicators. This will be coupled with development evaluation based on particular evaluation studies focused on a complementary set of outcome, process and impact indicators, to determine the particular results and impacts attained by the activities financed by the project.

## 7. Safeguard Policies:

### 7.1 Do any of the following safeguard policies apply to the project?

Policy	Applicability
<b>Environmental Assessment (OP 4.01, BP 4.01, GP 4.01)</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No
<b>Natural Habitats (OP 4.04, BP 4.04, GP 4.04)</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No
<b>Forestry (OP 4.36, GP 4.36)</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No
<b>Pest Management (OP 4.09)</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No
<b>Cultural Property (OPN 11.03)</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No
<b>Indigenous Peoples (OD 4.20)</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No
<b>Involuntary Resettlement (OP/BP 4.12)</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No
<b>Safety of Dams (OP 4.37, BP 4.37)</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No
<b>Projects in International Waters (OP 7.50, BP 7.50, GP 7.50)</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No
<b>Projects in Disputed Areas (OP 7.60, BP 7.60, GP 7.60)*</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No

### 7.2 Describe provisions made by the project to ensure compliance with applicable safeguard policies.

Safeguard policies which could potentially be applicable are: (i) environmental assessment; (ii) indigenous peoples; (iii) projects in international waters; (iv) involuntary resettlement; and (v) projects in disputed areas. Upon examination, the three first-named policies are applicable, as outlined below:

(i) Environmental assessment: As outlined in Section 5, the project aims to prevent future degradation of the Guarani Aquifer System through improved management, planning, information, policies, and development of specific pollution control measures. The project does not include infrastructure investments. However, the activities of Component VI might lead to post-project energy development or other thermal water use investments, which could have as yet unquantified environmental impacts requiring specific mitigation measures in the future. Accordingly, this project is classified as Category B.

(ii) Indigenous peoples: Given that the project area encompasses 1.2 million square kilometers, a number of indigenous groups living in the region are potentially affected by the project. The project will not have any infrastructure or investment components that would affect these indigenous groups. Some groups, however, have indicated their interest in being incorporated into

project implementation as stakeholders.

An Indigenous Peoples Strategy (IPS), Sub-component 3d, has been designed based on preparatory studies, consultations and discussions with key indigenous actors and institutions and other related civil society entities. It is important to note that with respect to OD 4.20, the IPS of the Guarani Aquifer Project was not formulated to mitigate actual or potential negative aspects of other project activities, but it rather constitutes one of the main mechanisms of the project for the effective and informed participation of indigenous peoples. The principal indigenous peoples organizations will be specifically consulted during the project period, and specific recommendations on how to best incorporate indigenous peoples as stakeholders will be included in the SAP so as to ensure their adequate inclusion in the management of the Guarani Aquifer System. Details are included in Annex 12.

(iii) International Waters: The guidelines referring to International Waters aim at identifying instances in which activities within a transboundary waterbody in one country would or could have effects on another country. In the case of this project the four riparian countries sharing the body of water are represented on the Project Steering Committee and have collectively submitted this project proposal. While the policy applies, separate notification of any one country is, therefore, not necessary.

(iv) Involuntary resettlement: Due to the nature of the project (e.g., involving no infrastructure investments), no involuntary resettlement will take place.

(v) Disputed areas: There are no disputed areas in the project region.

## F. Sustainability and Risks

### 1. Sustainability:

Sustainability of the project will be facilitated by involving stakeholders in the project activities from the beginning. As previously mentioned, the demand for this project originated in the countries. By building human capacities and strengthening institutions, and further sensitizing stakeholders, including those within civil society, it is expected that the collaborative framework built up by the project will be sustainable after the end of the project. Certain costs of the project, such as maintaining the information system, are of a recurrent nature and would require continued financing by the governments and other stakeholders after project completion. These costs, including the costs of human resources and institutions, will have to be borne by the countries within the Guarani Aquifer System region.

The terms of reference for the Strategic Action Program specifically include the design of financial mechanisms for long-term sustainability of project investments. This is especially pertinent given that the proposed aim of the project is to sustainably manage the aquifer. It is expected that these costs, in spite of the extent of the Guarani Aquifer System will be relatively modest. As mentioned previously, the Guarani Aquifer System is very confined, implying high costs - and therefore limited demand - for well drilling. Long-term monitoring (transaction) costs will thus be far lower than would be the case for a surface water system of the same extension. Consequently, the

expected financial burden on the countries is expected to be manageable.

As recently articulated at the previously referenced GEF first Biannual Conference on International Waters, the preparation of the Strategic Action Program, required by the GEF, constitutes the first phase of a project involving international (transboundary) waterbodies. It also implies that, in order to provide the project (and the process of better managing transboundary waters) with the necessary sustainability, a second phase needs to be contemplated during which the Strategic Action Program would be implemented. As the Strategic Action Program is the principal output of this project, the need for follow-up will be taken into account by including planning for the second, implementation phase of the Strategic Action Program into the last year of the current project. In the case of the Guarani Aquifer System, a second phase would imply investments in the protection of recharge areas, in the prevention and mitigation of point-source pollution, and in measures to reduce overdrafting of the Guarani Aquifer System in specific localities, as well as potential development of activities related to the thermal characteristics of its waters. Financing of the second phase might imply country resources, GEF, World Bank, private sector and/or other multi- or bilateral funding.

## **2. Critical Risks** (reflecting the failure of critical assumptions found in the fourth column of Annex 1):

<b>Risk</b>	<b>Risk Rating</b>	<b>Risk Mitigation Measure</b>
<b>From Outputs to Objective</b> Countries discontinue agreement to assess, generate and share data about the aquifer; relevant data and information is not available or shared.	M	Build a strong climate of collaboration through frequent and transparent communication during project preparation and implementation. Use Project Steering Committee to reinforce agreement.
Institutional arrangements cannot be agreed or do not function; compatible protocols, methodologies, processes and organizations fail to be agreed.	M	Work with Project Steering Committee to find solutions.
Counterpart funding not available.	M	The major part of contributions is in-kind. Use discussions in Steering Committee to resolve issue.
Capacity building measures do not produce quality contributions from all countries.	M	Monitor quality of inputs from all four countries and strengthen where needed.
Agreement on light and fair administrative structure for aquifer management cannot be reached.	S	Start discussions early in the process and take into account interests of the four countries, including the different stakeholder and decision making groups.
Local stakeholders, communities (CSOs) and NGOs are not appropriately involved in project implementation.	M	Disseminate information to civil society and design institutional arrangements to include organizations.
Institutional roles not clarified or supported, politically or financially,	S	Build a strong climate of collaboration through frequent and transparent communication during

especially at the sub-national government levels.		M	project preparation and implementation. Work with Project Steering Committee to improve institutional functioning.
Countries fail to carry out their obligations under regional agreements and plans.		M	Use Steering Committee mechanism and communication to resolve. General Secretariat to emphasize efforts in enforcing obligations.
<b>From Components to Outputs</b>			
Collaboration between partners in the four countries weakens.	M	Build a process of continued interaction as well as adequate monitoring of joint project results.	
Investigations are not carried out in a timely manner leading to partial slippage.	S	Monitor input continuously and strengthen where needed.	
Governments and the public do not remain interested in broad participation in the project.	M	Involve civil society from the beginning and inform them of options for participation to foster inclusion.	
Local interest in pilot measures is low; public does not participate in the project.	M	Secretariat to provide information to local stakeholders and incorporate concerns into design from beginning.	
Aquifer management system is not agreed or established	M	Build a strong climate of collaboration between all stakeholders through frequent and transparent communication. Work through Steering Committee to reinforce decision making processes.	
Timely follow-up is not achieved.	M	Encourage local ownership of the project through workshops and seminars; prepare the implementation strategy during the project period and secure funding for implementation	
Collaboration between partners, stakeholders, governmental units, and NGOs is not possible or fails	S	Disseminate information to civil society and design institutional arrangements to include organizations; build a strong climate of collaboration. General Secretariat to enhance efforts in this regard.	
<b>Overall Risk Rating</b>	M		

Risk Rating - H (High Risk), S (Substantial Risk), M (Modest Risk), N(Negligible or Low Risk)

### 3. Possible Controversial Aspects:

## G. Main Conditions

### 1. Effectiveness Condition

- Project Implementation Plan finalized and approved by the Bank.
- Bilateral Agreements between OAS and countries effective.
- Project Coordinator selected and approved by Bank.

- Basic infrastructure facilities for the operation of the General Secretariat of the Project have been established.

## **2. Other [classify according to covenant types used in the Legal Agreements.]**

n/a

## **H. Readiness for Implementation**

- 1. a) The engineering design documents for the first year's activities are complete and ready for the start of project implementation.
- 1. b) Not applicable.
  
- 2. The procurement documents for the first year's activities are complete and ready for the start of project implementation.
- 3. The Project Implementation Plan has been appraised and found to be realistic and of satisfactory quality.
- 4. The following items are lacking and are discussed under loan conditions (Section G):

A draft Project Implementation Plan, including a global procurement plan, exists and has been appraised. Finalization of the Project Implementation Plan will be a condition for effectiveness.

## **I. Compliance with Bank Policies**

- 1. This project complies with all applicable Bank policies.
- 2. The following exceptions to Bank policies are recommended for approval. The project complies with all other applicable Bank policies.

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Karin Erika Kemper  
**Team Leader**

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John Redwood  
**Sector Manager/Director**

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Vinod Thomas  
**Country Manager/Director**

## Annex 1: Project Design Summary

### LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project

Hierarchy of Objectives	Key Performance Indicators	Data Collection Strategy	Critical Assumptions
<b>Sector-related CAS Goal:</b> Improved groundwater resources management within the overall framework of improved water resources and natural resources management in the respective countries: Argentina, Brazil, Paraguay and Uruguay	<p><b>Sector Indicators:</b> Institutional and legal frameworks for groundwater resources management established and implemented</p> <p>Quality of polluted waterbodies improved or stabilized</p> <p>Groundwater overdraft mitigated or exploitation stabilized</p> <p>Water allocation efficiency, equitability, productivity and sustainability improved</p>	<p><b>Sector/ country reports:</b> Benchmark reviews of Country Assistance Strategies</p> <p>Economic Sector Work in water, groundwater, and natural resources management</p> <p>Environmental analyses</p>	<p><b>(from Goal to Bank Mission)</b></p> <p>Enduring political commitment to improve water resources management and protection</p> <p>Enduring political commitment to take preventive measures for environmental sustainability</p>
<b>GEF Operational Program:</b> Initiate actions toward resolving transboundary environmental concerns for the Guarani Aquifer System within an improved joint groundwater management framework  Derive lessons learned from experiences in using various types of institutional arrangements at the national and regional levels for collaboration in addressing priority transboundary environmental concerns	<p>Transboundary environmental analysis carried out, identifying top-priority multi-country environmental concerns</p> <p>Strategic Action Program elaborated, consisting of expected baseline and additional actions needed to resolve transboundary concerns</p> <p>Lessons learned disseminated, monitoring systems developed and implemented, and positive improvements in process indicators, stress reduction indicators and environmental status indicators documented</p>	<p>Project reports and documents</p> <p>Monitoring and dissemination workshops</p> <p>Supervision missions</p> <p>General Secretariat/ Steering Committee reports and minutes</p>	<p>Political commitment among the four countries continues high</p> <p>Coordinated activities and joint efforts among the four countries are undertaken; Stakeholders are adequately involved in all countries</p>

Hierarchy of Objectives	Key Performance Indicators	Data Collection Strategy	Critical Assumptions
<b>Global Objective:</b>  Sustainable use and management of the Guarani Aquifer System in Argentina, Brazil, Paraguay and Uruguay for current and future generations, supported by the joint development and implementation of an adequate, functioning aquifer management framework, based on sustainable technical, scientific, institutional, legal, financial, political, and environmental grounds	<b>Outcome / Impact Indicators:</b>  Pollution risks diminished or controlled  Overdraft risks diminished or stabilized  Risk of future inter-country groundwater conflicts diminished  Future mitigation and stabilization costs reduced	<b>Project reports:</b>  Strategic Action Program documentation  Specific scientific, legal, technical, and institutional documentation  Operational manuals  Mid-term evaluation studies  Periodic monitoring and evaluation system reports	<b>(from Objective to Goal)</b>  Continued political commitment by countries to agree on a common aquifer management framework  Counterpart funding, sufficient financial resources available
<b>Output from each Component:</b>  <b>1. Expansion and consolidation of current scientific and technical knowledge base of the Guarani Aquifer System</b>  1.a) Aquifer studies for consolidation and expansion of the scientific knowledge base carried out	<b>Output Indicators:</b>  1. a) Well inventory carried out in all four countries  1. a) At least 70% of all wells assessed in terms of use and water availability, quantity, and quality  1. a) Aquifer System's western and southern limits defined  1. a) A preliminary conceptual aquifer model is available to help improve understanding of its principal features  1. a) Geological and hydrogeochemical maps of priority areas produced  1. a) A general, regional hydrogeologic map, as well as thematic maps on	<b>Project reports:</b>  Report on wells, their distribution and impacts  Publication of relevant maps and accompanying descriptive written and digital materials  Published sampling, analytical, and quality control/quality assurance manual and reports  Reports and proceedings from seminars and workshops  Supervision / monitoring Reports  Evaluation mission reports (mid-term evaluation)  Periodic Technical Assistance visits and Reports	<b>(from Outputs to Objective)</b>  Continued agreement by countries to assess, create, enhance, and share data and information  Institutional arrangements between country and external partners functioning  Compatible protocols, processes, methodologies and organizations are being used  Relevant data, information and documentation are readily available and shared  Studies are adequately coordinated in terms of timing and mutual contributions

	<p>potentiometry with network flows, surveys of recharge and discharge areas, isotransmissivity and isoprodutivity, are available</p> <p>1. a) Water quality is assessed and pollution patterns distinguished in terms of the origin, impacts and ways to remediate the pollutants</p> <p>1. a) Specific isotope studies are carried out to support a better understanding on Guarani Aquifer System's origin and age, evolution, hydrodynamic behavior, boundary conditions, recharge-discharge relationships, and geothermal character</p> <p>1. b) Technical and socio-economic assessment of current and future use scenarios of Guarani Aquifer System carried out</p>	<p>Progress reports from the different NPEUs and the General Secretariat</p> <p>Reports from participating agencies</p> <p>Guarani Aquifer Project Website</p> <p>Monitoring and Evaluation reports</p>	<p>Guarani Aquifer System Project coordinates well with contributing agencies staff, such as IAEA and BGR</p>
	<p>1. b) Different water uses are assessed, including forecasts relying on alternative socio-economic scenarios simulated through digital aquifer modeling, to support direct decision making models</p> <p>1. b) Descriptive maps of the aquifer showing present development and abstractions, including water uses, geographic distribution, and socio-economic and environmental data, as well as typical well productivity, are available</p> <p>1. b) Regional technical rules are legal instruments developed to control well design, construction and operation</p> <p>1. b) Regional aquifer vulnerability and associated risks assessed, with special emphasis on transboundary areas.</p>		
<b>2. Joint development and</b>			

<p><b>implementation of the Guarani Aquifer System Management Framework</b></p> <p>2.a) Monitoring network for the aquifer system implemented, functioning and regularly assessed, to support scientific, technical and managerial activities regarding the protection and sustainable development of the Guarani Aquifer System</p> <p>2 b) Development and Integration of an Information System (SISAG - Sistema de Información del Sistema Acuífero Guarani) simultaneously implemented, shared, and regularly functioning in the four countries</p> <p>2. c) Strategic Action Program prepared, comprising at least plans for: (i) medium and long-term actions with regard to the management of the Guarani Aquifer System at the local, regional, national and supranational levels, (ii) investments for pollution and overdrafting prevention and mitigation measures, especially regarding transboundary problems, by public and/or private sectors, (iii) investments in geothermal energy use and other potential groundwater uses, (iv) and conflict resolution mechanisms</p>	<p>2. a) Permanent monitoring network comprised of at least 184 wells (5% of total number of known wells) in place; adequate equipment, sampling procedures and frequencies, analytical methods, and sample management protocols are available</p> <p>2. a) Monitoring network and equipment adequately maintained, and sustainably financed</p> <p>2.b) Information and Documentation System network implemented primarily via Internet, set up, and adequately operated and maintained with sustainable financing identified and available</p> <p>2. b) One SISAG Focal Point in each country equipped, set-up and functioning in each country</p> <p>2. c) Documentation available containing the Strategic Action Program for the four countries, legal and institutional frameworks, and accompanying material relevant to decision making such as regional mapping, diagrams and tables related to the state of the aquifer system, and including identification of financing agencies and donors, and future information needs beyond first program phase</p> <p>2 c) At least 8 workshops and meetings held between stakeholders of multiple levels, nationally and internationally, to arrive at</p>	<p>Periodic data reports and published information on the dimensions of the Guarani Aquifer System; supporting information published through Guarani Aquifer System (SISAG – Sistema de Información del Sistema Acuífero Guarani)</p> <p>Annual progress reports on progress toward formulation of the TDA and SAP, and the Guarani Aquifer System management framework</p> <p>Protocols for the operation and expansion of the GIS and web-based information systems implemented and sustained</p> <p>Supervision/monitoring Reports</p> <p>Strategic Action Program documentation</p> <p>Evaluation mission reports (mid-term)</p> <p>Periodic Technical Assistance visits and reports</p> <p>Progress reports from the Project Implementation Units according to institutional arrangements</p> <p>Guarani Aquifer Project Website</p> <p>Legal proposal document</p>	<p>Continued agreement by the four countries to jointly elaborate a Guarani Aquifer Management Framework and start parts of its implementation at a regional level</p> <p>Consensus among country governments and between these and civil society stakeholders</p> <p>Technical agreement can be reached on light and fair administrative structure for the Guarani Aquifer System</p> <p>CSOs are constructively participating in policy discussion and formulation</p> <p>Transboundary groundwater related institutional roles and responsibilities, with strong legal, political and financial support, are clarified at national, state / provincial / departmental levels, as applicable</p>
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	sustainable technical, scientific, legal, institutional, political and diplomatic agreements  2. c) Technical consensus proposal for a Legal Framework to manage the Guarani Aquifer System elaborated	An agreement or an intention protocol by the four countries as a paramount step toward a coordinated, sustainable management system for the aquifer	
2. d) Institutional Capacity strengthened in relevant agencies and institutions (state/national/provincial/municipal levels)	2 c) Multi-country agreement on an institutional, financial, and technical framework to jointly manage the Guarani Aquifer System exists and is under implementation  2. d) Specific support provided to water managers and strengthened institutional frameworks by means of Technical Assistance on demand, technical exchanges, and 40 twinning (staff exchange) arrangements  2. d) At least 8 events – seminars, meetings, workshops – held to improve water management, with benefit to at least 25 of the countries' organizations active in the groundwater field	Progress reports and minutes of the Steering Committee meetings and other diplomatic initiatives  Monitoring and Evaluation Reports  Supervision missions  Workshop and seminar reports and minutes	
2. e) Transboundary Diagnostic Analysis carried out	2. e) TDA documentation produced and disseminated	Transboundary Diagnostic Analysis documents	
<b>3. Public and stakeholder participation, Education and Social Communication</b>			
3. a) Regional Communications and Public Participation Plan prepared	3. a) Regional Public Communication and Participation Plan formulated and documentation available  3. a) Information and document dissemination is continuously provided by the Guarani Aquifer Geographic Information System, especially via its Website	Plan documentation  Manual on Regional and Local Social Communications published  Supervision / monitoring reports  Evaluation mission reports (mid-term and final)	Standardized criteria for Monitoring and Evaluation indicators are agreed with the four countries and being implemented  Capacity-building measures and Technical Assistance  Commitment remains high to integrate civil society into the
3. b) Guarani Aquifer System			

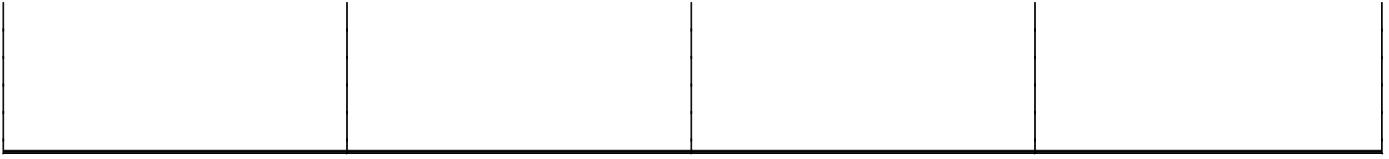
Citizens' Fund established	<p>3. b) Guarani Citizens' Fund established and US\$ 240,000 in grants awarded to CSOs</p> <p>3. b) Community-level activities carried out by CSOs to enhance public participation, communication and education</p> <p>3. c) Pertinent public communication materials, adapted to each country and with special emphasis on pilot areas produced and disseminated</p> <p>3. c) Information dissemination campaigns in each country carried out at local level</p> <p>3. d) Scoping study carried out, with emphasis on indigenous peoples' rights to water and natural resources</p> <p>3. d) Workshops, training and direct consultations have taken place in Argentina, Brazil and Paraguay</p> <p>3. d) Relevant project documentation has been translated into indigenous languages and disseminated</p>	<p>Periodic Technical Assistance visits and Reports</p> <p>Progress and Goal Achievement reports from the Project Implementation Units, according to institutional arrangements for the project</p> <p>Workshop reports</p> <p>Newspaper articles and TV / Radio coverage</p> <p>Environmental/groundwater education materials published</p> <p>Specific project documents, papers and reports made available by specialized and nonspecialized regional and international magazines, and other brochures and informational materials published and distributed</p> <p>Guarani Aquifer Website</p> <p>Reports on public participation considered in the preparation of the legal framework</p>	<p>process of designing a sustainable management framework for the Guarani Aquifer System</p> <p>Each country carries out its campaigns according to agreed regional Plans</p> <p>CSOs are interested in participating</p>
3. c) Instruments created and disseminated to increase awareness, interest and commitment among stakeholders			
3. d) Indigenous People's Strategy (IPS) implemented			

#### 4. Project monitoring and

<b>evaluation, and dissemination of project results</b>			
4. a) Monitoring, evaluation and feedback system developed and implemented	4. a) Project monitoring and evaluation system is implemented and functioning  4. a) At least bi-annual workshops (by country) held for technical discussions, consultations and project progress information and feedback  4. a) Progress reports, together with project result and performance reports, generated and disseminated at least once per year	Monitoring and Evaluation reports  Workshop reports  Supervision / monitoring reports  Evaluation mission reports (mid-term)  Periodic Technical Assistance visits and reports	Sufficient capacity is created to enable high-quality monitoring, processing, evaluation and feedback of project results  Healthy project performance helps keep counterpart funding available  Stakeholders are flexible to adjust course if necessary, derived from periodic project assessments and feedback recommendations
4. b) Dissemination of project results	4. b) Project/country stakeholders participate in at least four relevant international events, including GEF-IW meetings, to share and validate project results  4. b) Project webpage well maintained	Seminar and workshop papers and reports  Guarani Aquifer System Website	
<b>5. Development of Management and Mitigation Measures within identified “Hot Spots”</b>			
5. a) Hot Spot Concordia (Argentina) - Salto (Uruguay) and	5. a) and b) Socio-economic participatory stakeholder assessments carried out	Supervision / monitoring reports	Local buy-in and active Participation, involvement and commitment
5. b) Hot Spot Rivera (Uruguay) - Santana (Brazil)	5. a) and b) Local awareness raised through public participation by means of workshops, consultations and communications campaign ( <i>in connection with component 3</i> )  5. a) and b) Scientific studies executed and geological, hydrogeological, and hydrogeochemical information available and periodically updated	Pilot project design and operation manual published  Field visits to pilot areas  Evaluation mission reports (mid-term and final)  Periodic Technical Assistance visits and reports  Progress reports from the General Secretariat	Studies and analyses provide sufficient basis/background for the preparation of the pilots  Information is generated and improved, methodologies tested and results / conclusions at sub-regional level help improve joint development and implementation of water management framework  Aquifer water management and protection experience and lessons learned are available for sharing and replication

	<p>5. a) and b) Data bases on wells, water uses, and aquifer parameters are available via SISAG and local information networks</p> <p>5. a) and b) Specific subregional digital hydrogeological models are available to support decision making</p> <p>5. a) and b) Local aquifer management plan elaborated, including institutional arrangements, well permits system, well and recharge protection areas, subregional monitoring networks, and minimum distance criteria for well construction and operation</p> <p>5. a) and b) Specific transboundary management framework developed to allow testing and assessment of specific strategies, tools and actions to solve problems and provide input to regional actions</p> <p>5. a) and b) Institutional, legal, managerial, social, and environmental experiences documented to allow replicability assessments</p> <p>5. c) Geohydrological knowledge of area increased, esp. regarding recharge and discharge characteristics and aquifer vulnerability</p> <p>5. c) Socio-economic assessment, including water usage and well inventory, carried out, with emphasis on indigenous populations</p> <p>5. c) Public information campaign carried out</p> <p>5. c) Management needs</p>	<p>Guarani Aquifer Website</p> <p>Published sampling, analytical, and quality control/quality assurance manual and reports</p> <p>Reports and proceedings of seminars and workshops</p> <p>Final assessment reports on the costs, feasibility, lessons learned, and recommended future actions</p> <p>Local aquifer management plans</p> <p>Monitoring and Evaluation Reports</p> <p>Scientific and technical reports</p> <p>Workshop and consultation reports</p> <p>Public dissemination material</p> <p>Scientific and technical reports</p> <p>Workshop and consultation reports</p> <p>Public dissemination material</p> <p>Progress and evaluation reports</p> <p>Local aquifer management plan</p>	<p>Different partner agencies work together</p> <p>Collaboration across agencies exists</p>
5. c) Hot Spot Encarnación - Ciudad del Este - Caaguazú (Paraguay)			
5. d) Hot Spot Ribeirão Preto (Brazil)			

	<p>identified and proposal, including priority actions and localities, elaborated</p> <p>5. d) Participatory social assessment, consultations and local information dissemination carried out</p> <p>5. d) Technical assistance for local aquifer management planning provided</p> <p>5. d) Local aquifer management plan elaborated</p>		
<b>6. Assessment of Geothermal Energy Potential</b>	<p>6 a) Aquifer's geothermal potential assessed in its geohydrological, socio-economic, and environmental dimensions</p> <p>6.b) Recommendations for activities to be executed in future endeavours, proposals for possible geothermal development areas and future geothermal project framework defined</p>	<p>6. a) Geothermal data and pertinent information updated and new thematic maps produced (<i>in connection with Component I</i>)</p> <p>6. b) Four-country task force created to undertake scientific assessment jointly with international experts and agencies</p> <p>6. b) Analyses of socio-economic, financial, and environmental feasibility of possible future geothermal activities and areas carried out by Task Force</p> <p>6.2 b) Conceptual identification of possible pilot projects in the four countries is available</p>	<p>Supervision / monitoring reports</p> <p>Evaluation mission reports (mid-term and final)</p> <p>Periodic Technical Assistance visits and reports</p> <p>Progress reports from the Project Implementation Unit</p> <p>Workshop reports</p> <p>Guarani Aquifer Website</p> <p>Periodic publication of relevant maps and accompanying descriptive written and digital materials</p> <p>Compilation Report on all pertinent existing information and strategy definition with a local / subregional approach</p>
<b>7. Project Coordination and Management</b>	Project well managed and objectives reached	<p>Project Progress Reports</p> <p>Supervision Missions</p> <p>Steering Committee meetings</p>	<p>Task force successfully established and relevant stakeholders included</p> <p>Pertinent geothermal data available in a timely manner</p> <p>Development possibilities derived from newly acquired information, methodologies and experiences, assessed in hydrogeological, socio-economic and environmental terms</p> <p>Counterpart funding, including for country coordinators, is available</p> <p>Implementation arrangement adequately designed to deal with inherent project complexity due to the project's multinational character</p>



Hierarchy of Objectives	Key Performance Indicators	Data Collection Strategy	Critical Assumptions
<p><b>Project Components / Sub-components:</b></p> <p>1. Expansion and consolidation of current scientific and technical knowledge base of the Guarani Aquifer System</p> <p>2. Joint development and implementation of a Management Framework for the Guarani Aquifer System</p> <p>3. Public and stakeholder participation, education and social communication</p> <p>4. Project monitoring and evaluation and dissemination of project results</p> <p>5. Development of Management and Mitigation Measures within identified “Hot Spots”</p> <p>6. Assessment of Geothermal Energy Potential</p> <p>7. Project Coordination and Management</p> <p>Total project Cost</p>	<p><b>Inputs: (budget for each component)</b></p> <p>US \$ 9.91 million</p> <p>US \$ 7.01 million</p> <p>US \$ 1.31 million</p> <p>US \$ 0.48 million</p> <p>US \$ 3.73 million</p> <p>US \$ 0.28 million</p> <p>US \$ 4.04 million</p> <p><b>US \$ 26.76 million</b></p>	<p><b>Project reports:</b></p>	<p><b>(from Components to Outputs)</b></p> <p>Collaboration between partners in the four countries remains high.</p> <p>Research and development is carried out in a timely manner, with high quality and compatible methodologies.</p> <p>Political commitment to the project remains high, incl. active participation in project's institutional arrangements.</p> <p>Process to develop and implement the joint management framework is well designed and responds to stakeholders' needs</p> <p>Indicators refined and M&amp;E System defined in a timely manner</p> <p>Governments and the public remain interested in broad participation in the Guarani Aquifer System management and implementation</p> <p>Good baseline and timely follow-up</p> <p>Countries provide their counterpart, including active participation in in-country and regional activities</p> <p>Partners from different sectors and origins, including water and energy, collaborate</p>

## Annex 2: Detailed Project Description

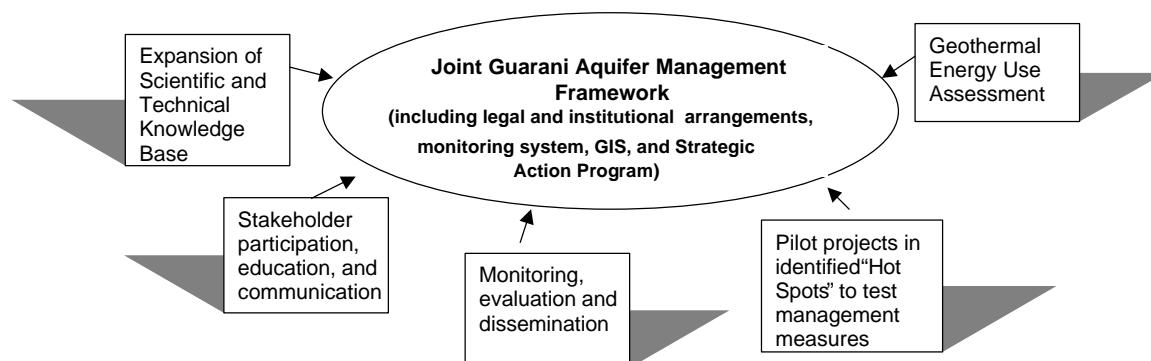
### LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project

#### 1. Objective

The long-term objective of the process started through the proposed Project is the sustainable management and use of the Guarani Aquifer System. The Guarani Aquifer System is situated in the eastern and south central portions of South America, and underlies parts of Argentina, Brazil, Paraguay and Uruguay. This project is a first step toward achieving the long-term objective. The purpose of the proposed project is to support the four countries in jointly elaborating and implementing a common institutional, legal and technical framework for managing and preserving the Guarani Aquifer System for current and future generations. To achieve this, seven project components are envisaged: (i) expansion and consolidation of the current scientific and technical knowledge base regarding the Guarani Aquifer System; (ii) joint development and implementation of a Guarani Aquifer System Management Framework, based upon an agreed Strategic Program of Action; (iii) enhancement of public and stakeholder participation, social communication and environmental education; (iv) evaluation and monitoring of the project and dissemination of project results; (v) development of regionally-appropriate groundwater management and mitigation measures in identified “Hot Spots”; (vi) consideration of the potential to utilize the Guarani Aquifer System’s “clean” geothermal energy; and, (vii) project coordination and management.

#### 2. Approach

The joint development and implementation of the Guarani Aquifer Management Framework is the core of the Project. The other project components are designed to provide the scientific, technical, social, legal, institutional, financial and economic basis for the Framework, as illustrated in Figure 1. The specific objectives, estimated costs, and GEF financing for the project components are described below.



The project has seven interrelated components that quantify the state of the aquifer in terms of its morphology and behavior, its use and conservation, its relationships to communities and institutions, and its planning and organizational needs for improving coordinated management of

its waters. This knowledge will provide a scientifically-sound and well-documented base for establishing a framework for the coordinated and consensual management of the Guarani Aquifer System, capable of providing for its environmental protection, and integrated and sustainable development. The project will identify and test key management elements (including policies, mechanisms, and instruments) that will facilitate the sustainable and coordinated management of the Guarani Aquifer System. The resulting management framework will provide the means to mitigate and/or resolve the most pressing transboundary environmental problems that threaten the aquifer. In addition, this framework will provide a means to address local conflicts arising from the use of the waters of the aquifer system (especially those related to water pollution and over exploitation to provide a long-term strategy for risk mitigation), and assess its potential to provide “clean” geothermal energy to communities within the region.

**By Component:**

**Project Component 1 - US\$9.91 million**

**Expansion and Consolidation of the Current Scientific and Technical Knowledge Base on the Guarani Aquifer System**

The objective of this Component is to synthesize, analyze, and expand the existing knowledge base related to the Guarani Aquifer System in the four countries. A sound scientific and technical understanding of the aquifer is essential to the development of an articulated, consensual and effective management framework that facilitates its sustainable development within its regional setting, while providing a necessary measure of environmental protection for the shared resource. The Component will also seek to expand and improve the understanding of the potential and threats facing this body of water. In so doing, this Component will identify institutional actors, water users, and social groups whose actions impinge upon the Guarani Aquifer System. There are two sub-components:

**1.a) Aquifer studies for consolidation and expansion of the scientific knowledge base**, in order to quantify and disseminate scientific knowledge on the geometry, structure and hydrodynamic behavior of the aquifer, and to synthesize and expand the existing knowledge base in order to meet specific objectives (including determination of the southern and western boundaries of the aquifer within Paraguay, Argentina and Uruguay) – A thorough inventory of public and private wells will be undertaken. The determination of the characteristics and magnitude of the Guarani Aquifer System, the extent of existing levels of pollution of the aquifer within the countries, and identification of the areas of recharge and discharge, including the hydrogeology and dynamics of the Guarani Aquifer System, are important, basic characteristics of the system that must be known prior to any attempt to manage it.

**1.b) Technical and socio-economic assessment of current and future use scenarios of the Guarani Aquifer System** – Based upon the knowledge base assembled during the previous sub-component, the technical knowledge of the Guarani Aquifer System will be used to develop techniques to (i) conduct an appraisal of the present uses and anticipated future uses of the aquifer under a variety of foreseeable scenarios, (ii) assess the interactions between these various uses and the cumulative impact of the Guarani Aquifer System, and (iii) appraise

the available technologies for surveying, extracting, and using the waters of the Guarani Aquifer System.

The results and products of the two sub-components will establish the parameters within which the Guarani Aquifer System can be sustainably exploited, without damage to the underlying structure and function of the aquifer system, within an objective technical and scientific framework. These results, in combination with the practical outcomes of the pilot projects in identified Hot Spots to be completed under Component V, are of fundamental importance for supporting decision making with respect to the management and protection of the Guarani Aquifer System.

The International Atomic Energy Agency (IAEA) will support a portion of this Component insofar as it relates to the application of isotope methodologies for determining, among other phenomena, the conditions and limits of groundwater flow within the Guarani Aquifer System. The IAEA will provide funds and in-kind support to the use of isotopes to delineate the extent and character of the aquifer, and, through these activities, contribute to building capacity and strengthening institutions in the countries in this region. The IAEA will also ensure the quality of the analyses and the consistency and reliability of laboratory results based upon the isotopes. IAEA activities are additional to project activities and are expected to further enhance the knowledge. The component would still reach its objectives, even if IAEA funding was not available.

In addition, the Government of Paraguay is currently in discussion with the *Bundesanstalt fuer Geowissenschaften und Rohstoffe* (“German Geological Survey” – BGR) with regard to the provision of technical assistance in support of this Component. Incremental financing has been made available by the BGR, which will provide in-kind support contributing to capacity building and institutional strengthening in Paraguay, and support the acquisition and management of geohydrological data within that portion of the aquifer. This will improve the capacity building effect in Paraguay and therewith the quality of the project. If the funding should not materialize, the overall project results would not be detrimentally affected, however.

Execution of this component will take place through the General Secretariat in close coordination with the four country Executing Agencies through their respective NPEUs.

GEF: US \$ 4.57 million; co-funding: US \$ 5.34 million; total: US \$ 9.91 million. Co-funding is expected to include contributions from the IAEA in the amount of US \$ 0.30 million, from the BGR in the amount of US \$ 0.14 million, and from the World Bank Netherlands Water Partnership Program (BNWPP) in the amount of US \$ 0.03 million.

#### **Project Component 2 - US\$7.01 million**

#### **Joint development and implementation of the Guarani Aquifer System Management Framework**

As outlined in the introduction, this component constitutes the core of the project, with the other components feeding into it. The objective of this component is to develop a framework for the coordinated management (technical, institutional, financial and legal) of the Guarani Aquifer

System, taking into account the principles of sustainable integrated development, the problems and potential of the Guarani Aquifer System, and environmental protection concerns. This framework will be established within a Strategic Action Program (SAP) to be implemented in the Guarani Aquifer System region. The SAP will articulate, in a logical and comprehensive manner, in both space and time, the principal lines of action necessary for achieving the project's long term objective. There are five sub-components:

2. a) **Design and implementation of an aquifer monitoring network** that provides results early in the execution phase to support efforts to implement and strengthen the knowledge base on the Guarani Aquifer System – This network includes the installation and running of equipment on a 5% sample of all wells. Its implementation is an essential tool for providing basic data and information necessary for the coordinated management and administration of the Guarani Aquifer System, and monitoring of its behavior in space and time.
2. b) **Development and integration of an Information System (SISAG - Sistema de Información del Sistema Acuífero Guarani)** for the Guarani Aquifer System that facilitates the management, standardization, dissemination, and utilization of data, information, and documents, in order to enhance coordinated management, based upon a sound knowledge of the Guarani Aquifer System – This system, including a GIS, will provide the technical basis for decision making relating to the aquifer. It will provide the basic knowledge necessary for resolving present and emerging problems, and ensuring the sustainable use of the aquifer's potential.
2. c) **Formulation of a Strategic Action Program (SAP)** – The SAP will provide a strategic framework for the coordinated management of the Guarani Aquifer System. Such a framework will facilitate and support solutions to the current and emerging problems of pollution and over-exploitation of the Guarani Aquifer System, as well as resolution of other transboundary environmental problems that may threaten its sustainable development.

A core piece of the SAP process will be to develop an institutional framework for the management of the Guarani Aquifer System. In addition, a sequence of activities, such as workshops and seminars, are planned to arrive at a technically agreed consensus proposal for a legal Guarani Aquifer System management framework. The SAP process also contributes to identifying and managing the potential uses of the Guarani Aquifer System through a process that encourages the participation of different stakeholders in the conduct of a prioritized, core group of activities for the coordinated management of the Guarani Aquifer System in a manner consistent with the purposes of the GEF and the interests of the four countries.

The SAP will enrich, diversify and disseminate knowledge, information, visions, and documentation on the Guarani Aquifer System, so as to promote sustainable, integrated management and environmental protection. (See Annex 14)

2. d) **Institutional strengthening** – Development of groundwater management expertise and strengthening the institutional base within the Guarani Aquifer System region is the basic building block upon which the transboundary management of the Guarani Aquifer System will

be supported. Appropriate and relevant means of strengthening agencies, in order to support the management framework, to be further elaborated during the subsequent implementation phases of the project, will promote a solid basis for the joint management of subterranean waters of the Guarani Aquifer System. These means include twinning (staff exchange) arrangements between agencies involved in Guarani Aquifer System management in the different countries to benefit at least 40 (ground)water managers, development and delivery of a suite of groundwater management courses, short-term Technical Assistance to agencies and institutions involved in groundwater management, and study tours of managers and decision makers to other relevant transboundary (ground-)water institutions. These activities will be targeted at national as well as subnational entities, including state/provincial institutions and - if applicable - to water supply utilities.

In addition, a fund for research and capacity building is currently being created, to be financed through the Bank Netherlands Partnership Program, to be accessed by universities in the Guarani Aquifer Region. Universities will be able to request funding in order to finance (i) development and carrying out of courses relating to groundwater research and/or management, with specific emphasis on the environmental aspects of the Guarani Aquifer System and (ii) research related to the Guarani Aquifer System with the express goal of involvement of Master's or Ph.D. students.

Research topics could include, for instance, broadening of the knowledge basis linked to point and non-point source pollution, including vulnerability assessments and protective zoning; investigation into vulnerability relating to localized aquifer overdraft; environmental aspects of groundwater administration and allocation (e.g. monitoring indicators and implementation of environmental monitoring schemes; impact analysis of water use concessions); environmental impacts of geothermal aquifer exploitation, pollution control management at country and/or regional level, environmental aspects of international law of groundwater resources related to the Guarani Aquifer System, and financial impacts on user groups through pollution and/or overexploitation.

The objective is to provide universities in the region of the Guarani Aquifer System, which are key players in the long-term management of the Guarani Aquifer, with resources for joint research and capacity building and to ensure that (i) groundwater in its environmental and social dimension enters the academic agenda in the region, also to the benefit of the problems encountered in shallower aquifers in the four countries; (ii) future human resources are trained in the environmental and social aspects of Guarani Aquifer Management as a critical input once the Guarani Aquifer Management Framework is agreed upon between the countries and to be implemented, (iii) the academic community continues to be involved in the umbrella Guarani Aquifer Project; and (iv) links are strengthened and created between the universities in the region. The Fund will amount to a total of US \$370,000 to be disbursed over a time period of three years. Regulations for the University Fund will be included in the Project Implementation Plan.

**2. e) Transboundary Diagnostic Analysis** - The mix of approaches adopted under this Component will not only contribute to the formulation of the SAP, but will also result in a

comprehensive Transboundary Diagnostic Analysis (TDA) that represents the first step toward defining the underlying root causes to be addressed during a program of active management of the aquifer. Given the technical capacities of the countries, it is important that the TDA be completed in such a way as to provide for the ongoing monitoring of the resource. This is particularly the case vis-à-vis the implementation of a monitoring system linked to an Information System, and the preparation and implementation of a shared GIS, which has been designed to support decision making for the management and protection of the Guarani Aquifer System. The Information System then becomes an essential element in the dissemination of knowledge on the aquifer and its different interrelationships. The nature of subterranean waters makes it possible to establish a monitoring system early on in the project. In addition, the volume and dispersion of the existing information on the aquifer requires a special informatics effort to organize and disseminate the information by means of a practical, operational information system during the early stages of project execution. By providing a working data and monitoring system early in the project, this Component can contribute to maintaining the interest of relevant stakeholder groups.

Execution of this component will take place through the General Secretariat in close coordination with the four country Executing Agencies through their respective NPEUs. In the case of the development of the SISAG, at least four national focal point agencies (i.e. at least one in each country) will be identified, which will be responsible for the development and maintenance of information in the SISAG.

GEF: US \$ 3.49 million; co-funding: US \$ 3.52 million; total: US \$ 7.01 million. Co-funding is expected to include contributions from the BGR in the amount of US \$ 0.05 million, and from the World Bank Netherlands Water Partnership Program (BNWPP) in the amount of US \$ 0.07 million.

#### **Project Component 3 - US\$ 1.31 million**

##### **Public and stakeholder participation, education and communication**

The objective of this Component is to promote, support, and enrich the participation and involvement of the public, and to foster environmental and water education, social communication, and the dissemination of knowledge on the project and the Guarani Aquifer System, its management and conservation, within stakeholder communities. It includes strategies, programs, and actions, as well as support for the pilot projects in the identified Hot Spots to be conducted under Component V. This Component will involve: (i) the design and implementation of a Regional Communications Plan that will contribute to sensitizing and educating people in the Guarani Aquifer System region, and (ii) ensuring that relevant stakeholders are involved in preparing and executing the SAP. The stakeholders identified to date, through the project development phase activities, include water users, resource management institutions, water service providers in both rural and urban areas, NGOs, academics, the private sector, and minority groups. Four sub-components are proposed:

3. a) **Design of a Regional Communications and Public Participation Plan** – Periodic reviews of the status of information dissemination, and of the participation of the population in the region, including public servants, water users, academics, professional groups, business

persons, environmental NGOs, indigenous groups and leaders, in developing and implementing the project, and in formulating the SAP will be undertaken. These reviews will contribute to an evaluation of results achieved at the end of the project in the areas of communications, education and public participation. A key element in achieving a high degree of public participation in the project will be the preparation of a Social Communications Manual for the project. The manual will outline ways and means of promoting events that will enhance the “image” of the project among stakeholder groups. It is anticipated that activities will include: the periodic preparation of an electronic “newsletter” to be distributed over the Internet, targeting specific groups of stakeholders; circulation of an informational bulletin on the project, likewise over the Internet, as well as through other media; conduct of institutional-based information campaigns; design and implementation of a distance learning curriculum for youth, to be disseminated through radio/television and the press; and creation of a project image bank of digital photographs relating to aspects of aquifer protection and management.

**3. b) Guarani Aquifer System Citizens' Fund.** Development of strategies and concrete actions for spurring and strengthening environmental education as well as education on the Guarani Aquifer System waters – Community-level dissemination of information and knowledge on the Guarani Aquifer System, its management and conservation, is an essential element for ensuring the sustainability of this project. Participation of community-based NGOs will be facilitated through a Guarani Aquifer System Citizens' Fund, the purpose of which is to support, in part, activities that encourage public participation, communication, and community education. This fund will be subject to implementation regulations that will govern the submission and funding of proposals from, *inter alia*, NGOs and community organizations operating in the Guarani Aquifer System region. It is anticipated that grants, up to US\$10,000 in value, will be awarded on a competitive basis, with a matching requirement of 20 percent applicant share and 80 percent Citizens' Fund grant. Grants could be used for implementation of groundwater/ environmental education and awareness raising activities related to the Guarani Aquifer System. The applicant share can be in-kind, with human resources valued at a standard rate to be determined as part of the grant regulations. Regulations for the Citizens' Fund will be included in the Project Implementation Plan.

**3. c) Creation and dissemination of instruments to increase awareness, interest, and commitment among stakeholders** – Measures to involve children and youth in the Guarani Aquifer System project will not only enhance the project's “corporate image”, but also result in a widespread and long term awareness and commitment to protecting and preserving the aquifer. Lessons learned from similar efforts within the Latin American region suggest that young people will carry the message of sustainable and responsible use of the aquifer from their classrooms to their homes, and that their parents will be engaged in the process of protection and sustainable utilization as a result. Thus, an important element of this sub-component will be development and dissemination of a school booklet and atlas of the aquifer. In addition, other activities envisioned include, *inter alia*, the preparation and dissemination of an environmental manual and a manual on the Guarani Aquifer System for teachers and community leaders; sponsorship of contests and sports awards; conduct of radio and television campaigns; creation of reference centers and a mobile Guarani Aquifer System

classroom; convening of workshops and seminars on the Guarani Aquifer System; and the production of supporting materials such as brochures, posters, and videos. Given the extent of the Guarani Aquifer System, these activities will emanate from the Regional Communications and Public Participation Plan (3 a) and initially will be prepared as pilot demonstration projects in the identified "Hot Spots" (see Component 5), targeted to specific locations, which will facilitate testing of the materials and programs prior to later expansion to the regional level during subsequent phases of the project.

**3 d) Indigenous Peoples Strategy** - An Indigenous Peoples Strategy (IPS) has been designed based on preparatory studies, consultations and discussions with key indigenous actors and institutions and other related civil society entities. Because there will be no physical project investments, indigenous peoples will not be directly affected by project activities. On the other hand, the long-term goal of the project to create a management framework for the Guarani Aquifer System may eventually have effects on their rights and obligations, e.g. with regard to registration of new wells. As previously noted, with respect to OD 4.20, the IPS of the Guarani Aquifer Project was not formulated to mitigate actual or potential negative aspects of other project activities, but it rather constitutes one of the main mechanisms of the project for the effective and informed participation of indigenous peoples. It includes further in-depth studies, participatory assessments, and consultations in the project area in general, as well as in the Paraguayan Pilot area in particular. Details such as phasing, action steps and budget are included in Annex 12.

Specifically, the results of this Component will: (i) foster greater participation by interested parties in the project; (ii) expand the regional dissemination of knowledge on subterranean waters and the Guarani Aquifer System; (iii) enhance integration among project participants; (iv) produce promotional materials for disseminating information on the aquifer and the project; and (v) promote activities to awaken an interest in the economics of water and conservation of water quality. This Component will furnish the greatest number of people in the region—including minority cultures and groups—with information so as to promote their greater participation and involvement in the project. Stakeholder participation, especially in the formulation of the SAP, pilot projects in the Hot Spots, and the evaluation and monitoring of the project, will improve the likelihood of its sustainability.

Execution of this Component is the responsibility of the General Secretariat as well as of the National Executing Agencies through the NPEUs. The National Executing Agencies will be specifically responsible for development and/or adaption of national outreach material as well as project workshops and consultations. In addition, civil society organizations that are awarded funding through the Citizens' Fund will act as executing entities.

GEF: US \$ 0.77 million; co-funding: US \$ 0.54 million; total: US \$ 1.31 million. Co-funding includes matching grants from beneficiaries representing US \$ 0.05 million.

#### **Project Component 4 - US\$0.48 million**

#### **Project Monitoring and Evaluation, and Dissemination of Project Results**

The objective of this Component is to create and implement a system for recording and analyzing

progress achieved during the project implementation period. This system will allow early detection of potential problems, and provide feedback to the participants on the experiences gained and lessons learned. This Component will include the dissemination of information, results and lessons learned, with a view to possibly replicating project results under similar conditions and circumstances elsewhere in the Guarani Aquifer System region and in other transboundary groundwater areas. It has two sub-components:

4. a) Development and implementation of a **monitoring, evaluation and feedback system** – Based upon agreed management and performance indicators that reflect the project objectives, consistent with the logical framework analysis (see Annex 1), periodic evaluations of project progress will be conducted by the Executing and Implementing Agencies. In addition, the Steering Committee, at its semi-annual meetings, will review the degree to which the project has fulfilled the key performance indicators. The Guarani Secretariat will also monitor project results on a regular basis. Goals, criteria and standards to measure and monitor project performance will be developed and agreed using the GEF-IW process indicators (see Annex 19).

4. b) **Dissemination of project results throughout the region and beyond** – The results of the project and lessons learned will be disseminated through reports, the Internet, international conferences, workshops and meetings, and direct exchange of experiences to other existing or potential groundwater management and protection projects. The General Secretariat will act as a focal point for the interaction of the Project with other GEF-IW projects in the Latin American region. Using the Inter-American Water Resources Network (IWRN) and other media, the project staff will communicate and coordinate activities between GEF-IW projects to facilitate information-sharing and dissemination of project approaches and results.

In order to contribute to institutional development and to ensure widespread implementation of the lessons learned through the conduct of the project, governmental stakeholders at the local and sub-national levels will be provided with specific information on the results of the project. In this way, the project will promote sustainable follow-up activities at the community level, and facilitate local ownership of the project findings.

The results of this Component will assist the Executing and Implementing Agencies to appropriately track project progress. This Component will also provide specific information to the General Secretariat and project Steering Committee to facilitate their participation in the project and in ensuring the direction of the project, based upon regular reports and agreed progress indicators. Specific progress measures, in addition to the key performance indicators identified in the PAD and consistent with the GEF-IW process indicators, will be developed and agreed under this Component.

Execution of this Component is the responsibility of the General Secretariat as well as of the National Executing Agencies through their NPEUs.

GEF: US \$ 0.26 million; co-funding: US \$ 0.22 million; total US \$ 0.48 million.

## **Project Component 5 - US\$3.73 million**

### **Development of Management and Mitigation Measures within Identified “Hot Spots”**

The objective of this Component is to design, apply, and evaluate the costs and feasibility of good management practices at specific sites within the Guarani Aquifer System region. Appropriate management and mitigation measures to address specific threats facing the sustainable utilization of the Guarani Aquifer System will be developed for demonstration purposes. Dissemination of information on successful management and mitigation measures will be likely to spur concrete actions in areas currently under threat and/or where existing or emerging conflicts occur, especially in border areas. The pilot projects will focus on the prevention and mitigation of specific point and nonpoint sources of pollution, as well as overdrafting of the aquifer in critical recharge and discharge areas, or in confined areas of the aquifer, where there is a high concentration of uses and users.

It has been established through technical studies that clear transboundary issues exist in the border areas of Argentina/Uruguay (well yields are diminishing and some cross border disputes are apparent due to the importance of these geothermal wells for tourism) and Uruguay/Brazil (pollution between sister cities across the border). The nature of the aquifer system, i.e. very large volumes of mainly confined aquifer storage compared to significant – but smaller and much more localized – volumes of active recharge, mean that there is a possibility that major development could provoke large drawdowns with the potential for conflict between competing users. This is the more significant, given the fact that the most valued exploitation is in the form of ‘overflowing geothermal wells’ and conservation of such artesian heads is managerially more demanding than normal aquifer management. Furthermore, the recharge area in Paraguay, bordering Brazil and Argentina, is a potential area for transboundary impact. These three areas have been included as Hot Spots with a transboundary focus to be addressed by the project.

In addition, the area of São Paulo is the one experiencing the most extraction and pollution in the entire aquifer system area. While it is highly unlikely that pollution in São Paulo would reach the other countries, the technical and institutional assessments have shown that this area can provide important lessons in terms of decentralized management and monitoring approaches. All four countries agree that the institutional management framework for the Guarani Aquifer System needs to be as light as possible, precisely due to its size. Therefore it will be necessary to test which types of measures will work in border areas and also in areas of significant national importance.

This component thus comprises two transboundary pilot projects associated with existing and emerging uses of groundwater, one border area pilot project associated with developing and understanding of aquifer characteristics, and one pilot project in a heavily urbanized area. In detail those are:

5. a) Concordia (Argentina) / Salto (Uruguay) – This area of the Guarani Aquifer System is currently experiencing concerns of a transboundary nature related to the exploitation of the waters of the Guarani Aquifer System for thermal tourism within a confined portion of the

aquifer. This pilot demonstration project will develop a local understanding of the behavior and a local joint sustainable management plan of the thermal waters of the Guarani Aquifer System aimed at the sustainable utilization of these waters. (As noted elsewhere, this activity will also contribute to the studies and investigations proposed under Component I, and will also contribute to the assessment of the thermal energy potential of the Guarani Aquifer System waters to be conducted under Component VI).

5. b) Rivera (Uruguay) / Santana do Livramento (Brazil) – This transboundary demonstration project is designed to assess mechanisms relating to the management and protection of subterranean waters within an unconfined portion of the aquifer. Specifically, this sub-component will address the increasing concerns identified within geographic areas devoted to agricultural development and rural activities with relevant joint growth patterns observed during the past few years. A local joint management plan for the aquifer will be elaborated to his effect.

5. c) Encarnación - Ciudad del Este - Caaguazú – The border corridor between Paraguay and Brazil/Argentina is a recharge/discharge area of the Guarani Aquifer System. This Pilot Project will provide critical information regarding such areas in the Guarani Aquifer System and address concerns with regard to its vulnerability to human disturbance. Based on the acquisition of this information, the outcome of this pilot is expected to be an assessment of and proposal for future management needs in this area.

5. d) Ribeirão Preto (Brazil) – In addition to the foregoing, localized contamination and overdrafting of the aquifer from urban land uses in densely populated portions of the aquifer is another threat facing the Guarani Aquifer System. Strategic interventions, including Technical Assistance for the development of a local aquifer management plan in the heavily impacted area of Ribeirão Preto will be supported by the Project. They will leverage current activities by the Government of Brazil regarding groundwater protection and management measures in this area.

These sub-components will involve scientific and technical activities to clarify the hydrogeology, geophysics, hydrogeochemistry, and hydrodynamics of specific areas within the Guarani Aquifer System, and, in general, better define the morphology and dynamics of the Guarani Aquifer System at specific sites of critical importance. The selected, land use-related demonstration projects are strongly oriented toward identifying, implementing, and evaluating concrete and sustainable management measures relevant to the aquifer, and in resolving existing and potential transboundary environmental and water quantity threats as they apply to the Guarani Aquifer System. On the technical side, they include well inventories, well construction assessments and assessments of related pollution and overdraft threats. Thus, while these pilot projects include an element of local/subregional modeling, they focus primarily on the determination and implementation of measures to mitigate problems and sustainably tap the existing potential of the aquifer. The projects directly involve local stakeholders and interested parties in the assessment and decision-making pertaining to the management, administration, and local protection of the aquifer. The results of this Component will be tried and tested applications, procedures, methodologies, and legal and fiscal instruments, designed to meet the project objectives, that can

be replicated elsewhere in the Guarani Aquifer System region or beyond where similar threats occur. The recharge/discharge area pilot project focuses more on developing an understanding of aquifer behavior in these critical areas, contributing basic information to, and complementing, the activities being conducted under Components I and II, and developing a methodology for assessing human impacts in these critical areas. A detailed description is included in Annex 18.

Execution of this Component is the responsibility of the General Secretariat as well as of the National Executing Agencies through their NPEUs.

GEF: US \$ 2.31 million; co-funding: US \$ 1.42 million; total US \$ 3.73 million. Within the co-funding, a BGR contribution in the amount of US \$ 0.41 million.

**Project Component 6 - US\$0.28 million**

**Assessment of Geothermal Energy Potential**

The objective of this Component is to evaluate the geothermal potential of the Guarani Aquifer System in scientific, technical, economic, financial, and environmental terms, and to provide this evaluation to the relevant ministries, including energy, within the participating countries. The thermal waters of the aquifer are currently being exploited on a limited basis for thermal tourism, primarily in Uruguay and, to a lesser degree, Argentina. Favorable conditions for the occurrence of thermal waters are likely to exist in Paraguay and in certain places in Brazil. In addition to the use of these waters for thermal tourism, the possibility exists that these thermal waters could also be used in industrial processes and for the generation of energy as a substitute for fossil fuels. In particular, there is a clear interest in tapping the low enthalpy supply of the aquifer. However, given existing concerns regarding the sustainability of these thermal waters, the energy-related options will have to be evaluated in technical, economic, social, and environmental terms. Depending on the results of such an evaluation, pilot activities could be developed to make use of this potential, and perhaps spur the development of new projects that could be of interest to the countries. This Component has two phases:

6. a) Phase one – During the first year of project execution, existing geohydrological data will be compiled and evaluated. Data to be used in the evaluation will be acquired under Component I of the project. These data will provide information on the extent of the thermal waters of the aquifer, and, through specific modeling activities, permit an assessment of the sustainability of proposals for exploiting such waters for geothermal energy production.

6. b) Phase two – During the second year of project execution, a task force comprised of representatives of the four countries, supported by world experts in the study and use of the enthalpic energy, will be created. This task force will conduct a scientific evaluation of the geothermal potential of the Guarani Aquifer System based upon the data acquired during Phase one. The task force will also evaluate the technical feasibility of using geothermal energy, conduct financial and economic analyses and environmental impact studies of possible future energy production activities. Depending upon the outcome of these actions, and taking into account technical, economic and environmental considerations, they will identify and prioritize areas for possible geothermal development. This latter activity, the results of which will be communicated to the energy ministries in the participating countries, will include

specific recommendations for future works and for the preparation of thermal projects at the conceptual level in the four countries, insofar as they are likely to be sustainable. Detailed Terms of Reference for the task force would be prepared by the General Secretariat during Year 1 of the Project.

The results of the Component will be specific recommendations for future works, including proposed areas for possible geothermal development, and concept level proposals for the formulation of such projects, along with any needed accompanying environmental mitigation measures. These results, together with the appropriate guidelines to be developed as part of the SAP, will be shared with the energy ministries of the participating countries and used to guide decision-making with respect to the future development of this potential. Based upon these results and recommendations of the task force, each country will be able to consider what steps to take to further develop identified potentials, including undertaking pilot projects in their territory should the results warrant.

Execution of this Component is the responsibility of the General Secretariat as well as of the National Executing Agencies through their NPEUs.

GEF: US \$ 0.20 million; co-funding: US \$ 0.08 million; total US \$ 0.28 million.

**Project Component 7 - US\$4.04 million**  
**Project Coordination and Management**

The objective of this Component is to provide organizational and administrative support to the project. This Component will include the incremental elements of activities associated with project leadership and coordination within the regional context, together with analytical capacity and production of specific material and documents. As noted under Component IV, the General Secretariat and the Coordination Group will act as focal points for the dissemination of project results, and coordination with, and communication between, other GEF-IW projects within the Latin American region. The IWRN and related communication media and mechanisms will be utilized to facilitate this interaction.

GEF: US \$ 1.80 million; co-funding: US \$ 2.24 million; total US \$ 4.04 million. Within the co-funding, an OAS contribution in the amount of US \$ 0.32 million is included.

### Annex 3: Estimated Project Costs

#### **LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

#### **Project Budget and Sources of Financing**

	Project Budget and Sources of Financing											
	External Contribution (US\$ x 1000)						Countries' Contribution (US\$ x1000)					
	GEF		Other Sources <sup>1</sup>		Subtotal		Uruguay	Argentina	Brazil	Paraguay	Subtotal	
	Amount	%	Amount	%	Amount	%					Amount	%
A. Expansion of the Knowledge Base	4571.1	46.1	470.0	4.7	5041.1	50.9	520.8	538.7	3255.3	556.5	4871.2	49.1
B. Development of a Joint Management Framework	3492.3	49.8	120.0	1.7	3612.3	51.5	496.7	626.6	1785.7	487.7	3396.7	48.5
C. Public and Stakeholder Participation	767.5	58.9	48.0	3.7	815.5	62.5	72.5	97.8	240.5	77.8	488.5	37.5
D. Monitoring, Evaluation and Dissemination	261.4	53.8			261.4	53.8	36.6	46.4	104.9	36.6	224.6	46.2
E. Development of Management and Mitigation Measures in Hot Spots	2314.1	62.0	410.0	11.0	2724.1	73.0	404.0	188.6	393.9	20.5	1007.0	27.0
F. Assessment of Geothermal Energy Potentials	202.4	70.5			202.4	70.5	21.1	21.1	21.1	21.1	84.5	29.5
G. Project Coordination and Management	1791.3	44.4	320.0	7.9	2111.3	52.4	347.1	404.5	820.8	347.1	1919.5	47.6
TOTAL	13400.1	50.1	1368.0	5.1	14768.1	55.2	1898.8	1923.6	6622.1	1547.3	11991.9	44.8

1) Contributions by BGR, OAS, IAEA, BNWPP, and Beneficiaries.

#### **Annex 4 Incremental Costs**

### **LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

**1. Broad Development Goals.** The Guarani Aquifer System is situated in the eastern and south central portions of South America, and underlies parts of Argentina, Brazil, Paraguay, and Uruguay. This project is a first step toward achieving the long-term objective of a sustainable management and use of the Guarani Aquifer System. Its purpose is to support the four countries in jointly elaborating and implementing a common institutional and technical framework for managing and preserving the Guarani Aquifer System for current and future generations. To achieve this purpose, seven project components are envisaged: (i) expansion and consolidation of the current scientific knowledge base regarding the Guarani Aquifer System; (ii) joint development and implementation of a Guarani Aquifer System Management Framework, based upon an agreed Strategic Program of Action; (iii) enhancement of public and stakeholder participation, social communication and environmental education; (iv) evaluation and monitoring of the project and dissemination of project results; (v) development of regionally-appropriate groundwater management and mitigation measures in identified “Hot Spots”; (vi) consideration of the potential to utilize the Guarani Aquifer System’s “clean” geothermal energy; and, (vii) project coordination and management.

**2. Baseline Situation.** Relatively few investments have been made to date in the project area and surrounding environs with regard to the monitoring and management of the Guarani Aquifer System as a resource. Notwithstanding, the countries have acknowledged the increasing pressures upon the Guarani Aquifer System, and have recently increased their levels of investment in this system. These consist of: (1) ongoing and long-term development projects for the lands overlying the Guarani Aquifer System, and (2) environmentally related activities associated with development programs, executed independently by federal/national, state/provincial, and local authorities, and (3) some groundwater management programs. Most of the projects tend to be within the latter categories of investment, and are almost exclusively financed by national agencies. These agencies include the Subsecretariats for Water Resources, for Planning and Social Environment, and for Environment, provincial directorates for public works and water/water resources, and universities in Argentina. In Brazil, these agencies include various national institutes, corporations and universities, the Secretariat for Water Resources, the National Water Agency, and state directorates for water and environment. In Paraguay, the agencies include the Secretariat for Environment, the National Environmental Health Service, the Asuncion Sanitation Corporation, and the national university. In Uruguay, these agencies include the National Directorates for Hydrography, for Minerals and Geology, and for Environment, the National Sanitation Administration, and national university. The studies undertaken by these agencies are almost exclusively aimed at data acquisition for specific research projects, are largely uncoordinated, and are designed to fulfill specific national or local purposes. While many of these projects are relatively uncoordinated, it is anticipated that benefits of the proposed project will be to coordinate them both within the countries and across the four countries. This will contribute to the formulation of the Strategic Action Program (SAP) to be realized during the conduct of this project. Therefore, these investments represent viable in-country programs and activities within the region that may have impacts on the project activities.

**3.** Other baseline activities, which have largely domestic or local impacts, include local development and water supply works being conducted by the federal and national governments, provinces, states, and local governments within the region. Data gathered under these programs will also be available to, and used in, the preparation of the SAP to address environmental and developmental concerns within the Guarani Aquifer System region.

**4. GEF Alternative Scenario.** The alternative scenario consists of the implementation of those actions needed to both introduce the principles of environmentally friendly management and sustainable development into development projects in the Guarani Aquifer System region. These actions are designed to achieve global/transboundary environmental benefits by providing a framework for the sustainable development and management of groundwater resources, and by addressing transboundary concerns identified through a rigorous program of data gathering and analysis. The elements of this program will be transferable to similar situations worldwide. The costs of the actions are those necessary to include sustainable development considerations into development projects within the region over and above the requirements of the regular environmental impact assessments and mitigation measures required to be completed under existing national, federal, provincial and state environmental laws and regulations.

**5.** Water resources management in the Guarani Aquifer System basin will be directed and coordinated by the relevant national, federal and subnational agencies, as set forth in specific national and federal laws. Harmonization and compatibilization of these legal systems, and existing national and federal programs, in the context of the Guarani Aquifer System is an important element of this project. To achieve this result, the agencies managing the water resources of the Guarani Aquifer System, *inter alia*, will require strengthening both in terms of institutional functioning and human resource capacity.

**6.** Reduced contamination, improved public health, and more effective and sustainable use of available water resources are national benefits to be expected as a result of the activities of this project. Notwithstanding, these outcomes also have significant impacts in maintaining the Guarani Aquifer System and, therefore, have additional benefit for the globally significant resources within the region. However, the full extent of localized benefits cannot be estimated at this time. Thus, it is assumed that the domestic funding provided is equivalent to the national costs and will adequately compensate for the domestic benefits achieved.

**7. Global Benefits.** The global benefit arising from the GEF intervention will be the formulation of a comprehensive management program to reduce and prevent contamination and pollution that will not only have significant human benefit in the surrounding countries, but also could have benefit to regionally significant wetlands, coastal areas, and riverine systems. Given that the countries are undertaking developmental investments in the Guarani Aquifer System area, it is also envisaged that project activities will shift these current investments towards a more sustainable path than they might otherwise take. A strategic program of activities will be conducted within the Guarani Aquifer System region, which will demonstrate an approach to (transboundary) groundwater management that could reduce contamination, minimize overconsumption, and promote sustainable utilization of the resource in the four countries and for groundwater systems worldwide. A breakdown of expected global benefits, by component,

follows.

Component I, Expansion and Consolidation of the Current Knowledge Base. The activities set forth under this component are designed to assess and quantify specific issues of concern within the Guarani Aquifer System basin identified during the GEF-PDF activities. These issues, to be qualified within a Transboundary Diagnostic Analysis (TDA), include the identification of the actual extent and geology of the Guarani Aquifer System; the quality of the waters contained within the Guarani Aquifer System; aspects of the hydrology, recharge and utilization of the waters of the Guarani Aquifer System; and the development of a model or suite of models, to be used in the management of the resource, that describe the Guarani Aquifer System. The proposed project considers means for identifying and quantifying risks of contamination and overuse of the Guarani Aquifer System, known to be currently occurring. The baseline costs cover existing infrastructure, monitoring activities, and investments in the Guarani Aquifer System region. The project alternative costs are US \$ 11.03 million, including the estimated US \$ 4.87 million counterpart contributions from the national and federal governments, and local governmental and nongovernmental (NGOs) organizations, including educational institutions. Incremental funding from GEF is \$ 4.57 million.

Component II, Joint Development and Implementation of a Guarani Aquifer System Management Framework. The rational use of water and other natural resources within the Guarani Aquifer System region is limited by several existing and potential uses of water within the region that are competing for increased shares of groundwater. This competition can influence the quality and quantity of groundwater as well as potentially influence ecosystem structure and functioning where the groundwater system interacts with the land surface. Given the intensity of existing and potential demands upon this system, development of an integrated program of water resource management could provide for a significant improvement in the decision-making ability of regulatory agencies in the region that would result in both global and domestic benefits. Such an improvement would contribute to achievement of an optimal mix of different groundwater uses, based upon the corresponding costs and benefits of each use, including, *inter alia*, environmental uses, which could support negotiated allocations among the different stakeholders and related water pricing decisions. Knowledge of the critical factors influencing groundwater behavior, and experience with methods of negotiation and agreement among competitive users of water, to be acquired under Components I, III, and V, as well as elements of this Component, will be used for improving management of natural resources in the basin. This management framework could be transferred to other transboundary groundwater systems where complex mixes of competitive water uses exist. The baseline cost of this Component is US \$ 1.01 million, representing investments in operating the existing geohydrological networks and other government activities. It is rather limited, given that up to now no efforts have been made to create a crossboundary management system. The project alternative cost is US \$ 11.03 million. GEF incremental funding is US \$ 3.49 million.

Component III, Public and Stakeholder Participation. The baseline costs of this component represent completed and ongoing activities by the governments, provinces, and states for engaging a variety of stakeholders in the design and implementation of on-the-ground management activities. It amounts to US \$ 0.34 million to cover ongoing environmental

educational and information programming within the Guarani Aquifer System region. The project alternative cost is US \$ 1.65 million. The actions proposed to be undertaken will expand and enhance public involvement and stakeholder participation, including indigenous groups, through broadly-based formal, institution-based as well as informal, community-based educational and informational opportunities. GEF incremental funding is US \$ 0.77 million.

**Component IV, Project Monitoring and Evaluation, and Dissemination of Results.** Together with the monitoring and management activities set forth in Components I through III, this Component will strengthen institutional capacities to monitor and manage the project and to increase and enhance the human resource capabilities necessary to carry out a program of strategic activities within the Guarani Aquifer System region, reinforce the capacities of the institutions working in the Guarani Aquifer System region to collaborate in data-sharing and analytical activities essential for the sustainable, shared utilization of the resource. The baseline cost of this is Component zero given that this component refers entirely to this new project. The project alternative cost is US \$ 0.48 million. GEF incremental funding is US \$ 0.26 million.

**Component V, Development of Management and Mitigation Measures.** Based upon information gathered during the GEF-PDF activities, together with the monitoring and management activities set forth in Components I through III, this Component will result in the development of measures to quantify, analyze, and mitigate the impacts of human use of the Guarani Aquifer System in up to four specific geographic areas overlying the aquifer. These areas represent current occurrences of groundwater management issues of concern that are likely to recur within the Guarani Aquifer System basin; namely, areas of exploitation of the aquifer for geothermal water use, for urban and industrial water use, and for agricultural water use, and areas of overexploitation of groundwater resources. The project will focus on two transboundary areas, one vulnerable recharge and discharge area in Paraguay and one heavily urbanized area in Brazil. The baseline cost of this Component is US \$ 1.1 million. The project alternative cost is US \$ 4.83 million. GEF incremental funding is US \$ 2.31 million.

**Component VI, Assessment of Geothermal Energy Potential.** This Component is designed to assess the potential utilization of the Guarani Aquifer System for geothermal energy production. Such utilization is an emerging use that has the potential to conflict with the current use of these waters for tourism. Nevertheless, geothermal energy production has the potential to provide a source of “clean energy”, which is, as yet, undeveloped and underutilized. The baseline cost of this Component is zero because investments in geothermal energy are already counted in the baseline of Component V and due to the fact that assessments of the geothermal energy potential on a transboundary scale up to now have not entered into government programs. This project will enable this vital step with regard to strategic assessment of possibilities and threats in using the geothermal energy potential. The project alternative cost, to consider the future utilization of this energy source, is US \$ 0.28 million. GEF incremental funding is US \$ 0.2 million.

**Component VII, Project Coordination and Management.** In order to ensure a coordinated and focused approach to the conduct of this project, this Component provides incremental funding for the management activities of the Guarani Secretariat and national executing agencies responsible for the day-to-day activities to be carried out by the project participants. Incremental costs of the

activities of the Steering Committee are also included within this Component. The baseline cost is zero because without the project, the countries would not need to invest in project coordination and management. The cost of the project alternative, adding the transboundary consideration to the current governmental and stakeholder activities and counting the counterpart costs incurred by the national, federal, state, provincial, and local governments, universities, stakeholders and NGOs currently active in the Guarani Aquifer System region, is US \$ 4.04 million. GEF incremental funding is US \$ 1.80 million.

**8.** Total co-financing is US \$ 13.36 million. The governments are contributing a total of \$11.99 million in cash, kind, and taxes foregone. It has been confirmed that the governments will exempt the OAS from tax liabilities. However, if the OAS ever lost its tax exempt status, then the governments would be required to pay a cash contribution of \$2.14 million toward taxes. Therefore, the taxes foregone by the countries are considered in the financing plan as counterpart contribution. A significant amount of resources have been mobilized for the project and associated financing from the BGR (Bundesanstalt fuer Geowissenschaften und Rohstoffe/Government of Germany), OAS, IAEA (International Atomic Energy Agency), and World Bank Netherlands Water Partnership Program (BNWPP) in the amount of US \$ 1.3 million is to be made available for this project. In addition, the IAEA has signaled its willingness to make a further US \$300,000 available in a second phase after two years of project implementation. A further contribution to the project will be made by the Bank Netherlands Partnership Program in the amount of US \$ 370,000. This additional amount is not included in the project financing plan. It is expected that additional future financing will be mobilized from other sources, including from the private sector. This is an explicit target of the Strategic Action Program process.

**Table A4-1: Incremental Cost Matrix (US \$M)**

<b>Component</b>	<b>Category</b>	<b>Amount</b>	<b>Domestic Benefits</b>	<b>Global Benefits</b>
(1) Expansion and Consolidation of the Knowledge Base	Baseline	1.12	Information on the quality and availability of groundwater resources in the Guarani Aquifer System	
	Alternative	11.03	Same as above, with additional information supporting the sustainable use of the resource and overlying lands with a transboundary perspective	Increased protection and sustainable use of a globally significant groundwater system
	Increment	4.57		
(2) Development and Implementation of a Management Framework	Baseline	1.01	Geohydrometeorological monitoring data	
	Alternative	8.02	Same as above, with added capacity for improved, sustainable groundwater management and decision-making for the entire Guarani Aquifer System, rather than only for national subareas	Positive impacts of coordinated groundwater management, and development of methodologies able to be applied to other transboundary basins
	Increment	3.49		
(3) Public and Stakeholder Participation	Baseline	0.34	Public awareness of water conservation and public health issues	
	Alternative	1.65	Same as above, with public support for appropriate development, utilization and conservation of groundwater	Positive impacts of coordinated groundwater management, and development of programs able to be applied to other transboundary basins
	Increment	0.77		
(4) Project Monitoring and Evaluation	Baseline	0.0		
	Alternative	0.48	Adequate monitoring and evaluation of the project, to achieve proposed results and effective dissemination of project results within the countries and worldwide	Increased protection of groundwater quality and quantity with resultant potential benefit to regional biological diversity and maintenance of surface water resources
	Increment	0.26		

<b>Component</b>	<b>Category</b>	<b>Amount</b>	<b>Domestic Benefits</b>	<b>Global Benefits</b>
(5) Development of Management and Mitigation Measures in Hot Spots	Baseline	1.1	Monitoring and regulation of water and land use, energy, and economic development	
	Alternative	4.83	Same as above, with added capacity to monitor and regulate the use and potential impacts of land use on groundwater quality and quantity, and promote sustainable economic development in the pilot areas and beyond	Increased protection of groundwater quality and quantity with resultant potential benefit to sustainable development and human utilization of transboundary underground water resources
	Increment	2.31		
(6) Assessment of Geothermal Energy Potentials	Baseline	0.0		
	Alternative	0.28	Increased knowledge about sustainable and beneficial strategies for development of the geothermal energy potential, including the development of “clean energy” sources	Development of methodologies for the integrated development and sustainable utilization of geothermal energy resources
	Increment	0.20		
(7) Project Coordination and Management	Baseline	0.0		
	Alternative	4.04	Carrying out of adequate project management functions	Development of methodologies for coordination of management and monitoring of multinational groundwater systems
	Increment	1.80		
<b>TOTAL</b>	Baseline	3.57		
	Alternative	30.33		
	Global Increment	13.40		
PDF/B Preparation		0.54		
Total Project Increment		26.76		

## Annex 5: Financial Summary

### **LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

**Years Ending  
2006**

	<b>IMPLEMENTATION PERIOD</b>						
	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Year 6</b>	<b>Year 7</b>
<b>Total Financing Required</b>							
<b>Project Costs</b>							
<b>Investment Costs</b>	3525.55	7576.1	4790.5	2293.85	0.0	0.0	0.0
<b>Recurrent Costs</b>	1886.95	2411.7	2295.7	1979.45	0.0	0.0	0.0
<b>Total Project Costs</b>	5412.5	9987.8	7086.2	4273.3	0.0	0.0	0.0
<b>Total Financing</b>	5412.5	9987.8	7086.2	4273.3	0.0	0.0	0.0
<b>Financing</b>							
<b>IBRD/IDA</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Government</b>	2594.75	3425	3296.9	2675.15	0.0	0.0	0.0
<b>Central</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Provincial</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>GEF</b>	2438.2	6142.1	3483.1	1336.1	0.0	0.0	0.0
<b>Cofinanciers:</b>							
<b>Beneficiaries</b>	0	19.2	19.2	9.6	0.0	0.0	0.0
<b>BGR</b>	137.5	162.5	162.5	137.5	0.0	0.0	0.0
<b>IAEA</b>	150	150	0	0	0.0	0.0	0.0
<b>BNWPP</b>	12	9	44	35	0.0	0.0	0.0
<b>OAS</b>	80	80	80	80			
<b>Total Project Financing</b>	5412.45	9987.8	7085.7	4273.35	0.0	0.0	0.0

#### **Main assumptions:**

- Contributions by the participating countries are in-kind, taxes foregone and in cash.
- Contribution by the BGR has been officially confirmed in the amount of Euro \$664,000, to be contributed to the project in-kind (i.e. goods, equipment, consultancies). Conservatively, the contribution is included in the project at an estimated US \$600,000. Finalization of the cooperation arrangement with the BGR depends on agreement between the GOP and BGR.
- IAEA has confirmed in-kind contribution (isotope analyses, technical assistance, equipment) of \$300,000 for the first 2 project years. It is expected that another \$300,000 will be made available in a second phase.
- BNWPP contribution will be through technical assistance to the project.
- Pending finalization of a separate Grant Agreement between the Bank and the OAS, the BNPP contribution is not included in this financing plan. It will consist of US\$ 370,000 in financial resources for

a University Capacity Building Fund and has already been approved by the Government of the Netherlands.

- OAS contribution is in-kind, i.e. staff time and use of OAS office facilities during the four years of the project.

## **Annex 6: Procurement and Disbursement Arrangements**

### **LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

#### **Procurement**

##### **Capacity Assessment**

The General Secretariat of the Organization of American States (OAS), as the designated recipient of the Grant funds in representation of the four beneficiary countries, will be the executing entity for the Project and thus responsible for compliance with Bank procurement procedures. Therefore, a capacity assessment was carried out at OAS headquarters in Washington, D.C.

The OAS has the necessary infrastructure and human resources, both in headquarters and in the resident missions in each of the four beneficiary countries, to carry out and manage its procurement in an orderly and well established manner. It would provide support, as needed, in the procurement, legal and financial management areas which would facilitate Project execution. All relevant manuals exist and appear to be applied. OAS has experience in executing Projects financed by various other external sources, some of which call for particular procurement requirements; such is the specific case of an on-going GEF Project in the Caribbean (Adaptation to Global Climate Change).

A small coordinating team will be created as the Guarani Aquifer System General Secretariat (GS), with oversight by the OAS' Environment and Sustainable Development Unit, to carry out day-to-day operations, including procurement, and would be located in one of the beneficiary countries. The General Secretariat will work closely with the four National Technical Coordinators to execute the Project and it would follow the general direction and leadership of the Project Steering Committee (the highest authority to be formed by delegates from the participating countries).

The General Secretariat team will include a coordinator ("General Secretary"), three technical staff, a financial administrator and an assistant. A procurement specialist will be hired for the OAS Headquarters project team. The draft Project Implementation Plan (to be finalized by grant effectiveness) specifies applicable procedures and requirements.

The assessment has been discussed with the Regional Procurement Advisor's Office on October 30, 2001. The risk assessment is AVERAGE as essential actions need to be taken to enable compliance with Bank requirements.

The following actions are recommended:

- (i) Finalization of the Project Implementation Plan (PIP) by Grant effectiveness. The PIP will contain:

- the updated Global Procurement Plan and a specific Plan for the first year of implementation;
- Outline of the Guarani Secretariat team's organization, responsibilities, and its relation to the supervisory Unit and to the OAS.
- With regard to procurement, it will describe document flow, thresholds, methods and steps to be followed for the types of procurement and contracting, thresholds for Bank's prior review, and procedures for planning procurement actions and reporting. Annexes to the PIP will include internal forms and standard Bank documents (for ICB and RFP).

(ii) Selection of a qualified procurement specialist.

## **Procurement Methods**

Methods and thresholds described below are summarized in Table A.

**Goods.** Equipment includes highly specialized computer systems, to be procured through ICB, standard computer equipment, office furniture and other minor items. Contracts estimated at \$150,000 or more would be awarded following ICB procedures; and contracts estimated at US\$80,000 or less would follow national/international shopping, up to an aggregate of US\$150,000.

**Consultant Services.** The Project would finance specialized studies in the areas of hydrology, geology, hydrochemistry and related fields, model development, monitoring system design, inventory performance, social and legal issues, etc. Other technical assistance related to institutional and social and informational aspects, and Project management and evaluation are also included. Large contracts (over \$200,000) would be awarded following internationally advertised competition.

Contracts valued at over \$100,000 would be selected following Quality-Cost based method (QCBS); contracts estimated at less than \$100,000 would follow procedures based on Consultants' Qualifications (CQ) method, up to an aggregate of \$1.3 million.

Individual consultants include long-term contracts for the OAS General Secretariat team and other shorter term technical assistance. Recruitment would be done according to Section V of the Bank Consultants Guidelines. The Project would also finance two staff to support the OAS as Executing Agency of the Project totalling \$312,000 for the duration of the Project.

**Training Services.** The Project includes financing of study tours, staff exchange programs, organization of workshops and seminars etc. This category would cover rents, training materials, food, travel expenses, facilitator fees, etc. To the extent applicable, training services would be awarded through price comparison.

**Matching Grants.** An amount of \$240,000 is included in the Project to finance goods, works and services under demand-driven subprojects geared to conservation and sustainable use of the

Guarani Aquifer System. Subproject beneficiaries would be required to cofinance in cash or kind, in addition to complying with eligibility criteria outlined in the Project Implementation Plan. The average size of individual subprojects is estimated at \$10,000.

Procurement under subprojects would follow commercial practices based on comparison of price quotations. Direct contracting would be allowed in certain cases with prior approval from OAS Project team. These procedures, among others, will be contained in the PIP. OAS would be responsible for ensuring that these requirements are adhered to by the subproject beneficiaries. Goods, works and services under this category do not form part of the aggregate amounts in other categories.

**Operating Costs.** “Recipient’s Operating Expenditures” are defined as expenditures for the reasonable cost of travel for the Recipient’s staff assigned to the Project, per diems, communications and administration of the Project; and

“GAS General Secretariat Operating Expenditures” are defined as expenditures for the reasonable cost of office supplies, utilities, communications, travel and per diem of General Secretariat staff, as well as travel and per diem for members of the Project Steering Committee and the National Project Execution Units. The total amount allocated to these expenditures is \$290,000.

Operating expenses incurred by the OAS in its capacity as the Executing Agency for the project will be reimbursed based on receipts (e.g. travels, per diem) and against predefined outputs in accordance with the agreed Annual Operational Plans for the project.

#### **Procurement methods (Table A)**

**Table A: Project Costs by Procurement Arrangements**  
(US\$ million equivalent)

<b>Expenditure Category</b>	<b>Procurement Method<sup>1</sup></b>				<b>Total Cost</b>
	<b>ICB</b>	<b>NCB</b>	<b>Other<sup>2</sup></b>	<b>N.B.F.</b>	
<b>1. Works</b>	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
<b>2. Goods</b>	0.80 (0.70)	0.00 (0.00)	0.16 (0.15)	3.00 (0.00)	3.96 (0.85)
<b>3. Services</b> <b>Consulting</b>	0.00 (0.00)	0.00 (0.00)	11.70 (10.10)	3.60 (0.00)	15.30 (10.10)
<b>4. Training and Workshops</b>	0.00 (0.00)	0.00 (0.00)	1.70 (1.40)	1.40 (0.00)	3.10 (1.40)
<b>5. Matching Grants</b>	0.00 (0.00)	0.00 (0.00)	0.24 (0.24)	0.05 (0.00)	0.29 (0.24)
<b>6. Operating Costs</b>	0.00 (0.00)	0.00 (0.00)	0.90 (0.80)	3.20 (0.00)	4.10 (0.80)
<b>Total</b>	0.80 (0.70)	0.00 (0.00)	14.70 (12.69)	11.25 (0.00)	26.75 (13.39)

<sup>1/</sup> Figures in parenthesis are the amounts to be financed by the Bank Grant. All costs include contingencies.

<sup>2/</sup> Includes civil works and goods to be procured through shopping, consulting services, services of contracted staff of the project management office, training, technical assistance services, and incremental operating costs related to (i) managing the project, and (ii) re-lending project funds to local government units.

**Table A1: Consultant Selection Arrangements (optional)**  
 (US\$ million equivalent)

Consultant Services Expenditure Category	Selection Method							Total Cost <sup>1</sup>
	QCBS	QBS	SFB	LCS	CQ	Other	N.B.F.	
<b>A. Firms</b>	7.90 (6.60)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	1.30 (1.20)	0.00 (0.00)	3.50 (0.00)	12.70 (7.80)
<b>B. Individuals</b>	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	2.50 (2.20)	0.15 (0.00)	2.65 (2.20)
<b>Total</b>	7.90 (6.60)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	1.30 (1.20)	2.50 (2.20)	3.65 (0.00)	15.35 (10.00)

1\ Including contingencies

Note: QCBS = Quality- and Cost-Based Selection

QBS = Quality-based Selection

SFB = Selection under a Fixed Budget

LCS = Least-Cost Selection

CQ = Selection Based on Consultants' Qualifications

Other = Selection of individual consultants (per Section V of Consultants Guidelines), Commercial Practices, etc.

N.B.F. = Not Bank-financed

Figures in parenthesis are the amounts to be financed by the Bank Grant.

**Prior review thresholds (Table B)**

**Table B: Thresholds for Procurement Methods and Prior Review<sup>1</sup>**

<b>Expenditure Category</b>	<b>Contract Value Threshold (US\$ thousands)</b>	<b>Procurement Method</b>	<b>Contracts Subject to Prior Review (US\$ millions)</b>
<b>1. Works</b>			
<b>2. Goods</b>	>150	ICB	All (0.80)
	<80	Shopping	First contract (0.05)
<b>3. Services: Consultants</b>	>100	QCBS	All (6.40)
	<100	CQ	First contract only (0.06)
<b>Individual Consultants</b>	>50	Section V of Consultants Guidelines	All contracts and those for key staff in GS's team (0.50)
<b>4. Miscellaneous</b>			
<b>5. Miscellaneous</b>			
<b>6. Miscellaneous</b>			

**Total value of contracts subject to prior review:** \$7.81 m.

**Overall Procurement Risk Assessment**

**Average**

**Frequency of procurement supervision missions proposed:** One every 12 months (includes special procurement supervision for post-review/audits)

<sup>1</sup>Thresholds generally differ by country and project. Consult OD 11.04 "Review of Procurement Documentation" and contact the Regional Procurement Adviser for guidance.

## **Disbursement**

### **Allocation of grant proceeds (Table C)**

**Table C: Allocation of Grant Proceeds**

<b>Expenditure Category</b>	<b>Amount in US\$million</b>	<b>Financing Percentage</b>
1. Goods	0.79	100% *
2. Consultant Services	9.70	100%
3. Training and Workshops	1.36	100%
4. Matching Grants	0.24	100% of disbursed amounts
5. Recipient Operating Expenditures	0.29	100% *
6. Guarani Secretariat Operating Expenditures	0.53	100% *
7. Unallocated	0.49	
<b>Total Project Costs</b>	<b>13.40</b>	
<b>Total</b>	<b>13.40</b>	

\* Financing of 100% is based on the fact that the executing agency is not subject to taxation in the beneficiary countries; thus, the respective governments are foregoing the tax income.

Also, it must be noted that the countries' counterpart contribution through parallel financing is substantial, as detailed in Table 2 of the main text. The reason for not cofinancing each payment is to avoid cumbersome administrative dealings that applying counterpart from each of the sources would entail, and to facilitate keeping Grant accounts clearly separate.

### **Use of statements of expenditures (SOEs):**

Disbursements will be made on the basis of traditional Statements of Expenditures (SOEs) and Direct Withdrawal Applications (DWAs). In the case of the latter, disbursements will be made on the basis of full documentation for all expenditures made under contracts requiring prior review by the Bank, and contracts whose value will be raised above the prior review limits as a result of amendments. For all other expenditures, disbursements will be made against SOEs: (a) goods costing less than \$80,000; (b) contracts for consulting firms, including NGOs costing less than \$100,000; (c) contracts for individual consultants costing less than \$50,000; and (d) all expenditures relating to training services, matching grants and operating costs. All consolidated SOEs documentation will be maintained by the OAS for post-review and audit purposes. Reimbursement requests should be sent to the Bank on a monthly basis.

### **Special account:**

A Special Account in US dollars would be opened by the OAS, using its commercial bank - Bank of America. The Authorized Allocation to the Special Account would be up to US\$1,300,000. Monthly replenishment of funds will be made on evidence of satisfactory utilization of the previous advance(s) as evidenced by the documentation submitted in support of disbursement applications. Deposits into the Special Account and its replenishments, up to the Authorized Allocation(s) will be made initially on the basis of Applications for Withdrawals (Form 1903) accompanied with the supporting and other documentation specified in the Disbursement

Handbook.

**Audit:**

An external auditor, acceptable to the Bank, will be contracted by the OAS to carry out an annual financial audit of the project as required by OP/BP 10.02. 1. The company to be hired annually by the OAS for auditing of the General Secretariat of the OAS, will also audit the present Project. For this audit, the separate TOR agreed with the Bank will be applied and a separate audit report will be furnished.

## Annex 7: Project Processing Schedule

### **LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

<b>Project Schedule</b>	<b>Planned</b>	<b>Actual</b>
<b>Time taken to prepare the project (months)</b>	29	30
<b>First Bank mission (identification)</b>	09/20/1999	09/20/1999
<b>Appraisal mission departure</b>	02/10/2002	12/09/2001
<b>Negotiations</b>	03/04/2002	04/11/2002
<b>Planned Date of Effectiveness</b>	09/01/2002	

**Prepared by:**

General Secretariat of the Guarani Aquifer System Project; Argentina: Ministerio de Infraestructura y Vivienda, Subsecretaría de Recursos Hídricos; Brazil: Ministério do Meio Ambiente, Secretaria de Recursos Hídricos; Agência Nacional de Águas; Paraguay: Secretaría del Ambiente, Dirección General de Recursos Hídricos; Uruguay: Ministério de Transportes y Obras Públicas, Dirección Nacional de Hidrografía; Secretariat of the Organization of American States.

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## **Annex 8: Documents in the Project File\***

### **LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

#### **A. Project Implementation Plan**

Draft Project Implementation Plan

Component Implementation Plan(s), Costs, Timetable and Procurement Plan

#### **B. Bank Staff Assessments**

Procurement Assessment

Financial Management Assessment

Project Concept Document and PCD Review Meeting Minutes

Decision Meeting Minutes

First and second PDF Block B Documentation

GEF Project Brief

GEF Concept Note

Back-to-Office Reports and Aide Memoires

#### **C. Other**

### **Documents prepared during PDF B Project Preparation Phase**

#### **I.1 COMPONENT I. Expansion and Consolidation of the Current Knowledge Base on the Guarani Aquifer System**

Survey of all existing technical data:

- FUNPAR, Informe Final de la Consultoría: *Expansión y consolidación de la base actual de conocimiento básico; Estudios Básicos del Acuífero*, February 2001.

Study of the actual and potential uses of the aquifer:

- Jorge de los Santos and Chang Kiang, Informe Final de la Consultoría: *Estudio del uso actual y potencial del Acuífero Guarani*, March 2001.

#### **I.2 COMPONENT II. Joint Development and Implementation of the Guarani Aquifer System Management Framework**

Definition of relevant information for aquifer monitoring network:

- Albert Mente, Informe Final de la Consultoría: *Definición de información relevante para la red de monitoreo del acuífero*, January 2001.

Technical and conceptual design of the information system:

- Noemi Tardivo, Informe Final de la Consultoría: *Sistema integral de información*

*geográfica para la cogestión del agua del Sistema Acuífero Guaraní*, March 2001.

Survey of existing legal-institutional framework:

- Corina Fernández, Informe Final de la Consultoría: *Levantamiento y análisis del Marco jurídico-institucional y aspectos legales en la materia hídrica ambiental de Argentina*, March 2001.
- Cid Tomanik Pompeu, Informe Final de la Consultoría: *Levantamiento y análisis del Marco jurídico-institucional y aspectos legales en la materia hídrica ambiental de Brasil*, March 2001.
- Lauro Ramírez, Informe Final de la Consultoría: *Levantamiento y análisis del Marco jurídico-institucional y aspectos legales en la materia hídrica ambiental de Paraguay*, April 2001.
- Arturo Navarro, Informe Final de la Consultoría: *Levantamiento y análisis del Marco jurídico-institucional y aspectos legales en la materia hídrica ambiental de Uruguay*, February 2001.

Preparation of TOR for a Strategic Action Plan:

- Jorge Rucks, Stephen Foster, Roberto Ronchietto, Luiz Noronha, Eduardo Mestre, Roberto Kirchheim, Griselda Castagnino, Informe Final del PEA : *Programa Estratégico de Acción: Resumen Ejecutivo, Descripción y Términos de Referencia*, March 2001.

Institutional assessment of involved agencies and institutions:

- Luiz Noronha, Informe Final de la Consultoría: *Propuesta de Desarrollo Institucional y de Arreglos Institucionales*, April 2001.

### **I.3 COMPONENT III. Public Participation**

Identification of stakeholders, education and communication needs, and pilot projects for public participation:

- María Elena González Pioli, Informe Final de la Consultoría: *Necesidades de educación ambiental y del agua, comunicación social y proyectos piloto para la participación e involucramiento público*, March 2001.

Definition of mechanisms for communication and public participation in decision making:

- Mario Bernalt, Informe Final de la Consultoría : *Identificación de actores, definición de mecanismos para comunicación y participación pública que se requerirán durante el proceso de ejecución del proyecto*, March 2001.

Indigenous Peoples Participation:

- Esther Prieto, Informe Final de la Consultoría : *Participación e Involucramiento de las Comunidades Indígenas en las actividades de Gestión Sostenible e Integrada, y Protección Ambiental del Sistema Acuífero Guaraní*, Informe Final - Repùblica de Paraguay. Sept.

2001.

- Esther Prieto, Informe Final de la Consultoría : *Participación e Involucramiento de las Comunidades Indígenas en las actividades de Gestión Sostenible e Integrada, y Protección Ambiental del Sistema Acuífero Guarani, Informe Final - República Argentina*. Sept. 2001.
- Juracilda Veiga, *As populações indígenas e as iniciativas de proteção ambiental e manejo sustentável do Sistema Aqüífero Guarani*. July 2001.

#### Project Workshops and Meeting Reports:

- Proceedings of the Seminar on the Guarani Aquifer, Foz do Iguaçu; January 31 – February 1, 2000.
- Reports of the Project Workshops:
  - a. July 12-14, 2000 - Santa Fe, Lanzamiento del Proyecto, implementación de arreglos institucionales y definición de marco Lógico y aspectos técnico-científicos del Programa del PSAG;
  - b. November 28-29, 2000 - Asunción, Revisión de Avances del Proyecto y Reorientaciones de Aspectos Técnicos, Científicos y Legales - Institucionales para apoyar la Preparación del Proyecto;
  - c. March 14-17, 2001 - Montevideo, Propuesta de PEA, incluyendo TORs; definición de Bases de las Componentes 1 y 5 del Documento de Proyecto;
  - d. April 3-4, 2001 - Montevideo, Académicos, Revisión de Componentes 1, 5 y 6 de la Descripción del Proyecto;
  - e. April 23-24, 2001 - Montevideo; Revisión de la Estructura y contenidos de la Descripción del Proyecto;
  - f. May 7-8, 2001 - Asunción; Revisión y contrapropuesta de Arreglos Institucionales; Revisión de las bases de Costos del Proyecto;
  - g. May 28-30, 2001 - Salto; Revisión y Consenso de la Documentación resultante de la Fase de Preparación del Proyecto; para la Protección Ambiental y Desarrollo Sostenible del Sistema Acuífero Guarani

#### **I.4 COMPONENT IV. Project Monitoring and Evaluation, and Dissemination of Project Results**

##### *Project Monitoring and Evaluation Plan*

#### **I.5 COMPONENT V. Development of Management and Mitigation Measures within Identified “Hot Spots”**

Identification of possible pilot areas for implementation of programs and development of TORs for pilot programs:

- Alberto Calcagno, Informe Final de la Consultoría : *identificación de áreas para la*

*ejecución de programas y acciones piloto y definición de términos de referencia*, March 2001.

**I.6     COMPONENT VI. Development of Geothermal Energy Potentials**

- Hydrothermalism. Lars Tallbacka, Informe Final de la Consultoría : *Geothermal Project Component*, June 2001.

**I.7     COMPONENT VII. Project Coordination and Management**

Incremental cost analysis:

- Roberto Ronchietto, Informe Final de la Consultoría : *Análisis de Costos Incrementales del Proyecto*. June 2001.

\*Including electronic files

## Annex 9: Statement of Loans and Credits

### LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project

02-Apr-2002  
Argentina

Project ID	FY	Purpose	Original Amount in US\$ Millions					Difference between expected and actual disbursements*	
			IBRD	IDA	GEF	Cancel.	Undisb.	Orig	Frm Rev'd
P069913	2002	AR Santa Fe Provincial Reform	330.00	0.00	0.00	0.00	176.70	0.00	0.00
P070374	2002	AR PROFAM LIL	5.00	0.00	0.00	0.00	5.00	0.40	0.00
P073591	2002	AR SAL 1	400.00	0.00	0.00	0.00	200.00	200.00	0.00
P057473	2001	AR INDIGENOUS COMMUNITY DEVELOPMENT LIL	5.00	0.00	0.00	0.00	5.00	1.00	0.00
P057459	2001	+R Sustainable Fisheries Magmt (LIL)	5.00	0.00	0.00	0.00	5.00	0.00	0.00
P044447	2001	AR Catamarca Provincial Reform	70.70	0.00	0.00	0.00	44.30	20.00	0.00
P068344	2001	AR Cordoba PRL5	303.00	0.00	0.00	0.00	200.00	100.00	0.00
P064614	2001	AR- Second Secondary Education Project	56.99	0.00	0.00	0.00	54.42	-2.57	0.00
P055482	2000	AR-Pub. Hlth. Surv. & Disease Control	52.50	0.00	0.00	0.00	46.82	33.60	0.00
P057449	1999	AR State Modernization	30.30	0.00	0.00	0.00	24.59	24.59	0.00
P045048	1999	RENEW.ENERGY R.MKTS	0.00	0.00	10.00	0.00	8.38	4.98	0.00
P006043	1999	RENEW.ENERGY R.MKTS	30.00	0.00	0.00	0.00	28.39	12.09	0.00
P006046	1999	WATER SCTR RFRM	30.00	0.00	0.00	0.00	26.98	24.48	3.98
P055461	1999	AR SOC&FISC NTL ID SYS	10.00	0.00	0.00	0.00	3.45	3.45	2.24
P006058	1999	AR-Social Prot.4	90.80	0.00	0.00	0.00	65.22	43.83	0.00
P050714	1998	AR-Secondary Ed. 3	119.00	0.00	0.00	0.00	8.06	8.06	0.00
P006041	1998	SMALL FARMER DV.	75.00	0.00	0.00	0.00	35.19	31.34	31.34
P049269	1998	AR-Social Protec.3	284.00	0.00	0.00	0.00	6.93	6.93	0.00
P050713	1998	AR MODEL COURT DEV.	5.00	0.00	0.00	0.00	3.53	3.53	0.00
P006050	1998	POLLUTION MGT.	18.00	0.00	0.00	6.00	10.76	14.81	1.42
P055935	1998	EL NINO EMERGENCY FLOOD PROJECT	42.00	0.00	0.00	0.00	20.14	20.14	20.14
P039787	1998	GEF AR-BIODIVERSITY CONSERVATION	0.00	0.00	10.10	0.00	7.86	1.15	0.00
P052590	1998	NAT HWY REHAB&MAINT	450.00	0.00	0.00	0.00	161.15	146.28	0.00
P039584	1997	B.A.URB.TSP	200.00	0.00	0.00	0.00	125.89	108.89	20.89
P040808	1997	N.FOREST/PROTC	19.50	0.00	0.00	0.00	11.36	3.36	0.00
P006052	1997	FLOOD PROTECTION	200.00	0.00	0.00	0.00	133.37	130.37	126.37
P006059	1997	AR-Maternal & Child Hlth & Nutrition 2	100.00	0.00	0.00	0.00	49.18	24.18	0.00
P006010	1997	PROV AG DEVT I	125.00	0.00	0.00	0.00	107.77	69.54	37.56
P005980	1997	PROV ROADS	300.00	0.00	0.00	0.00	214.86	200.86	0.00
P043418	1997	AR-AIDS and STD Control	15.00	0.00	0.00	0.00	2.18	2.18	0.00
P046821	1997	AR PENSION TA	20.00	0.00	0.00	0.00	3.64	3.64	-0.74
P006040	1996	FORESTRY/DV	16.00	0.00	0.00	0.00	5.31	4.46	0.00
P006057	1996	AR-SECONDARY ED. 2	115.50	0.00	0.00	0.00	37.10	37.10	0.00
P037049	1996	AR PUB.INV.STRENGTHG	16.00	0.00	0.00	5.50	5.69	11.19	0.00
P034091	1996	AR-Higher Ed. Reform	165.00	0.00	0.00	25.40	29.62	55.02	34.97
P006018	1995	AR PROV DEVT II	225.00	0.00	0.00	0.00	26.75	16.25	0.00
P006060	1995	MUNIC DEVT II	210.00	0.00	0.00	2.92	45.19	19.62	0.00
P005968	1987	SEGBA V	276.00	0.00	0.00	10.46	17.20	27.66	8.65
		Total:	4415.29	0.00	20.10	50.28	1962.97	1412.40	286.83

**LATIN AMERICA**  
**STATEMENT OF IFC's**  
**Held and Disbursed Portfolio**  
**Jan - 2002**  
**In Millions US Dollars**

FY Approval	Company	Committed				Disbursed			
		IFC				IFC			
		Loan	Equity	Quasi	Partic	Loan	Equity	Quasi	Partic
2000	ASF	20.00	0.00	0.00	20.50	20.00	0.00	0.00	20.50
1998	AUTCL	5.22	0.00	0.00	0.00	5.22	0.00	0.00	0.00
1994	Aceitera Chabas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	Aceitera General	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
1960/95/97/99	Acindar	48.61	0.00	0.00	0.00	48.61	0.00	0.00	0.00
1994/95/96	Aguas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1977/84/86/88/94/96	Alpargatas	10.00	0.00	0.00	40.50	10.00	0.00	0.00	40.50
1999	American Plast	8.00	0.00	0.00	0.00	8.00	0.00	0.00	0.00
1993	Arg Equity Inv.	0.00	2.79	0.00	0.00	0.00	2.79	0.00	0.00
2000	Argentina SMMC	34.40	12.50	0.00	0.00	30.96	12.50	0.00	0.00
1989/91/96	BBV Bco. Frances	0.89	0.00	0.00	0.00	0.89	0.00	0.00	0.00
1994/99	BGN	0.00	0.00	33.00	0.00	0.00	0.00	33.00	0.00
2001	BSFE	20.00	0.00	0.00	0.00	5.83	0.00	0.00	0.00
1996/99	Banco Galicia	0.00	0.00	0.00	45.00	0.00	0.00	0.00	45.00
1996	Bansud	2.64	0.00	0.00	0.00	2.64	0.00	0.00	0.00
2000	Bco Hipotecario	25.00	0.00	0.00	102.50	25.00	0.00	0.00	102.50
1996	Brahma - ARG	4.29	0.00	8.50	6.60	4.29	0.00	8.50	6.60
1997	Bunge-Ceval	10.72	0.00	5.00	0.00	10.72	0.00	5.00	0.00
1996	CAPSA	6.55	0.00	5.00	18.00	6.55	0.00	5.00	18.00
1999	CCI	0.00	20.00	6.00	0.00	0.00	20.00	6.00	0.00
1995	CEPA	6.67	0.00	3.00	1.20	6.67	0.00	3.00	1.20
2000	Cefas	10.00	0.00	5.00	0.00	6.00	0.00	5.00	0.00
1999	Correo Argentino	63.00	6.82	5.18	0.00	63.00	6.82	5.18	0.00
1994/95	EDENOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998	F.V. S.A.	9.00	0.00	4.00	0.00	9.00	0.00	4.00	0.00
1998	FAID	0.00	2.75	0.00	0.00	0.00	2.75	0.00	0.00
2000	FAPLAC	10.00	0.00	5.00	0.00	10.00	0.00	5.00	0.00
1992	FEPSA	1.10	0.00	2.00	0.00	1.10	0.00	2.00	0.00
1997	FRIAR	10.00	0.00	2.50	7.00	10.00	0.00	2.50	7.00
1996	Grunbaum	6.00	0.00	2.00	3.33	6.00	0.00	2.00	3.33
1995/97	HSBC Argentina	25.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00
1998	Hospital Privado	9.06	0.00	0.00	0.00	9.06	0.00	0.00	0.00
1992	Huantraico	0.00	17.00	0.00	0.00	0.00	0.00	0.00	0.00
1995/97	Kleppe/Caldero	6.00	0.00	0.00	0.00	6.00	0.00	0.00	0.00
1996	MBA	0.00	0.16	0.00	0.00	0.00	0.16	0.00	0.00
1992/93/96	Malteria Pampa	2.00	0.00	1.00	0.00	2.00	0.00	1.00	0.00
0/97	Milkaut	5.63	0.00	10.00	1.50	5.63	0.00	10.00	1.50
78/81/86/87/91/3/6/8	Minetti	30.00	0.00	14.00	100.00	30.00	0.00	14.00	100.00
1993/94	Molinos	0.00	1.24	0.00	0.00	0.00	1.24	0.00	0.00
1995	Nahuelsat	10.00	5.00	0.00	0.00	10.00	5.00	0.00	0.00
1996/99	Neuquen Basin	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	Nuevo Central	1.25	3.00	0.00	0.00	1.25	3.00	0.00	0.00
1992/95	PAE - Argentine	3.64	0.00	0.00	7.27	3.64	0.00	0.00	7.27
1998	Patagonia	3.30	0.00	1.00	0.00	3.30	0.00	1.00	0.00
Total Portfolio:		587.25	117.41	155.05	591.13	562.64	86.84	155.05	591.13

Approvals Pending Commitment					
FY Approval	Company	Loan	Equity	Quasi	Partic
1999	American Plast	0.00	0.00	0.35	0.00
2000	APSF	0.00	0.00	0.00	9.50
2000	Argentina SMMC	50.00	0.00	37.50	450.00
2001	Edenor SME	20.00	0.00	0.00	0.00
2002	EDET	20.00	15.00	0.00	50.00
2001	Eki	9.50	2.50	0.00	0.00
2001	Gasnor	20.00	0.00	0.00	20.00
2000	Hipotecario USCP	25.00	0.00	0.00	0.00
2001	ITBA	7.00	0.00	0.00	0.00
Total Pending Commitment:		151.50	17.50	37.85	529.50

**Brazil**  
02-Apr-2002

Project ID	FY	Purpose	Original Amount in US\$ Millions						Difference between expected and actual disbursements <sup>a</sup>	
			IBRD	IDA	SF	GEF	Cancel.	Undisb.	Orig	Frm Rev'd
P051696	2002	SÃO PAULO METRO LINE 4 PROJECT	209.00	0.00	0.00	0.00	0.00	209.00	0.00	0.00
P055954	2002	GOIÁS STATE HIGHWAY MANAGEMENT	65.00	0.00	0.00	0.00	0.00	64.35	3.45	0.00
P057665	2002	BR-FAMILY HEALTH EXTENSION PROJECT	68.00	0.00	0.00	0.00	0.00	68.00	0.00	0.00
P060221	2002	FORTALEZA METROPOLITAN TRANSPORT	85.00	0.00	0.00	0.00	0.00	87.88	0.00	0.00
P073192	2002	PROJECT	14.50	0.00	0.00	0.00	0.00	14.46	0.00	0.00
P074085	2002	TA Financial Sector	20.80	0.00	0.00	0.00	0.00	20.80	0.00	0.00
P057649	2001	Sergipe Rural Poverty Reduction	54.35	0.00	0.00	0.00	0.00	51.31	6.33	0.00
P073294	2001	Rural Poverty Reduction Project - BA	8.88	0.00	0.00	0.00	0.00	8.79	2.26	0.00
P050881	2001	BR Fiscal & Fin. Mgmt. TAL	22.50	0.00	0.00	0.00	0.00	22.50	6.00	0.00
P050880	2001	RURAL POVERTY REDUCTION PROJECT - PI	30.10	0.00	0.00	0.00	0.00	28.90	0.80	0.00
P050875	2001	Rural Poverty Reduction Project - PE	37.50	0.00	0.00	0.00	0.00	34.63	4.70	0.00
P050772	2001	Rural Poverty Reduction Project - CE	202.10	0.00	0.00	0.00	0.00	180.93	23.00	0.00
P059566	2001	LAND-BASED POVERTY ALLEVIATION I (SIM)	90.00	0.00	0.00	0.00	0.00	88.24	-1.76	0.00
P059565	2001	BR- CEARA BASIC EDUCATION	69.60	0.00	0.00	0.00	0.00	40.72	-10.18	0.00
P062619	2000	BR- BA BASIC EDU PROJECT (PHASE I)	5.05	0.00	0.00	0.00	0.00	1.32	0.67	-0.68
P039200	2000	INSS REF LIL	43.40	0.00	0.00	0.00	0.00	42.66	11.26	0.00
P047309	2000	ENERGY EFFICIENCY (ELETROBRAS)	0.00	0.00	0.00	15.00	0.00	11.69	2.57	0.00
P039199	2000	BR ENERGY EFFICIENCY (GEF)	30.30	0.00	0.00	0.00	0.00	29.60	-0.70	0.00
P050776	2000	PROSANEAR 2	50.00	0.00	0.00	0.00	0.00	40.40	-9.60	0.00
P006449	2000	NE Microfinance Development	136.00	0.00	0.00	0.00	0.00	124.97	44.44	0.00
P035741	2000	CEARA WTR MGT (PROGERIRH) (SIM)	15.00	0.00	0.00	0.00	0.00	13.37	8.47	6.44
P048869	1999	NATL ENV 2	150.00	0.00	0.00	0.00	0.00	107.67	70.17	0.00
P050763	1999	SALVADOR URBAN TRANS	202.00	0.00	0.00	0.00	0.00	53.33	-21.67	0.00
P058129	1999	BR- Fundescola 2	15.00	0.00	0.00	0.00	0.00	9.18	9.18	9.18
P043874	1999	BR EMER. FIRE PREVENTION (ERL)	100.00	0.00	0.00	0.00	0.00	61.87	61.87	0.00
P054120	1999	BR- DISEASE SURVEILLANCE - VIGISUS	165.00	0.00	0.00	0.00	3.50	49.13	45.13	0.00
P038895	1998	BR- AIDS & STD Control II	198.00	0.00	0.00	0.00	0.00	125.71	113.60	58.71
P038947	1998	FED.WTR MGT	155.00	0.00	0.00	0.00	0.00	123.61	123.61	0.00
P057910	1998	BR- SC. & TECH 3	5.00	0.00	0.00	0.00	0.00	3.06	3.06	-0.54
P051701	1998	BR PENSION REFORM LIL	80.00	0.00	0.00	0.00	0.00	10.37	-1.23	0.00
P043420	1998	MARANHAO R.POVERTY	150.00	0.00	0.00	0.00	0.00	146.99	139.38	120.06
P042565	1998	WATER S.MOD.2	60.00	0.00	0.00	0.00	0.00	28.91	17.11	0.00
P035728	1998	PARAIBA R.POVERTY	51.00	0.00	0.00	0.00	0.00	29.91	27.15	8.42
P006559	1998	BAHIA WTR RESOURCES	45.00	0.00	0.00	0.00	0.00	25.02	25.02	0.00
P006474	1998	(BF-R)SP.TSP	55.00	0.00	0.00	0.00	0.00	52.66	35.26	21.66
P048357	1998	BR LAND MGT 3 (SAO PAULO)	20.00	0.00	0.00	0.00	0.00	0.02	0.02	-7.30
P043421	1998	BRAZIL CEN.BANK TAL	186.00	0.00	0.00	0.00	17.17	138.11	155.28	0.00
P006475	1997	RJ M.TRANSIT PRJ.	90.00	0.00	0.00	0.00	0.00	23.77	23.77	0.00
P046052	1997	LAND RFM PILOT (SIM)	9.60	0.00	0.00	0.00	0.00	2.19	2.19	1.42
P006562	1997	CEARA WATER PILOT (SIM)	100.00	0.00	0.00	0.00	0.00	54.06	54.06	3.37
P038896	1997	BAHIA MUN.DV	24.00	0.00	0.00	0.00	0.00	0.57	0.57	0.00
P034578	1997	R.POVERTY(RGN)	70.00	0.00	0.00	0.00	0.00	53.55	50.55	37.55
P043873	1997	RGS HWY MGT	60.00	0.00	0.00	0.00	0.00	34.15	32.86	19.90
P006532	1997	AG TECH DEV.	300.00	0.00	0.00	0.00	0.00	156.71	156.71	42.93
P043868	1997	FED HWY DECENTR	100.00	0.00	0.00	0.00	0.00	60.38	42.56	16.51
P040028	1996	RGS LAND MGT/POVERTY	350.00	0.00	0.00	0.00	75.00	17.92	92.92	17.92
P006210	1996	RAILWAYS RESTRUCTURG	0.00	0.00	0.00	10.00	0.00	3.17	4.44	5.06
P037828	1996	GEF BR-NAT'L BIODIVERSITY	175.00	0.00	0.00	0.00	0.00	84.50	82.70	58.73
P006554	1996	BR (PR)R.POVERTY	300.00	0.00	0.00	0.00	0.00	110.89	110.89	0.00
P006564	1995	BR- HEALTH SECTOR REFORM - REFORsus	99.00	0.00	0.00	0.00	0.00	18.12	18.12	0.00
P038882	1995	BELO H M.TSP	102.00	0.00	0.00	0.00	0.00	18.99	18.99	0.00
P006436	1995	RECIFE M.TSP	140.00	0.00	0.00	0.00	0.00	21.29	21.29	12.29
P006543	1994	Ceara Urban Development & Water Resource	150.00	0.00	0.00	0.00	0.00	3.71	3.71	0.00
		BR- MINAS GERAIS BASIC EDU.								

Project ID	FY	Purpose	Original Amount in US\$ Millions						Difference between expected and actual disbursements <sup>a</sup>	
			IBRD	IDA	SF	GEF	Cancel.	Undisb.	Orig	Frm Rev'd
P006522	1994	ESP.SANTO WATER	154.00	0.00	0.00	0.00	54.00	13.19	67.19	6.70
P006541	1993	BR WTR Q/PLN(SP/PR/FED)	245.00	0.00	0.00	0.00	5.15	4.16	9.31	2.71
P006505	1992	MATO GROSSO NAT RES	205.00	0.00	0.00	0.00	15.00	12.12	27.12	0.00
P006454	1992	RONDONIA NTRL RES. M	167.00	0.00	0.00	0.00	10.00	10.84	20.84	0.00
		Total:	5,734.68	0.00	0.00	25.00	179.83	2,854.35	1,735.45	441.06

**Brazil**  
**STATEMENT OF IFC's**  
**Held and Disbursed Portfolio**  
**Jan - 2002**  
**In Millions US Dollars**

FY Approval	Company	Committed				Disbursed			
		IFC				IFC			
		Loan	Equity	Quasi	Partic	Loan	Equity	Quasi	Partic
1997	Guilman-Amorim	25.78	0.00	0.00	57.47	25.78	0.00	0.00	57.47
1998	Icatu Equity	0.00	20.00	0.00	0.00	0.00	12.14	0.00	0.00
1999	Innova SA	20.00	5.00	0.00	60.00	20.00	5.00	0.00	60.00
1980/87/97	Ipiranga	29.33	0.00	0.00	57.27	29.33	0.00	0.00	57.27
1999	Itaberaba	0.00	5.34	0.00	0.00	0.00	5.34	0.00	0.00
1999	JOSAPAR	8.00	0.00	7.00	0.00	3.00	0.00	7.00	0.00
1995	LATASA - Brazil	1.33	0.00	5.00	0.00	1.33	0.00	5.00	0.00
1995	Lojas Americana	14.00	0.00	5.00	2.00	14.00	0.00	5.00	2.00
1987/92/96/99	MBR	20.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00
0	Macedo Nordeste	6.33	0.00	5.00	0.00	6.33	0.00	5.00	0.00
1996	Mallory	4.36	0.00	0.00	0.00	4.36	0.00	0.00	0.00
1975/96	Oxiteno NE	10.00	5.00	0.00	0.00	10.00	0.00	0.00	0.00
1994	Para Pigmentos	21.50	0.00	9.00	12.32	21.50	0.00	9.00	12.32
1987/96	Perdigao	15.31	0.00	0.00	2.00	15.31	0.00	0.00	2.00
1989/95	Politeno Ind.	5.85	0.00	0.00	0.00	5.85	0.00	0.00	0.00
1994/00/02	Portobello	0.00	1.15	0.00	0.00	0.00	1.15	0.00	0.00
2000	Puras	4.67	0.00	0.00	0.00	4.67	0.00	0.00	0.00
1998	Randon	6.53	0.00	3.00	0.00	6.53	0.00	3.00	0.00
1991	Rhodia-Ster	0.00	5.95	0.00	0.00	0.00	5.95	0.00	0.00
1995	Rhodiaco/PTA	7.50	0.00	0.00	3.00	7.50	0.00	0.00	3.00
1990	Ripasa	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00
1997	Rodovia	27.22	0.00	0.00	47.70	27.22	0.00	0.00	47.70
	S.A.I.C.C.	0.00	2.85	0.00	0.00	0.00	2.85	0.00	0.00
1994/96	SP Alpargatas	16.67	0.00	5.00	0.00	16.67	0.00	5.00	0.00
1987/97	Sadia	20.50	0.00	6.83	109.33	20.50	0.00	6.83	109.33
1994/95/97	Samarco	11.70	0.00	0.00	6.67	11.70	0.00	0.00	6.67
1997	Samaritano	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	Saraiva	10.38	3.00	0.00	0.00	10.38	3.00	0.00	0.00
1998	Seara Alimentos	0.00	3.88	0.00	0.00	0.00	3.88	0.00	0.00
0	Sepebita	32.00	0.00	0.00	8.00	17.00	0.00	0.00	8.00
2001	Sucorrico	7.50	0.00	0.00	0.00	7.50	0.00	0.00	0.00
1997	Synteko	18.00	0.00	0.00	0.00	18.00	0.00	0.00	0.00
2001	TIGRE	13.46	0.00	5.00	6.41	13.46	0.00	5.00	6.41
1996	TRIKEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992/93	Tecon Rio Grande	6.65	0.00	5.50	14.84	6.65	0.00	5.50	14.84
1998	Tecon Salvador	3.50	1.00	0.00	5.00	3.50	0.77	0.00	5.00
2001	Votorantim	1.43	0.00	0.00	0.00	1.43	0.00	0.00	0.00
1993	Vulcabras	16.68	0.00	0.00	0.00	16.68	0.00	0.00	0.00
1999	Wembley	0.00	10.00	0.00	0.00	0.00	10.00	0.00	0.00
1997	Wiest	0.00	0.00	8.00	0.00	0.00	0.00	8.00	0.00
1999	AG Concession	0.00	15.00	15.00	0.00	0.00	0.00	0.00	0.00
2001	Algar Telecom	0.00	8.17	0.00	0.00	0.00	8.17	0.00	0.00
1996/97	Apolo	8.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00
2001	Arteb	20.00	7.00	0.00	18.33	20.00	7.00	0.00	18.33
1998									
	Total Portfolio:	731.43	159.78	133.83	649.28	657.65	131.34	115.53	644.16

FY Approval	Company	Approvals Pending Commitment			
		Loan	Equity	Quasi	Partic
2002	Banco Itau	0.00	0.00	0.00	100.00
2000	BBA	10.00	0.00	0.00	50.00
2001	Brad Templeton	0.00	0.00	20.00	0.00
2001	Cataguazes	45.00	0.00	0.00	40.00
1999	Cibrasec	0.00	0.00	7.50	0.00
2001	Satipel	15.00	15.00	0.00	0.00
2002	Unibanco-CL	0.00	0.00	0.00	150.00
2001	Unisul	15.00	0.00	0.00	0.00
2002	Univali	10.00	0.00	0.00	0.00
Total Pending Commitment:		95.00	15.00	27.50	340.00

**Paraguay**  
02-Apr-2002

Project ID	FY	Purpose	Original Amount in US\$ Millions						Difference between expected and actual disbursements <sup>a</sup>	
			IBRD	IDA	SF	GEF	Cancel.	Undisb.	Orig	Frm Rev'd
P069269	2002	PY Pilot Community Development Project	9.00	0.00	0.00	0.00	0.00	9.00	0.00	0.00
P039983	1998	4th RURAL WATER SUPPLY & SANITATION	40.00	0.00	0.00	0.00	0.00	32.76	25.80	21.22
P007927	1997	PY-M.HLTH/CHD.DV.	21.80	0.00	0.00	0.00	0.00	7.41	5.30	1.47
P007926	1995	ASUNCION SEWERAGE	46.50	0.00	0.00	0.00	15.00	10.12	23.88	0.00
P007918	1994	NTL RES MGMT I	50.00	0.00	0.00	0.00	0.00	21.22	20.71	15.32
		Total:	167.30	0.00	0.00	0.00	15.00	80.51	75.69	38.01

Paraguay  
STATEMENT OF IFC's  
Held and Disbursed Portfolio  
Jan - 2002  
In Millions US Dollars

FY Approval	Company	Committed				Disbursed			
		IFC		IFC		Loan		Equity	
		Loan	Equity	Quasi	Partic	Loan	Equity	Quasi	Partic
	Total Portfolio:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Approvals Pending Commitment									
FY Approval	Company	Loan	Equity	Quasi	Partic				
	Total Pending Commitment:	0.00	0.00	0.00	0.00				

**Uruguay**  
02-Apr-2002

Project ID	FY	Purpose	Original Amount in US\$ Millions						Difference between expected and actual disbursements <sup>a</sup>	
			IBRD	IDA	SF	GEF	Cancel.	Undisb.	Orig	Frm Rev'd
P074543	2002	FOOT & MOUTH DISEASE - ERL	18.50	0.00	0.00	0.00	0.00	11.07	-7.43	0.00
P070058	2001	PUBLIC SERVICES MODERNIZATION TA	6.00	0.00	0.00	0.00	0.00	5.79	0.19	0.00
P063383	2000	APL OSE MOD&REHAB.	27.00	0.00	0.00	0.00	0.00	24.73	-2.27	0.00
P049267	1999	TRANSPORT II	64.50	0.00	0.00	0.00	0.00	1.79	0.14	0.00
P041994	1999	UY-BASIC ED2	28.00	0.00	0.00	0.00	0.00	7.85	5.30	0.00
P039203	1997	FOREST PROD.TSP	76.00	0.00	0.00	0.00	5.00	43.73	48.73	0.00
P008177	1996	POWER TRNMSN & DISTR	125.00	0.00	0.00	0.00	0.00	68.24	67.34	0.00
P008161	1995	UY-HEALTH SECTOR DEVELOPMENT	15.60	0.00	0.00	0.00	5.00	2.25	7.25	2.25
P008173	1994	IRRG NAT RES MGMT	41.00	0.00	0.00	0.00	0.00	0.08	0.08	-0.76
Total:			401.60	0.00	0.00	0.00	10.00	165.53	119.33	1.49

**Uruguay**  
STATEMENT OF IFC's  
Held and Disbursed Portfolio  
Jan - 2002  
In Millions US Dollars

FY Approval	Company	Committed				Disbursed			
		IFC				IFC			
		Loan	Equity	Quasi	Partic	Loan	Equity	Quasi	Partic
1985/92	Azucitrus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2001	Banco Montevideo	0.00	9.00	9.00	0.00	0.00	9.00	9.00	0.00
1995	Consorcio Aerop.	1.87	0.00	4.00	2.73	1.87	0.00	4.00	2.73
1991	Granja Moro	1.78	0.75	0.00	0.00	1.78	0.75	0.00	0.00
1980/88/96	Surinvest	0.00	0.00	1.93	0.00	0.00	0.00	1.93	0.00
2001	UMontevideo	5.00	0.00	0.00	0.00	3.30	0.00	0.00	0.00
Total Portfolio:		8.65	9.75	14.93	2.73	6.95	9.75	14.93	2.73

FY Approval	Company	Approvals Pending Commitment			
		Loan	Equity	Quasi	Partic
Total Pending Commitment:		0.00	0.00	0.00	0.00

## Annex 10: Country at a Glance

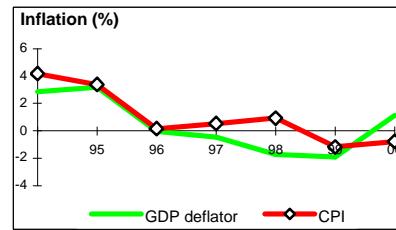
### LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project

#### Argentina

POVERTY and SOCIAL	Argentina	Latin America & Carib.	Upper-middle-income	
<b>2000</b>				
Population, mid-year ( <i>millions</i> )	37.0	516	647	
GNI per capita ( <i>Atlas method, US\$</i> )	7,470	3,680	4,620	
GNI ( <i>Atlas method, US\$ billions</i> )	276.5	1,895	2,986	
<b>Average annual growth, 1994-00</b>				
Population (%)	1.3	1.6	1.3	
Labor force (%)	2.1	2.3	2.0	
<b>Most recent estimate (latest year available, 1994-00)</b>				
Poverty (% of population below national poverty line)	..	..	..	
Urban population (% of total population)	90	75	76	
Life expectancy at birth (years)	74	70	69	
Infant mortality (per 1,000 live births)	18	30	28	
Child malnutrition (% of children under 5)	2	9	..	
Access to an improved water source (% of population)	79	85	87	
Illiteracy (% of population age 15+)	3	12	10	
Gross primary enrollment (% of school-age population)	111	113	107	
Male	111	..	106	
Female	111	..	105	
<b>KEY ECONOMIC RATIOS and LONG-TERM TRENDS</b>			100.0	
	1980	1990	1999	2000
GDP ( <i>US\$ billions</i> )	77.0	141.4	283.3	285.0
Gross domestic investment/GDP	25.3	14.0	17.9	15.9
Exports of goods and services/GDP	5.1	10.4	9.8	10.8
Gross domestic savings/GDP	23.8	19.7	16.2	15.3
Gross national savings/GDP	22.8	15.4	13.7	12.7
Current account balance/GDP	-6.4	1.2	-4.2	-3.1
Interest payments/GDP	1.7	1.6	3.0	3.5
Total debt/GDP	35.3	44.0	51.5	51.4
Total debt service/exports	37.3	41.0	100.2	85.5
Present value of debt/GDP	..	..	54.5	..
Present value of debt/exports	..	..	455.3	..
	1980-90	1990-00	1999	2000
(average annual growth)				
GDP	-0.7	4.3	-3.4	-0.5
GDP per capita	-2.1	3.0	-4.6	-1.7
Exports of goods and services	3.8	8.6	-1.4	2.0
	1980-90	1990-00	1999	2000
(average annual growth)				
GDP	-0.7	4.3	-3.4	-0.5
GDP per capita	-2.1	3.0	-4.6	-1.7
Exports of goods and services	3.8	8.6	-1.4	2.0
	1980-90	1990-00	1999	2000
(average annual growth)				
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(average annual growth)				
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(average annual growth)				
GDP	-0.7	4.3	-3.4	-0.5
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(average annual growth)				
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(average annual growth)				
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(average annual growth)				
GDP	-0.7	4.3	-3.4	-0.5
GDP per capita	-2.1	3.0	-4.6	-1.7
Exports of goods and services	3.8	8.6	-1.4	2.0
	1980-90	1990-00	1999	2000
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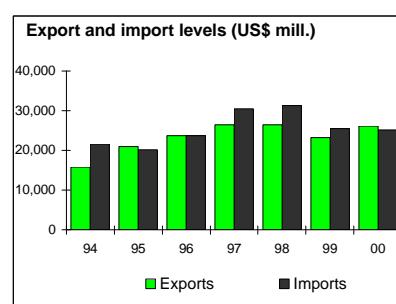
**PRICES and GOVERNMENT FINANCE**

	1980	1990	1999	2000
<b>Domestic prices</b>				
(% change)				
Consumer prices	100.8	2,314.0	-1.2	-0.8
Implicit GDP deflator	90.8	2,076.8	-1.9	1.1
<b>Government finance</b>				
(% of GDP, includes current grants)				
Current revenue	8.1	14.4	19.7	19.7
Current budget balance	3.1	-1.5	-1.5	-1.5
Overall surplus/deficit	-2.5	-2.5	-2.6	-2.4



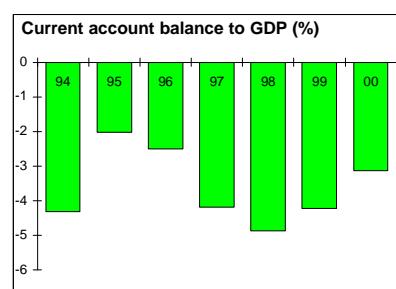
**TRADE**

	1980	1990	1999	2000
(US\$ millions)				
Total exports (fob)	..	12,488	23,315	26,244
Food	..	1,374	2,063	2,322
Meat	..	873	829	933
Manufactures	..	3,364	6,952	7,825
Total imports (cif)	..	4,197	25,538	25,157
Food	..	..	..	..
Fuel and energy	..	423	730	719
Capital goods	..	1,338	11,902	11,724
Export price index (1995=100)	..	..	80	88
Import price index (1995=100)	..	..	85	83
Terms of trade (1995=100)	..	..	94	106



**BALANCE of PAYMENTS**

	1980	1990	1999	2000
(US\$ millions)				
Exports of goods and services	9,893	14,727	27,836	31,005
Imports of goods and services	13,081	6,954	32,687	32,685
Resource balance	-3,188	7,773	-4,851	-1,679
Net income	-1,609	-6,203	-7,473	-7,517
Net current transfers	-101	71	379	287
Current account balance	-4,898	1,641	-11,945	-8,909
Financing items (net)	6,776	1,352	13,146	8,470
Changes in net reserves	-1,878	-2,993	-1,201	439

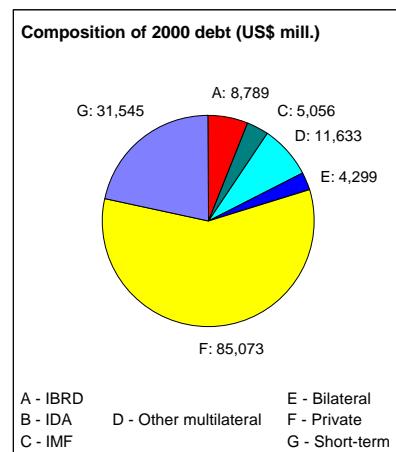


**Memo:**

Reserves including gold (US\$ millions)	..	10,814	27,831	26,465
Conversion rate (DEC, local/US\$)	4.99E-08	0.5	1.0	1.0

**EXTERNAL DEBT and RESOURCE FLOWS**

	1980	1990	1999	2000
(US\$ millions)				
Total debt outstanding and disbursed	27,157	62,232	145,994	146,395
IBRD	404	2,609	8,596	8,789
IDA	0	0	0	0
Total debt service	4,182	6,158	27,900	26,500
IBRD	71	414	982	1,239
IDA	0	0	0	0
Composition of net resource flows				
Official grants	2	21	6	6
Official creditors	58	456	1,538	1,957
Private creditors	6,038	-974	3,478	-4,204
Foreign direct investment	678	1,836	8,236	10,696
Portfolio equity	0	13	-112	15
World Bank program				
Commitments	27	0	132	441
Disbursements	71	405	1,573	1,020
Principal repayments	34	233	445	538
Net flows	37	172	1,128	482
Interest payments	37	182	537	701
Net transfers	0	-10	591	-219



## Brazil

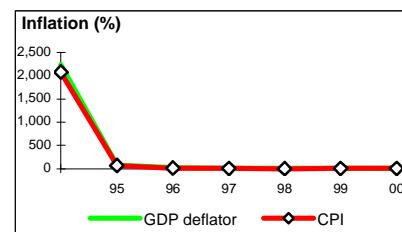
POVERTY and SOCIAL	Brazil	Latin America & Carib.	Upper-middle-income	Development diamond*	
<b>2000</b>					
Population, mid-year ( <i>millions</i> )	170.1	516	647		
GNI per capita ( <i>Atlas method, US\$</i> )	3,590	3,680	4,620		
GNI ( <i>Atlas method, US\$ billions</i> )	610.1	1,895	2,986		
<b>Average annual growth, 1994-00</b>					
Population (%)	1.3	1.6	1.3		
Labor force (%)	1.9	2.3	2.0		
<b>Most recent estimate (latest year available, 1994-00)</b>					
Poverty (% of population below national poverty line)	22	..	..		
Urban population (% of total population)	81	75	76		
Life expectancy at birth (years)	67	70	69		
Infant mortality (per 1,000 live births)	32	30	28		
Child malnutrition (% of children under 5)	6	9	..		
Access to an improved water source (% of population)	87	85	87		
Illiteracy (% of population age 15+)	15	12	10		
Gross primary enrollment (% of school-age population)	125	113	107		
Male	..	..	106		
Female	..	..	105		
<b>KEY ECONOMIC RATIOS and LONG-TERM TRENDS</b>				Economic ratios*	
	<b>1980</b>	<b>1990</b>	<b>1999</b>	<b>2000</b>	
GDP ( <i>US\$ billions</i> )	235.0	465.0	529.4	595.5	
Gross domestic investment/GDP	23.3	20.2	20.4	20.5	
Exports of goods and services/GDP	9.1	8.2	10.6	10.9	
Gross domestic savings/GDP	21.1	21.4	19.3	19.3	
Gross national savings/GDP	17.8	18.9	16.1	..	
Current account balance/GDP	-5.5	-0.8	-4.8	-4.1	
Interest payments/GDP	2.7	0.4	2.5	2.5	
Total debt/GDP	30.4	25.8	45.6	39.7	
Total debt service/exports	63.4	22.5	112.3	77.9	
Present value of debt/GDP	..	..	45.9	..	
Present value of debt/exports	..	..	403.7	..	
	<b>1980-90</b>	<b>1990-00</b>	<b>1999</b>	<b>2000</b>	<b>2000-04</b>
(average annual growth)					
GDP	2.7	2.9	0.8	4.5	3.6
GDP per capita	0.8	1.5	-0.5	3.2	2.3
Exports of goods and services	7.5	5.5	12.0	11.0	13.0
<b>STRUCTURE of the ECONOMY</b>				Growth of investment and GDP (%)	
	<b>1980</b>	<b>1990</b>	<b>1999</b>	<b>2000</b>	
(% of GDP)					
Agriculture	11.0	8.1	7.2	7.4	
Industry	43.8	38.7	27.5	28.6	
Manufacturing	33.5	..	23.1	24.0	
Services	45.2	53.2	65.3	64.0	
Private consumption	69.7	59.3	61.8	62.5	
General government consumption	9.2	19.3	18.9	18.2	
Imports of goods and services	11.3	7.0	11.7	12.1	
	<b>1980-90</b>	<b>1990-00</b>	<b>1999</b>	<b>2000</b>	<b>2000-04</b>
(average annual growth)					
Agriculture	2.8	3.2	7.4	3.0	
Industry	2.0	2.6	-1.6	5.0	
Manufacturing	1.6	2.1	-0.7	..	
Services	3.3	3.0	1.3	3.9	
Private consumption	1.2	5.7	6.1	9.9	
General government consumption	7.3	-1.7	-9.3	-5.4	
Gross domestic investment	3.3	3.4	-3.0	5.0	
Imports of goods and services	0.5	11.9	-14.8	13.8	

Note: 2000 data are preliminary estimates.

\* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

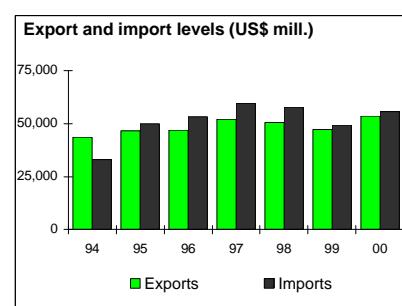
**PRICES and GOVERNMENT FINANCE**

	1980	1990	1999	2000
<b>Domestic prices</b>				
(% change)				
Consumer prices	..	2,947.7	8.9	6.0
Implicit GDP deflator	87.3	2,509.5	4.3	8.5
<b>Government finance</b>				
(% of GDP, includes current grants)				
Current revenue	..	..	19.5	20.0
Current budget balance	..	..	0.4	1.0
Overall surplus/deficit	..	..	-6.8	-3.2



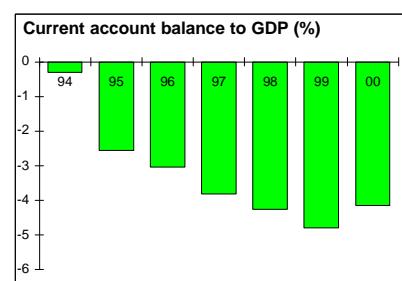
**TRADE**

	1980	1990	1999	2000
(US\$ millions)				
Total exports (fob)	..	31,414	47,140	53,589
Coffee	..	2,656	2,746	3,048
Soybeans	..	2,854	1,593	2,188
Manufactures	..	19,624	35,312	41,027
Total imports (cif)	..	20,661	49,275	55,800
Food	..	1,379	1,655	1,507
Fuel and energy	..	4,354	4,258	6,362
Capital goods	..	5,932	13,570	13,593
Export price index (1995=100)	80	81	91	97
Import price index (1995=100)	65	74	113	118
Terms of trade (1995=100)	123	109	80	82



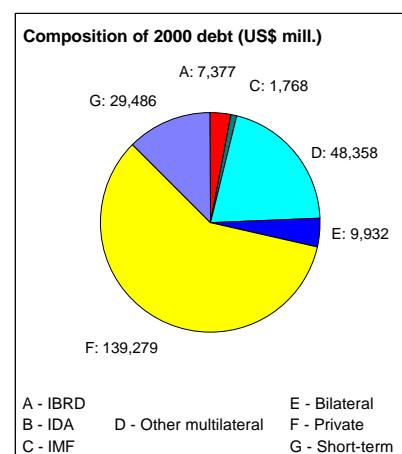
**BALANCE of PAYMENTS**

	1980	1990	1999	2000
(US\$ millions)				
Exports of goods and services	21,857	34,615	55,205	64,470
Imports of goods and services	27,788	26,708	63,443	72,741
Resource balance	-5,931	7,907	-8,238	-8,271
Net income	-7,044	-12,523	-18,848	-17,886
Net current transfers	42	834	1,689	1,521
Current account balance	-12,933	-3,782	-25,397	-24,636
Financing items (net)	8,990	-5,043	13,634	33,815
Changes in net reserves	3,943	8,825	11,763	-9,179
<b>Memo:</b>				
Reserves including gold (US\$ millions)	5,853	9,175	35,725	33,011
Conversion rate (DEC, local/US\$)	1.92E-11	2.48E-5	1.8	1.8



**EXTERNAL DEBT and RESOURCE FLOWS**

	1980	1990	1999	2000
(US\$ millions)				
Total debt outstanding and disbursed	71,520	119,877	241,468	236,200
IBRD	2,035	8,427	6,822	7,377
IDA	0	0	0	0
Total debt service	14,757	8,168	67,522	53,200
IBRD	275	1,975	1,381	1,351
IDA	0	0	0	0
Composition of net resource flows				
Official grants	14	41	62	..
Official creditors	825	-633	660	-2,037
Private creditors	3,745	-427	-11,828	-32,675
Foreign direct investment	1,911	989	32,659	..
Portfolio equity	0	0	1,961	..
World Bank program				
Commitments	820	905	1,863	1,593
Disbursements	343	788	1,533	1,692
Principal repayments	98	1,251	952	887
Net flows	245	-463	580	805
Interest payments	177	725	428	464
Net transfers	68	-1,187	152	341



## Paraguay

POVERTY and SOCIAL		Paraguay	Latin America & Carib.	Lower-middle-income	Development diamond*	
<b>2000</b>						
Population, mid-year ( <i>millions</i> )		5.5	516	2,046		
GNI per capita ( <i>Atlas method, US\$</i> )		1,440	3,680	1,140		
GNI ( <i>Atlas method, US\$ billions</i> )		7.9	1,895	2,327		
<b>Average annual growth, 1994-00</b>						
Population (%)		2.6	1.6	1.0		
Labor force (%)		3.1	2.3	1.3		
<b>Most recent estimate (latest year available, 1994-00)</b>						
Poverty (% of population below national poverty line)		..	..	..		
Urban population (% of total population)		56	75	42		
Life expectancy at birth (years)		70	70	69		
Infant mortality (per 1,000 live births)		24	30	32		
Child malnutrition (% of children under 5)		..	9	11		
Access to an improved water source (% of population)		79	85	80		
Illiteracy (% of population age 15+)		7	12	15		
Gross primary enrollment (% of school-age population)		111	113	114		
Male		112	..	116		
Female		109	..	114		
<b>KEY ECONOMIC RATIOS and LONG-TERM TRENDS</b>						
	1980	1990	1999	2000	Economic ratios*	
GDP ( <i>US\$ billions</i> )	4.6	5.3	7.7	7.5		
Gross domestic investment/GDP	31.7	22.9	23.0	22.1		
Exports of goods and services/GDP	15.3	33.2	23.0	20.4		
Gross domestic savings/GDP	18.3	16.6	9.3	7.0		
Gross national savings/GDP	19.2	19.7	11.9	9.8		
Current account balance/GDP	-13.5	7.4	-0.8	-4.0		
Interest payments/GDP	0.8	1.5	0.9	1.0		
Total debt/GDP	20.1	40.0	32.5	36.2		
Total debt service/exports	17.0	12.2	6.4	8.0		
Present value of debt/GDP	..	..	31.0	..		
Present value of debt/exports	..	..	65.7	..		
	1980-90	1990-00	1999	2000	2000-04	
(average annual growth)						
GDP	2.5	2.2	0.5	-0.3	GDP	
GDP per capita	-0.6	-0.4	-2.1	-2.8	GDI	
Exports of goods and services	11.5	-0.6	-16.9	-39.9	Imports	
<b>STRUCTURE of the ECONOMY</b>					Growth of investment and GDP (%)	
	1980	1990	1999	2000		
(% of GDP)						
Agriculture	28.6	27.8	21.9	20.6		
Industry	27.4	25.2	26.0	27.6		
Manufacturing	16.0	16.8	13.6	14.4		
Services	43.9	47.0	52.1	51.8		
Private consumption	75.7	77.2	81.9	82.7		
General government consumption	6.0	6.2	8.8	10.3		
Imports of goods and services	28.7	39.5	36.7	35.5		
	1980-90	1990-00	1999	2000	Growth of exports and imports (%)	
(average annual growth)						
Agriculture	3.6	6.6	0.5	-0.3		
Industry	0.3	3.1	0.9	5.3		
Manufacturing	4.0	0.6	-4.4	5.7		
Services	3.1	-2.2	-2.9	0.5		
Private consumption	2.4	3.6	-4.6	3.5		
General government consumption	1.5	6.4	4.2	4.5		
Gross domestic investment	-0.8	0.2	-3.9	-4.3		
Imports of goods and services	4.4	3.2	-26.7	-12.3		

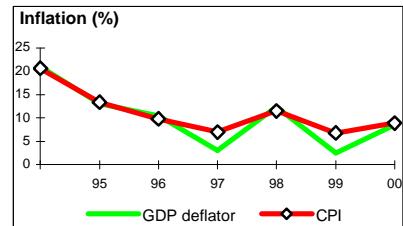
Note: 2000 data are preliminary estimates.

\* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

## Paraguay

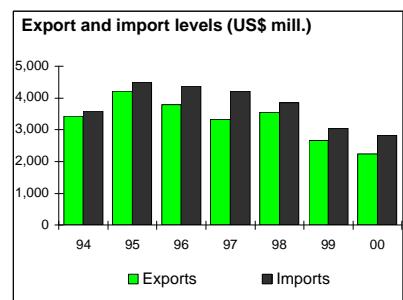
### PRICES and GOVERNMENT FINANCE

	1980	1990	1999	2000
<b>Domestic prices</b>				
(% change)				
Consumer prices	..	38.2	6.8	8.9
Implicit GDP deflator	16.7	36.3	2.5	8.5
<b>Government finance</b>				
(% of GDP, includes current grants)				
Current revenue	..	12.2	16.8	16.2
Current budget balance	..	3.5	2.1	0.2
Overall surplus/deficit	..	2.9	-3.6	-4.6



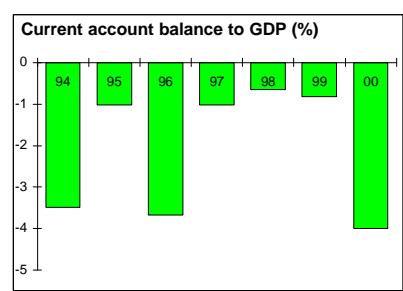
### TRADE

	1980	1990	1999	2000
(US\$ millions)				
Total exports (fob)	..	1,366	2,673	2,251
Soy products	..	267	307	286
Cotton	..	333	62	78
Manufactures	..	408	1,933	1,380
Total imports (cif)	..	1,636	3,042	2,837
Food	..	442	1,061	989
Fuel and energy	..	146	186	173
Capital goods	..	569	505	471
Export price index (1995=100)	..	..	..	..
Import price index (1995=100)	..	..	..	..
Terms of trade (1995=100)	..	..	..	..



### BALANCE of PAYMENTS

	1980	1990	1999	2000
(US\$ millions)				
Exports of goods and services	701	2,514	3,267	2,801
Imports of goods and services	1,314	2,169	3,533	3,307
Resource balance	-613	345	-266	-506
Net income	-4	2	31	32
Net current transfers	0	43	171	175
Current account balance	-618	390	-64	-299
Financing items (net)	769	-170	180	101
Changes in net reserves	-151	-220	-117	198

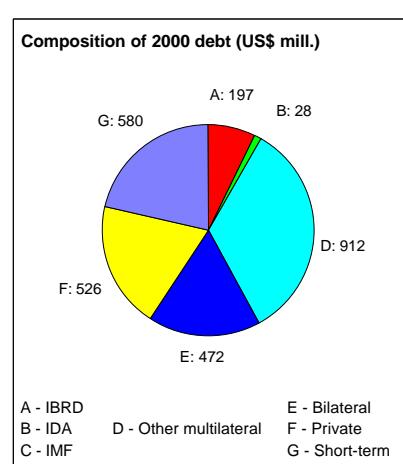


### Memo:

Reserves including gold (US\$ millions)	..	675	996	797
Conversion rate (DEC, local/US\$)	126.0	1,229.8	3,119.1	3,486.4

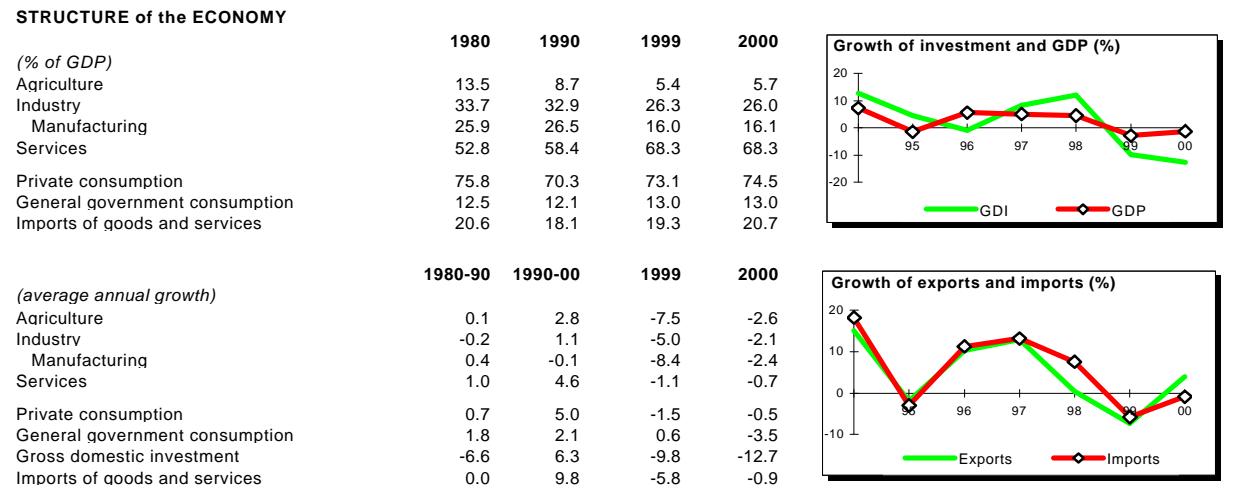
### EXTERNAL DEBT and RESOURCE FLOWS

	1980	1990	1999	2000
(US\$ millions)				
Total debt outstanding and disbursed	921	2,105	2,514	2,715
IBRD	80	279	182	197
IDA	45	41	30	28
Total debt service	133	325	233	254
IBRD	7	65	32	29
IDA	1	1	2	2
Composition of net resource flows				
Official grants	10	7	0	0
Official creditors	38	-149	42	89
Private creditors	94	-9	94	-18
Foreign direct investment	32	77	66	95
Portfolio equity	0	0	-21	3
World Bank program				
Commitments	31	0	0	0
Disbursements	33	16	42	47
Principal repayments	2	41	25	20
Net flows	31	-25	18	26
Interest payments	6	25	10	11
Net transfers	25	-50	8	16



## Uruguay

POVERTY and SOCIAL	Uruguay	Latin America & Carib.	Upper-middle-income		
<b>2000</b>					
Population, mid-year ( <i>millions</i> )	3.3	516	647		
GNI per capita ( <i>Atlas method, US\$</i> )	6,000	3,680	4,620		
GNI ( <i>Atlas method, US\$ billions</i> )	20.0	1,895	2,986		
<b>Average annual growth, 1994-00</b>					
Population (%)	0.7	1.6	1.3		
Labor force (%)	1.2	2.3	2.0		
<b>Most recent estimate (latest year available, 1994-00)</b>					
Poverty (% of population below national poverty line)	..	..	..		
Urban population (% of total population)	91	75	76		
Life expectancy at birth (years)	74	70	69		
Infant mortality (per 1,000 live births)	15	30	28		
Child malnutrition (% of children under 5)	..	9	..		
Access to an improved water source (% of population)	98	85	87		
Illiteracy (% of population age 15+)	2	12	10		
Gross primary enrollment (% of school-age population)	109	113	107		
Male	109	..	106		
Female	108	..	105		
<b>KEY ECONOMIC RATIOS and LONG-TERM TRENDS</b>					
	1980	1990	1999	2000	
GDP ( <i>US\$ billions</i> )	10.1	9.3	20.7	19.7	
Gross domestic investment/GDP	17.3	12.2	15.1	13.9	
Exports of goods and services/GDP	15.0	23.5	18.0	19.3	
Gross domestic savings/GDP	11.7	17.6	13.9	12.5	
Gross national savings/GDP	8.1	14.0	12.4	10.8	
Current account balance/GDP	-7.0	1.8	-2.8	-2.4	
Interest payments/GDP	1.2	3.4	1.8	2.1	
Total debt/GDP	16.4	47.5	36.0	44.6	
Total debt service/exports	18.8	40.8	25.3	30.2	
Present value of debt/GDP	..	..	36.3	..	
Present value of debt/exports	..	..	179.7	..	
	1980-90	1990-00	1999	2000	2000-04
(average annual growth)					
GDP	0.5	3.4	-2.8	-1.3	2.6
GDP per capita	-0.1	2.6	-3.6	-2.0	2.1
Exports of goods and services	3.9	5.9	-7.4	4.0	4.6



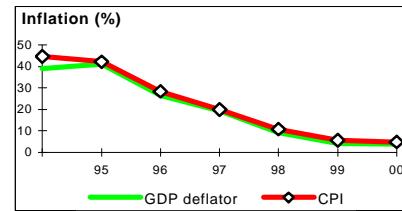
Note: 2000 data are preliminary estimates.

\* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

## Uruguay

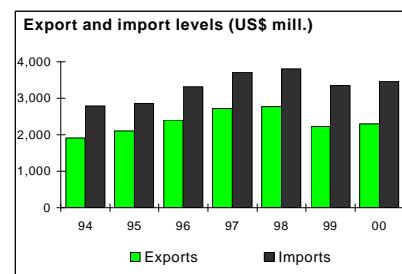
### PRICES and GOVERNMENT FINANCE

	1980	1990	1999	2000
<b>Domestic prices</b> (% change)				
Consumer prices	..	111.4	5.6	4.8
Implicit GDP deflator	54.8	106.8	4.2	3.6



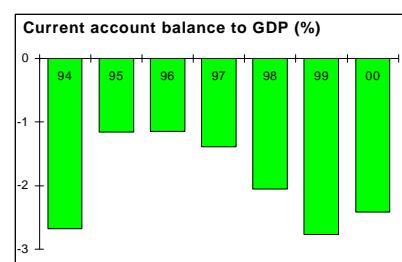
### TRADE

	1980	1990	1999	2000
(US\$ millions)				
Total exports (fob)	..	1,693	2,237	2,295
Meat	..	422	673	700
Vegetables	..	192	354	255
Manufactures	..	837	981	1,061
Total imports (cif)	..	1,343	3,357	3,466
Food	..	95	306	316
Fuel and energy	..	219	490	462
Capital goods	..	393	1,050	973
Export price index (1995=100)	..	105	88	90
Import price index (1995=100)	..	115	97	102
Terms of trade (1995=100)	..	91	90	89



### BALANCE of PAYMENTS

	1980	1990	1999	2000
(US\$ millions)				
Exports of goods and services	1,526	2,159	3,530	3,680
Imports of goods and services	2,144	1,675	3,981	4,149
Resource balance	-618	483	-451	-469
Net income	-100	-321	-191	-73
Net current transfers	9	8	70	66
Current account balance	-709	170	-572	-476
Financing items (net)	827	-109	586	647
Changes in net reserves	-118	-61	-13	-171

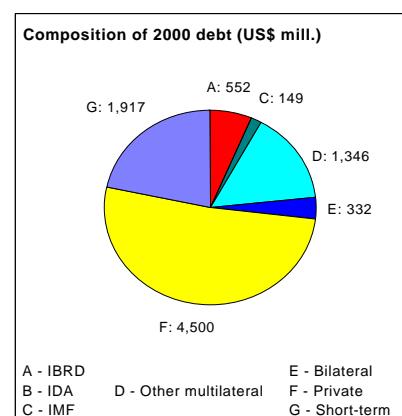


### Memo:

Reserves including gold (US\$ millions)	..	1,098	2,524	2,695
Conversion rate (DEC, local/US\$)	9.10E-3	1.2	11.5	12.3

### EXTERNAL DEBT and RESOURCE FLOWS

	1980	1990	1999	2000
(US\$ millions)				
Total debt outstanding and disbursed	1,660	4,415	7,447	8,796
IBRD	72	359	476	552
IDA	0	0	0	0
Total debt service	299	987	1,059	1,313
IBRD	13	70	96	100
IDA	0	0	0	0
Composition of net resource flows				
Official grants	0	0	0	0
Official creditors	37	104	252	136
Private creditors	190	-192	-112	856
Foreign direct investment	290	0	229	195
Portfolio equity	-7	108	128	376
World Bank program				
Commitments	74	63	93	108
Disbursements	4	51	66	134
Principal repayments	6	43	63	58
Net flows	-2	8	3	76
Interest payments	7	28	33	42
Net transfers	-9	-19	-30	35

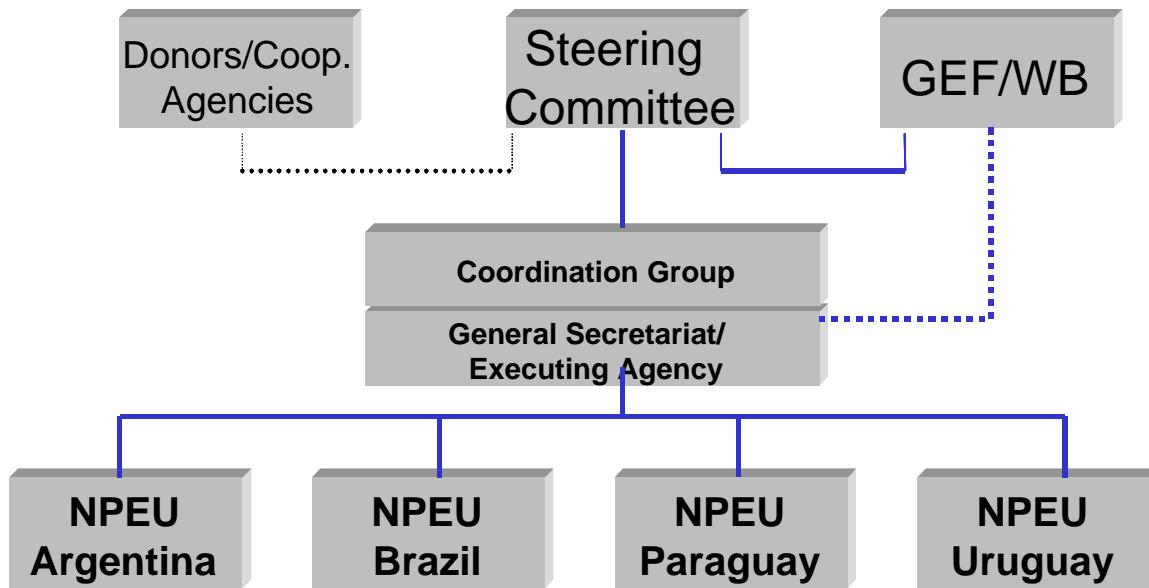


**Additional  
Annex 11**

**LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

**Institutional Arrangements for Project Implementation**

The figure below summarizes the institutional set-up for project implementation. In the following, arrangements for (i) project management and coordination, (ii) project administration, and (iii) (national) executing agencies are outlined.



**Steering Committee – Consejo Superior de Dirección del Proyecto**

**Coordination Group – Coordinación Colegiada**

**General Secretariat – Secretaría General del Proyecto Sistema Acuífero Guarani**

**Executing Agency – Organization of American States (OAS)**

**NPEU – National Project Executing Unit – Unidad Nacional de Ejecución del Proyecto**

**GEF/WB – Global Environment Facility – World Bank**

**Donors/Cooperating Agencies – includes IAEA and BGR. These and other agencies may be invited to Steering Committee meetings.**

## ***1. Project Management and Coordination***

The Organization of American States (OAS) will be the Executing Agency for the Grant and will be responsible for Project Management through its Sustainable Development and Environment Unit. A General Secretariat of the Guarani Aquifer System Project ("General Secretariat") will be established in Montevideo, Uruguay, which will have the function of a project implementation unit. This Secretariat will be staffed with a General Secretary (Project Coordinator), three Technical Specialists, a Financial Administrator as well as support staff.

Project Management lies with the OAS through the General Secretariat and through supporting OAS staff, including a procurement specialist, at Headquarters in Washington, D.C. and country offices, especially the country office in Buenos Aires where the OAS Project Teamleader will be based.

The General Secretary - and his staff - will have the function of day-to-day management of the Project, in liaison with the OAS.

The Project Steering Committee will set the overall framework for the Project and will meet at least twice a year to provide directions. It will be composed of three representatives for each country who will be appointed by the National Executing Agency. These will represent the areas of Water Resources, Foreign Affairs, and the Environment. The National Executing Agencies are (i) Argentina - Ministerio de Infraestructura y Vivienda, Subsecretaría de Recursos Hídricos, (ii) Brazil - Agência Nacional de Águas, (iii) Paraguay - Secretaría del Ambiente - Dirección General de Protección y Conservación de Recursos Hídricos, (iv) Uruguay - Ministerio de Transportes y Obras Públicas, Dirección Nacional de Hidrografía. The Project Steering Committee will have a rotational chairmanship. The first chairmanship will be held by Paraguay.

Each Executing Agency will appoint a National Coordinator who will manage in-country activities, in close collaboration with the General Secretariat.

The four National Coordinators will form a Coordination Group, which will work with the General Secretariat to ensure smooth operations at the country level. Together with the General Secretariat they will agree on periodical Operations Plans at the regional and at the country level. They will be responsible to manage the National Project Executing Units (NPEUs).

The National Project Executing Units consist of stakeholders (national and subnational governments, NGOs, academia, etc.) who provide advice to the project coordinator, help develop Terms of Reference, participate in supervision of consultants, and disseminate information about the project to their respective entities. They may also facilitate project work in their respective entities. Each NPEU is organized according to needs as defined by the country. In the case of Argentina and Brazil they will reflect their federal characteristics.

## ***2. Project Administration***

Project Administration takes place through the General Secretariat and through the OAS. While the General Secretariat has the function to carry out the work plan, develop all technical work, organize work meetings, liaise with the countries and stakeholders, as well as with international agencies, provide project monitoring reports, etc., the OAS has overall responsibility for this work. In addition, the OAS is responsible for all project procurement and for management of all financial funds provided through the GEF Grant, as described in Annex 6.

### ***3. National Executing and Participating Agencies***

The National Executing Agencies ensure the selection and participation of key representatives in the Project Steering Committee. They appoint the National Coordinator and through the National Coordinator, provide support to the General Secretariat, manage the NPEU, facilitate and support in-country work and facilitate coordination between countries. The National Executing Agencies are also responsible for providing counterpart financing.

Participating Agencies are those agencies in the countries, which participate (or in the future will participate) in Guarani Aquifer Management. They participate in the project by providing access to data and, where applicable, to their facilities, sending representatives to project meetings, disseminating results, implementing monitoring activities when agreed, etc. Participating Agencies have been defined by each country and a list is provided in the Project Implementation Plan.

National Executing Agencies, through their National Coordinator, are responsible for involving Participating Agencies in order to ensure project sustainability and benefits through adequate involvement and consultation. In the cases of Argentina and Brazil, this particularly relates to the involvement of agencies at the provincial and state levels.

**Additional  
Annex 12**

**LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

**Sub-component 3d): Indigenous Peoples Strategy**

**I. INTRODUCTION**

1. The Guarani Aquifer System, underlying parts of Argentina, Brazil, Paraguay and Uruguay, is a strategic resource named in honor of the Guarani Indigenous Nation. The main threats to the resource stem from uncontrolled abstraction, and pollution in the extraction and recharge areas. Given that groundwater recharge is restricted, and that groundwater pollution is reversible only at very high cost, if at all, there is considerable merit in protecting the Guarani Aquifer System for current and future generations.
2. An important objective of the present project is to enhance the knowledge about the Guarani Aquifer System, including its southwestern border areas, and its characteristics. In order to achieve the objective of the project to support the four involved countries Argentina, Brazil, Paraguay and Uruguay in developing a joint framework for the sustainable management of the Guarani Aquifer System, one of the main steps is thus to enhance the technical and scientific knowledge about it. The present project thus focuses on strongly on knowledge creation and sharing as a prerequisite to developing a management system.
3. The project area covers the southwestern area of Brazil, the eastern part of Argentina, Paraguay and the northeastern part of Uruguay. There are indigenous communities in the former three countries, but not in Uruguayan territory.
4. This Indigenous Peoples Strategy (IPS), which is Sub-component 3d, has been designed based on preparatory studies, consultations and discussions with key indigenous actors and institutions and other related civil society entities.
5. Because there will be no physical project investments, indigenous peoples will not be directly affected by project activities. On the other hand, the long-term goal of the project to create a management framework for the Guarani Aquifer System may eventually have effects on their rights and obligations, e.g. with regard to registration of new wells. It is thus important to note that with respect to OD 4.20, the IPS of the Guarani Aquifer Project was not formulated to mitigate actual or potential negative aspects of other project activities, but rather the IPS constitutes one of the main mechanisms of the project for the effective and informed participation of indigenous peoples.
6. Indigenous communities were specifically considered during project preparation following their expressed wish to be informed and incorporated into the project activities. A consultation has been specifically designed into part of the Public Participation Component to both inform indigenous groups in the Guarani Aquifer System region and seek appropriate mechanisms to best

incorporate their views into the project. For this reason, the project will ensure that indigenous groups are fully and adequately informed about project activities and that the knowledge about the aquifer which will be acquired during the project will be shared with indigenous and ethnic groups and communities.

## **II. INDIGENOUS GROUPS IN THE GUARANI AQUIFER PROJECT**

7. The assessments conducted during project preparation basically coincide in the following:

- Preparatory studies have shown that indigenous peoples live in the Guarani System area in general and in case of the pilot projects, in the Paraguay area. There are no indigenous peoples in the pilot areas of Argentina/Uruguay or Uruguay/Brazil or in the Ribeirão Preto pilot areas.
- In all of the countries, the indigenous settlements and reserves are undergoing severe problems of land demarcation and border identification. The expansion of agriculture, forestry and mining activities are the main threats imposed from outside. Accompanying these physical threats, indigenous peoples' original values and traditions are being lost in the face of a much more complex network of social factors;
- In general, due to land use tradition and subsistence cultures, the environment is more protected in the reserves and the level of impact on water and soil is much lower than among exogenous farmers;
- In most regions of the Guarani Aquifer System, indigenous peoples do not use its waters (see Table A12-1 below), but this needs to be investigated more in-depth during the project;
- The perception of natural elements and especially of the cosmology and meaning of water and groundwater is almost religious and beyond non-indigenous approaches;
- In each country there is at least one institution that is responsible for mediating and interacting directly with indigenous communities;
- There are numerous non-profit, academic and religious organizations working with indigenous communities at all levels;
- In some areas there are strong political disputes among indigenous communities.

**Table A 12-1: Main Characteristics by Region/Country**

Characteristics	Argentina	Brazil	Paraguay
Legal framework and institutional representation	Law 23.302 Protección de Comunidades Aborigenes; Instituto Nacional de Asuntos Indígenas responsible; includes indigenous representatives and representatives of the Provinces; Provincial Law similar to national Paraguayan Law (Province of Formosa); IICA (Indigenous Communities Institute)	Indigenous traditional culture and behavior, faiths and language are recognized by the union which is responsible for protecting them and guaranteeing their land and natural resources possession (reserves); FUNAI (Fundação Nacional do Índio)	The constitution recognizes the cultural plurality and rights of indigenous people in participating in the country's economic, social, political and cultural life; INDI (Instituto Paraguayo del Indígena)
Indigenous ethnic groups in the Project area (number and number of reserves if applicable)	There are no indigenous groups in the only area that has wells (Province of Entre Ríos). During project implementation, it will be investigated which provinces the Guarani Aquifer System covers. In Formosa, for instance, where the Aquifer is believed to stretch, there are 3 indigenous ethnic groups of the guaicurú linguistic family: Toba, Pilagas and Wichi; communal settlements with land ownership. There is no use of Guarani Aquifer water, however.	11 indigenous ethnic groups and 103 indigenous reserve areas in the States of Rio Grande do Sul (16 reserve areas), Santa Catarina (4), Paraná (16), São Paulo (4), Mato Grosso do Sul (51), Mato Grosso (12).	4 indigenous ethnic groups of the Guarani linguistic family: Aché, Mbya, Pai-Tavyterá and Avá Guarani; communal settlements with land ownership.
Indigenous population and main populations according to groups	To be defined in scoping study during project implementation.	Approximately 100.000; Guarani are the most numerous, followed by the Kaingangs (25.500). The groups are Tupi-Guarani (Guarani and Xetá), Jé and Macro-Jé (Kaingang, Xokleng, Xavante, Bororo, Ofayé and Krenak), Aruak (Terena and Pareci), Karib (Bakairi) and Guaikuru (Kadiwéu).	Approximately 21.000 (Pai Tavyterá - 8.026; Mbya - 4.744, Avá Guarani - 6.918; Aché - 639).
Environmental features and main conflicts related to water resources	No information available regarding Guarani Aquifer due to very limited amount of wells (6), only in one province (Entre Ríos)	Besides the fact that in some areas land-use patterns from the vicinity are replicated, indigenous areas are in general more conserved; deforestation, organic contamination of surface waters, displacement due to dam construction	Same characteristics as in Brazil
Types of water supply	Surface waters, springs, shallow large-diameter wells (Province of Formosa)	Surface waters, springs, shallow and tube wells	Surface waters, springs, shallow large-diameter wells
Direct impacts on the aquifer and identified conflicts	Very little (to be investigated through scoping study during project implementation)	Little to moderate; reserves are located in outcropping and/or recharge areas; some 100 wells drilled by FUNASA (National Health Foundation) in unknown conditions (possible maintenance problems); marketing of Guarani Aquifer water intended in one locality	Very little; reserves are located in outcropping and/or recharge areas

### III. ACTIONS PLANNED FOR INDIGENOUS PEOPLES PARTICIPATION

8. State institutions that address indigenous issues in each country will be the channels through which the project will inform and consult. They will be invited to send their technicians to project meetings regarding public participation as well as technical activities such as well inventory and monitoring. With this information in hand, they will follow their usual proceedings in communication strategies towards indigenous communities.

9. Given that indigenous peoples live in the project area in general and, specifically, in the Paraguayan pilot area, the approach to ensure project participation is two-pronged:

**(A) For indigenous peoples who live in the aquifer region in general:**

- During the first two years of project implementation most of the project will deal with studies for better understanding of the aquifer as well as providing the platform for the Guarani Aquifer Strategic Action Plan. During this time, it would be misleading to directly address indigenous peoples in the project area because there would be no direct activities in their areas (for instance, wells are usually privately owned or by public water utilities). In this first phase, the project will make sure, through its national coordinators and the Guarani Secretariat, to keep the main official state organizations (e.g. FUNAI in Brazil, Instituto Nacional del Indígena in Argentina, and Instituto Paraguayo del Indígena) informed about project activities such as workshops and seminars so that they can – in turn – inform the indigenous community. In the case of Brazil, direct communication with indigenous NGOs and communities, started during project preparation, will be continued and deepened.
- In addition, a scoping study will be carried out in Year 2 of the project, which will expand the information acquired during project preparation, in particular with regard to indigenous water rights and natural resources management rights and obligations. This study will be carried out in a participatory fashion, including fieldwork and direct interaction with indigenous peoples.
- In Year 3, when first project results as well as first proposals for institutional frameworks are available, direct consultations through workshops and training will be carried out with representative indigenous groups and organizations. This will ensure that throughout the project indigenous perspectives are taken into account, with increasing intensity once substantive discussions can take place.
- In addition, indigenous organizations will be able to participate in the Guarani Citizen's Fund and apply for funding for community level projects (Component 3 c). This information will be passed on directly to their liaison organizations, as well as indigenous NGOs that have been consulted with during project preparation.

**(B) For indigenous peoples living in the Paraguayan pilot area:**

- This pilot will focus, in the first two years, on data gathering and modeling of the aquifer and the recharge area in the western part of Paraguay. At the same time, an in-depth social assessment will be undertaken in the area, which will explicitly include a focus on indigenous groups. This will provide the basis for appropriately involving these groups once active steps for

aquifer management will be undertaken in this pilot area. As mentioned in Annexes 2 and 14, these activities are not as yet fully defined due to the lack of data regarding aquifer vulnerability in the area due to recharge and possible pollution patterns. Any involvement of the indigenous people in the area will have to take into account the results of the hydrogeological and modeling studies. The involvement will include consultations about aquifer management activities, any legal implications, training, as well as provision of material about the aquifer in local indigenous languages.

#### **IV. INSTITUTIONAL ARRANGEMENTS**

Both the General Secretariat and the National Project Executing Units will play a role in implementing this subcomponent. The General Secretariat will develop general Terms of Reference for the studies and social assessments (one professional in the Secretariat will be specialized on public participation and social issues). Given the diversity of indigenous groups in the three countries, the National Coordinators – and the NPEUs – will detail the Terms of Reference for their respective countries and will also accompany the studies. They will also constitute the main liaison for in-country relationships with the respective indigenous organizations, NGOs, etc.

#### **V. BUDGET**

<b>Activity</b>		<b>Cost (US\$)</b>
<b>(A) General Guarani Aquifer System Area</b>	Information Dissemination	40,000
	Scoping Study	20,000
	Workshops, Training and Direct Consultations	60,000
	Translation of Documents and Dissemination	20,000
<b>(B) Paraguay Pilot Area</b>	Extensive Social Assessment in Paraguay Pilot	30,000
	Workshops, Training and Direct Consultations	80,000
	Translation of Documents and Dissemination	10,000
	<b>Total</b>	<b>210,000</b>

**Additional  
Annex 13**

**LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

**Root Cause Analysis**

**1. Background.** The Guarani Aquifer System is one of the largest groundwater reservoirs in the world. It is located under the four MERCOSUR countries: Argentina, Brazil, Paraguay and Uruguay. The Guarani Aquifer System extends from the central-west region of Brazil into Paraguay and the southeastern and southern regions of Brazil, and into northeastern Argentina and central and western Uruguay. The Guarani Aquifer System has an estimated total surface area of approximately 1.2 million square kilometers (839,800 km<sup>2</sup> in Brazil, 225,500 km<sup>2</sup> in Argentina, 71,700 km<sup>2</sup> in Paraguay, and 45,000 km<sup>2</sup> in Uruguay). The portion within Brazil encompasses about two-thirds of the total areal extent of the System, and included portions of eight Brazilian states—an area equal to that of England, France and Spain combined. An estimated fifteen million people live within the Aquifer's area of surface influence. (See area maps).

**2. Issues.** Legal and regulatory mechanisms for the management of groundwater resources are lacking throughout the MERCOSUR region. Both in Argentina and Brazil, for instance, significant pollution of shallow groundwater resources is occurring, although, due to its significant average depth, the Guarani Aquifer System is not significantly affected by this type of degradation. However, in areas where the Guarani Aquifer System is close to the land surface, there are pollution threats posed by the use of the Guarani Aquifer System waters in irrigation schemes and potential leaking of agrochemicals in highly mechanized intensive agriculture areas. In addition, it is being potentially overdrafted with consequent negative impacts on its quality.

The Guarani Aquifer System is a strategic water resource within the MERCOSUR region. It can be preserved if adequately protected and managed. The main threat to the resource stems from uncontrolled pollution in extraction and recharge areas. Given that groundwater pollution is reversible only at very high costs, if at all, there is considerable merit in protecting the Guarani Aquifer System for current and future generations.

**3. Problems and Symptoms.** The Guarani Aquifer System is a clear example of an international (*transfronterizo*) waterbody threatened by environmental degradation through pollution, as defined and included in the GEF Operational Program Number 8. In the absence of a strategic intervention supported by the GEF, the likelihood of "business-as-usual" prevailing in the four countries is high. At the aquifer's current rate of use, and considering the growing use of groundwater for human consumption, it is easy to foresee an increasing threat of pollution in the not too distant future. The uncontrolled use of the Guarani Aquifer System, without rules or regulation, can alter its status from that of a strategic reserve of drinking water for the population in portions of Argentina, Brazil, Paraguay and Uruguay, to that of a degraded waterbody that is the source of conflict among the countries. If nothing is done, the future of this underground treasure could be the same as that of other aquifers that have tended to become both polluted and

over-exploited, at least in certain areas. The global benefit of the proposed project is in terms of the preservation of this transboundary resource for current and future generations. In the specific case of the Guarani Aquifer System, there is the opportunity to exploit the advantages of preventive activity. The project would ensure that, in the face of increasing scarcity and pollution of surface water sources in the beneficiary countries, this resource will be managed today so as to be available as a strategic reserve when needed in the future. An important issue to be considered in this regard is the fact that an international legal framework for the management of transboundary groundwater resources currently does not exist.

To this end, it should be noted that the World Bank, for example, does not have a specific policy on groundwater resources. This issue is being addressed in the ongoing evaluation of the World Bank Water Resources Policy Paper of 1993. It is generally recognized that transboundary groundwater issues need to be addressed, as projects are often proposed and implemented in areas where a situation of scarcity and competition for groundwater resources already exists (e.g., in North Africa and the Middle East). In the case of the Guarani Aquifer System of South America, the World Bank, through the GEF, could make a significant contribution to shaping an institutional framework regarding transboundary groundwaters that could serve as a replicable model in other countries and regions. In addition, the experience derived from this project would be expected to contribute to GEF and World Bank policy with regard to transboundary groundwater issues.

**3.1 Problems related to poorly quantified environmental impacts.** As noted above, the actual configuration and extent of the Guarani Aquifer System remains largely unknown. Notwithstanding, problems related to the contamination of portions of the groundwater reservoir are known to exist, particularly in those areas where the aquifer is at or near the land surface. In addition, in those areas where the aquifer is being heavily utilized for water supply purposes, localized problems with overdrafting of the water resource are presumed to exist, with concomitant potential impacts on economic activities and surface ecosystems that are intimately linked with the groundwater system.

**3.2 Problems related to stakeholder involvement.** Problems related to stakeholder involvement historically have been related to the utilization of groundwater as an alternative water source for human economic activities, especially in areas where surface water resources are lacking or contaminated from human activities. As noted above, the Guarani Aquifer System is viewed by the countries as a reserve of potable freshwater to be utilized primarily for the future economic development of the basin countries. Notwithstanding, concerns have been identified within the basin with respect to the utilization of the waters of the Guarani Aquifer System to support tourism, particularly in the vicinity of western Uruguay and northeastern Argentina. Such concerns impact the sustainable utilization of the resources, and indicate a need to sensitize stakeholders with respect to the nature, attributes, behavior, and hydrology of the Guarani Aquifer System.

**3.3 Problems related to economic development.** Problems related to economic development include the lack of appropriate regulations governing the exploitation of groundwater resources for human purposes. Because of the strategic nature of the Guarani Aquifer System within the

context of the MERCOSUR region, the need to develop an appropriate framework within which to support sustainable economic activities, including both current uses and potential future uses of the Guarani Aquifer System, forms an important issue to be addressed by this project. Such concerns are best addressed in a sectoral context, with the participation of key stakeholders.

**3.4 Problems related to institutions, human resources, and the lack of a holistic management approach.** Problems related to institutions and human resources include the lack of a comprehensive framework of data acquisition and data-sharing within the Guarani Aquifer System region. This lack contributes to difficulties in developing and implementing an appropriate legal and regulatory framework within which to manage the resources of the Guarani Aquifer System. Related to the lack of institutional capacity are emerging problems related to the lack of authority to control environmental problems, and fragmented and locally focused jurisdictions that have failed to bring a comprehensive and cohesive approach to water management in the Guarani Aquifer System region. Further, some management and development-related actions are fragmented among agencies and between local jurisdictions. As a consequence, potential problems relate to the lack of a unified vision of the Guarani Aquifer System as an integrated whole are likely to occur in the absence of further interventions in the region. Potential problems include inter-sectoral conflicts over water usage, competing rather than complementary demands for water, and a piecemeal approach to water resources development in the basin.

**3.5 Problems of water quality.** Problems related to water quality include localized bacteriological contamination and contamination by synthetic organic (agro-) chemicals. These problems are currently localized to specific areas of the Guarani Aquifer System region, especially with respect to those wells that lack effective casings.

**3.6 Problems of water quantity.** Problems related to water quantity are highly localized within the Guarani Aquifer System, and are related to localized overdrafting of the resource.

**4. Root Causes.** Despite the apparent proliferation of problems in the Guarani Aquifer System region, there would appear to be relatively few root causes that contribute to the majority of the potential problems likely to be observed or to occur in the future in the absence of further interventions to protect the resource. The root causes of existing and potential problems will be identified during this project.

**4.1 Anthropogenic causes.** People almost exclusively have the potential to degrade the Guarani Aquifer System. Although increased economic development in the region has succeeded in improving the quality of life for many of the citizens of the region (as intended), rates of exploitation of the natural resource base have increased. In the first instance, the redistribution of population in the region has led to increased urbanization, which in turn has the potential to contribute untreated human wastes and other contaminants to the system. These populations have also created an increased demand for water and food, both of which affect the potential for overdrafting the Aquifer—the water being used primarily for potable purposes. Superimposed on these causative factors are modifications of the natural hydrological regime caused by the imposition of impervious surfaces on recharge areas, and modifications affecting natural discharge areas of the Guarani Aquifer System. In addition, emerging demands for “clean” energy for use by

the people and industries of the basin constitute an emerging challenge related to the extraction and disposal of thermal waters. Currently, many of the potential impacts are highly localized, and there is an opportunity to put into place mechanisms to mitigate and manage many of these threats.

**4.2 Legal and institutional causes.** While human land use activities have the potential to contribute significantly to the potential degradation of the Guarani Aquifer System, legal and institutional shortcomings may exacerbate these problems by failing to control or regulate human actions in the area. Existing mechanisms fail to view the Aquifer as a unit, in which actions taken at specific sites have a cumulative effect throughout the system. While the consequences of such fragmented institutional mechanisms are currently quite minor, should the situation not be remedied, substantial and costly actions may be needed in the future to overcome this lack of regulation, and lack of a holistic approach to ecosystem and economic development.

**5. Actions Identified to Address Root Causes.** To help in overcoming the historical inertia inherent in the causative factors identified above, emphasis in project design has been given to those actions which address root causes that can best be humanly managed; i.e., those anthropogenic causes and legal and institutional causes that can be modified through planning and subsequent implementation of corrective actions. Natural root causes generally cannot be effectively controlled by human actions and hence are of lesser importance from a groundwater management perspective (although knowledge of these causes is an essential starting point from which to implement interventions to address human and institutional causes). The following actions have been proposed to address the human causative factors of potential environmental degradation of the Guarani Aquifer System.

**5.1 Acquisition of basic scientific information and dissemination of knowledge.** Project activities have been developed to acquire and disseminate supplementary baseline information to support determination of root causes (Components I and II), and investigate alternative courses of action to ensure sustainable use practices (Component V). In addition, a further group of activities has been proposed as a means of synthesizing and disseminating information gathered through diagnostic studies. These include, *inter alia*, activities which demonstrate ways in which citizens can contribute to the protection of community water resources, which address the need for public informational programming to enhance citizen participation in the decision-making process, and which train community-based extension agents to disseminate information on issues and mitigation measures to citizens (Component III).

**5.2 Development of a holistic institutional management framework.** Project activities have been developed to provide an integrated management framework within which groundwater protection and management activities can be identified and carried out (Component II). Project activities in this category include, *inter alia*, activities which address the needs to harmonize technical approaches for data acquisition and share information within the Guarani Aquifer System region. These activities also encompass the synthesis and integration of the strategic elements of the foregoing project activities in the SAP, or Strategic Action Program.

**5.3 Support to groundwater management and regulatory agencies.** Project activities have

been developed to provide directed support to create and strengthen the operational capabilities of institutions, committees, and related civic organizations within the Guarani Aquifer System region. These activities include, *inter alia*, activities which promote the establishment of a framework to promote stakeholder involvement and participation (Component III), and refine and strengthen the role of the existing agencies within the basin through twinning and other capacity building activities (Component II).

**5.4 Assessment of emerging concerns.** Finally, project activities have been developed to provide a thorough consideration of the use of the Aquifer for geothermal energy production, an emerging issue that is related to human use of the Guarani Aquifer System and its water reserves (Component VI). These activities will inform decisions relating to the potential future development and use of the Guarani Aquifer System for human purposes, including their economic, technical, and environmental dimensions.

**6. Concluding remarks.** Significant progress has been made in the definition of issues and problems (and their root causes in some instances) within the Guarani Aquifer System region during the project preparation phase. Work proposed under the GEF International Waters focal area builds on this progress in seeking to extend region-wide actions to the local community. This work is predicated upon the principles of civic involvement, public participation, and responsible governmental action at all levels of government, and embodies a comprehensive program of research, demonstration projects, and information dissemination designed to identify a framework for subsequent preventive and remedial measures and management actions that will result in the sustainable economic development of this region.

**Additional  
Annex 14**

**LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

**Strategic Action Program**

**1. The GEF Process.** The GEF International Waters (IW) Projects often follow a logical sequence of diagnosis and analysis, culminating in the preparation of an agreed program of strategic actions to address common transboundary issues of concern. To this end, GEF IW projects often begin with the GEF Implementing Agencies assisting the cooperating countries in undertaking strategic work that focuses on joint fact-finding. Consistent with the Operation Strategy (OP), the joint fact-finding encourages collaborating countries to institute interministerial technical teams to assemble information on water-related problems and conflicts in the basin, and to share this information with counterparts from other countries within the multinational basin. Such information forms the basis for defining and quantifying shared, transboundary concerns. Such concerns are documented in a Transboundary Diagnostic Analysis (TDA) that contains the facts of the actual or likely future issues of concern, conflicts, and problems. These facts and the associated diagnostic analysis facilitate identification of the root causes of the concerns, conflicts, and problems, and enables actions to resolve shared issues of concern. A key element in developing actions to resolve water-related conflicts, disputes, and problems is the involvement of stakeholders; the principal actors involved in water use and management having been identified as an element of the TDA. This collaborative, factual analysis is essential to the process of determining priorities for action, and is the first step in formulating a Strategic Program of Actions (SAP) designed to address the root causes of the concerns in an effective and collaborative manner. The TDA-SAP process has been adopted by the GEF Council as the basis for GEF IW projects.

**2. Transboundary Diagnostic Analysis.** The process of developing the TDA enables countries to learn how to exchange information and work together. Interministerial committees often are established in each country to assemble and provide factual information on the country-portion of shared waterbodies. By reviewing and analyzing the data and information provided by each country, the transboundary nature, magnitude, and significance of water quality, biological, habitat or other land use-related conflicts, degradation or threats can be determined and prioritized. This review and analysis provides an objective basis for the countries to jointly assign relative degrees of concern to the issues identified, and separate those issues that are of joint concern from those that are of national concern. In addition, the root causes of the conflicts or degradation, and relevant social issues, can be identified. This analysis will also enable the identification of key stakeholders and communities. While social and societal concerns are identified and quantified to the extent possible, the TDA is intended to be a technical document, prepared by the scientific community within the countries participating in the GEF IW project.

**3.** The TDA process provides the opportunity for the countries to identify and understand the linkages between problems and their root causes. By categorizing these causes within specific

economic sectors, this analysis permits the active participation and engagement of key stakeholders. This enables the preparation of holistic, comprehensive, cost-effective solutions for complex transboundary problems. It also enables these problems to be defined in terms of manageable elements, linked to specific and identifiable geographic localities, or “hot spots”, that can be readily prioritized in terms of an agreed system of prioritization developed by the collaborating countries.

**4. Strategic Action Program.** The resulting actions required to address priority transboundary issues of concern, identified through the TDA process, are further developed and articulated within the Strategic Action Program. This program sets out a series of agreed actions needed to minimize or mitigate identified water quality, biological, habitat or other land use-related conflicts, degradation or threats within specific economic sectors and in specific geographic locations. These actions generally include specific policy, legal, and institutional actions, reforms and investments on a multicountry and national basis. These specific actions generally are developed at the country level, often through the interministerial committees with the active participation of stakeholders at the national and subnational levels, that are subsequently compiled and agreed at the multicountry level. In most cases, the development of multicountry strategic action programs complement specific action plans developed by the collaborating countries. These latter plans, individual national action plans (NAPs), form the national commitment of the countries to the implementation of strategic actions necessary to bring about the sustainable development and utilization of shared, transboundary resources. Such country-level actions, in turn, may be eligible for additional GEF assistance in the implementation of those additional, or incremental, actions necessary to give effect to the agreed transboundary benefits identified in the SAP. These incremental costs reflect the various states of economic development within the collaborating countries, and serve as the basis for GEF IW implementation projects.

**5. Enabling Activity.** In essence, this multicountry process of issue identification, quantification, prioritization, and action planning constitute the equivalent of the “enabling activities” identified within the other GEF focal areas. Enabling activities are those fundamental steps that must be taken in order for collaborating countries to address priority concerns established by the conventions. To this end, the SAP forms an important and essential step in identifying country-driven commitments to action that may reduce the risk of failure of subsequent GEF interventions that assist in the implementation of country-driven actions.

**6. Monitoring and Evaluation.** A final step in the GEF process is that of monitoring of project implementation, which allows project management to take appropriate corrective actions during the course of the conduct of project activities, and evaluation, which measures project performance, efficiency, and impact against pre-determined milestones or indicators. Evaluation indicators are generally set forth in the Logical Framework as a part of project design.

**7. Guarani Aquifer System Project.** As noted previously, the primary outcome of the project will be an agreed Strategic Action Program, consistent with the GEF process outlined above. This program will be based upon a sound technical and scientific process of data acquisition, sharing, and analysis, setting forth issues of transboundary concern. To this end, an

operational system of data acquisition and data-sharing is an integral part of the Guarani Project—contained within Components I and II of the proposed GEF IW project. Because of the close linkage between the technical analysis (TDA) and the resultant priority, strategic actions necessary to address the root causes of agreed multicountry concerns, the identification of regionally-appropriate, cost-effective mitigation and management measures (Component V), acceptable to basin communities and key stakeholders (see Component III), also form critical elements of the Guarani Aquifer System project. In order to ensure the sustainability of these management and mitigation measures, and data acquisition and sharing mechanisms, the Guarani Project also includes institutional strengthening and capacity building (Component IV) as important activities within the project framework. Finally, the proposed project activities also recognize emerging issues related to the Guarani Aquifer System, and specific investigations with respect to the potential development of the Aquifer for geothermal energy, are also included within the framework of the project (Component VI). All of these activities contribute to the development of a sustainable multicountry framework for the sustainable management and development of the Guarani Aquifer System.

**Additional  
Annex 15**

**LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

**Public Involvement Plan Summary**

- 1.** The formulation of the proposal for the Environmental Protection and Sustainable Development of the Integrated Management of the Guarani Aquifer System, including its proposed GEF components, has involved extensive and broad-based participation by representatives of the municipal/departmental, state/provincial, and national/federal governments, academic and research institutions, private sector representatives and nongovernmental organizations. The participation process was facilitated by a series of consultative workshops, conducted in Foz do Iguaçu (Brazil) during January 2000, Santa Fe (Argentina) during July 2000, Asunción (Paraguay) during November 2000, Montevideo (Uruguay) during March and April 2001, Asunción during May 2001, and Salto (Uruguay) during May 2001. In addition, a number of focus group sessions were held to solicit sectoral input from NGOs, in Garopaba and Caxambú (Brazil) during November of 2000 and 2001, and in Rio Grande do Sul (Brazil) during May 2001; from the private sector in Florianópolis during May 2001; and, from the indigenous peoples groups in Brazil (Curitiba) during May 2001 and in Paraguay during June 2001.
- 2.** Approximately 200 persons representing more than 100 institutions, government agencies, and NGOs, participated in the public meetings and provided inputs in drafting this proposal, many of which are expected to participate in the implementation of the project.
- 3.** A list of those institutions that participated in the public meetings convened prior to the preparation of this project document, and which are expected to participate in project implementation as well as subsequent public meetings, is presented below. Governmental organizations are categorized as national/federal or as provincial/state government agencies. Nongovernmental organizations and other governmental bodies are also listed, including state-(Brazil) and provincial- (Argentina) level governmental agencies. Where the participating organizations are known by an acronym, the acronym is also shown.

**4. NATIONAL AND FEDERAL GOVERNMENTAL ORGANIZATIONS**

**Argentina**

- Ministerio de Relaciones Exteriores y Culto
- Subsecretaría de Recursos Hídricos -Sistema Nacional de Información - SNIH/SRH
- Secretaría de Desarrollo Sustentable y Política Ambiental- SDSPA
- Instituto Nacional del Agua y del Ambiente - INA

**Brazil**

- Ministério do Meio Ambiente - MMA

- Secretaria de Recursos Hídricos – SRH
- Secretaria Executiva – SECEX
- Secretaria de Qualidade Ambiental nos Assentamentos Humanos – SQA
- Assessoria Especial para Assuntos Internacionais
- Agência Nacional de Águas – ANA
- Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – IBAMA

- Ministério de Minas e Energia
  - Departamento Nacional de Produção Mineral – DNPM
  - Companhia de Pesquisa de Recursos Minerais – CPRM
  - Secretaria de Energia
- Ministério da Agricultura
  - Secretaria de Desenvolvimento Rural
- Ministério da Integração Nacional – MI
  - Secretaria de Programas Regionais Integrados
- Ministério da Saúde – MS
  - Agência Nacional de Vigilância Sanitária - ANVISA
  - Fundação Nacional da Saúde – FUNASA
- Ministério das Relações Exteriores – MRE
  - Divisão da América Meridional I- DAM I
  - Divisão do Meio Ambiente – DEMA
- Ministério do Planejamento, Orçamento e Gestão
  - Secretaria de Assuntos Internacionais- SEAIN
- Ministério da Ciência e Tecnologia - MCT
  - Comissão Nacional de Energia Nuclear - CENEN
- Presidência da República
  - Secretaria de Acompanhamento e Estudos Institucionais da- SAEI/GSI
  - Agência Brasileira de Inteligência - ABIN
- Fundação Nacional do Índio – FUNAI
- Caixa Econômica Federal – CEF

#### Paraguai

- Secretaría Medio Ambiente - SEAM
- Secretaría Técnica de Planificación - STP
- Ministerio de Salud Pública y Bienestar Social- SENASA - Servicio Nacional de Saneamiento Ambiental
- Ministerio de Obras Públicas y Comunicaciones ( M.O.P.C.) – Viceministerio de Minas y

### Energía

- Ministerio de Relaciones Exteriores
- Cooperativa Nacional de Aguas y Saneamiento - CORPOSANA
- Secretaría del Ambiente - Proyecto Saro - Sistema Ambiental de la Región Oriental
- Programa Regional. Piloto Uft
- Servicio Geológico Geotécnico
- Ente Binacional Yaciretá-Itaipú

### Uruguay

- Ministerio de Relaciones Exteriores
- Ministerio de Transporte y Obras Públicas - Dirección Nacional de Hidrografía – MTOP -DNH
- Ministerio de Vivienda, Ordenamiento Territorial y Medio Ambiente - Dirección Nacional de Medio Ambiente – MVOTMA-DINAMA
- Ministerio de Ganadería Agricultura y Pesca – Programa Prenader
- Ministerio de Industria, Energía y Minería - Dirección Nacional de Minería y Geología -DINAMIGE
- Obras Sanitarias del Estado – OSE

## 5. PROVINCIAL AND STATE GOVERNMENTAL ORGANIZATIONS

### Argentina

- Dirección Provincial de Obras Hidráulicas de Santa Fé - SPAR
- Dirección de Hidráulica Provincia de Entre Ríos - Ministerio de Obras Públicas
- MOSRV
- Administración Provincial del Agua - APA - Provincia del Chaco
- Instituto Misionero de Agua y Saneamiento - IMAS - Provincia de Misiones

### Brazil

- Agência Goiana de Meio Ambiente e Recursos Hídricos
- Fundação Ecológica de Mineiros – FEMAS
- Fundação Estadual do Meio Ambiente de Mato Grosso –FEMA
- Companhia Matogrossense de Mineração – METAMAT
- Companhia de Saneamento do Estado do Mato Grosso – SANEMAT
- Instituto de Planejamento , de Ciência e Tecnologia – IPLAN
- Fórum Permanente de Meio Ambiente e Desenvolvimento Sustentável do Mato Grosso do Sul – FORMADS
- Conselho de Desenvolvimento e Integração – COSESUL/MS
- Centro de Desenvolvimento de Tecnologia Nuclear – CDTN
- Instituto Mineiro de Gestão das Águas – IGAM
- Companhia de Saneamento do Estado de Minas Gerais – COPASA
- Fundação Centro Tecnológico de Minas Gerais – CETEC
- Secretaria de Estado de Meio-Ambiente e Recursos Hídricos do Paraná – SEMA

- Superintendência de Desenvolvimento de Recursos Hídricos do Paraná – SUDERHSA
- Secretaria de Estado de Meio-Ambiente – SEMA- Rio Grande do Sul
- Companhia Riograndense de Saneamento – CORSAN
- Secretaria de Estado de Coordenação e Planejamento- Rio Grande do Sul
- Secretaria de Estado de Recursos Hídricos, Saneamento e Obras – SRHSO
- Secretaria de Estado de Meio Ambiente, Coordenadoria de Planejamento Ambiental- CPLA/SMA
- Instituto Florestal de São Paulo - IF
- Instituto Geológico de São Paulo – IG
- Instituto de Pesquisas Tecnológicas – IPT
- SABESP – Companhia de Saneamento Básico de São Paulo
- Secretaria de Estado do Desenvolvimento Urbano e Meio Ambiente do Estado de Santa Catarina-SDM
- Secretaria de Estado da Fazenda- Santa Catarina
- Secretaria de Obras Públicas e Saneamento – SOPS/RS
- Secretaria de Estado de Planejamento e Coordenação Geral - SEPL/CCPG
- Companhia de Tecnologia de Saneamento Ambiental – CETESB
- Departamento de Águas e Energia Elétrica – DAEE
- Secretaria de Estado do Desenvolvimento Econômico e Integração ao MERCOSUL, RS
- Secretaria de Estado do Meio Ambiente do Mato Grosso do Sul
- Empresa de Saneamento do Estado do Mato Grosso do Sul – SANESUL
- Secretaria de Estado do Meio Ambiente e Desenvolvimento Sustentável– SEMAD, MG
- Agência Goiana de Desenvolvimento Mineral e Industrial - AGIM
- Companhia de Pesquisa de Recursos Minerais – CPRM, Superintendência Regional de Goiás
- Saneamento de Goiás S.A – SANEAGO
- Delegacia Federal de Agricultura – DFA/MS
- Fundação de Apoio e Pesquisa de Ensino Superior – FAPEC
- Instituto de Meio Ambiente Pantanal
- Serviço de Patrimônio Indígena – FUNAI/MS
- Companhia de Pesquisas e Recursos Minerais – CPRM, Superintendência Regional de Belo Horizonte
- Companhia Mineradora de Minas Gerais – COMIG
- Secretaria de Estado de Meio-Ambiente e Recursos Hídricos (MG)
- Secretaria de Estado de Planejamento e Coordenação (MG)
- Minerais do Paraná S.A – MINEROPAR
- Companhia de Pesquisas e Recursos Minerais – CPRM, Superintendência Regional do Rio Grande do Sul
- Instituto Brasileiro do Meio Ambiente e dos Recursos Renováveis – IBAMA, Regional Rio Grande do Sul
- Promotoria de Justiça de Caxias do Sul
- Companhia de Pesquisas e Recursos Minerais – CPRM, Superintendência Regional de São Paulo

- Comitê de Bacia Hidrográfica do Alto Tietê – CBH-AT
- Comitê de Bacia Hidrográfica – CBH – TJ
- Comitê de Bacia Hidrográfica Médio Paranapanema – CBH-MP
- Empresa Brasileira de Pesquisas Agropecuárias – EMBRAPA, Jaguariúna

## **6. LOCAL GOVERNMENTAL ORGANIZATIONS**

Paraguay -- Gobiernos de los Departamentos Alto Paraná-Itapúa-Caaguazú-Concepción  
Uruguay -- Intendencias de los Departamentos de Salto y Paysandú

## **7. UNIVERSITIES**

### **Argentina**

- Universidad de Buenos Aires - UBA
- Universidad Nacional del Litoral - UNL/FICH
- Universidad del Centro - Instituto de Hidrología de Llanuras - UNICEN/IHL
- Universidad de la Plata - CISABA
- Universidad Católica de Santa Fe

### **Brazil**

- Universidade Federal de Goiás – UFG
- Universidade Federal do Mato Grosso – UFMT
- Universidade Federal de Minas Gerais – UFMG
- Universidade Federal de Uberlândia – UFU
- Universidade Federal do Paraná –UFPR
- Universidade Federal do Rio Grande do Sul-UFRGS/ Instituto de Pesquisa

### **Hidráulica-IPH**

- Universidade do Vale dos Sinos – UNISINOS
- Universidade Federal de Santa Maria – UFSM
- Universidade Federal de Santa Catarina – UFSC
- Universidade Estadual Paulista Júlio de Mesquita Filho – UNESP
- Universidade de São Paulo – USP
- Universidade Federal do Mato Grosso do Sul

### **Paraguay**

- Universidad Nacional de Asunción

### **Uruguay**

- Universidad de la República

## **8. NONGOVERNMENTAL ORGANIZATIONS (NGOs)**

### **Argentina**

- Asociación Latinoamericana de Hidrología Subterránea

- Instituto de Estudios e Investigaciones para el Medio Ambiente
- Comisión Desarrollo Sustentable Cuenca del Plata
- Fundación Ambiente e Recursos Naturales

Brazil

- Consórcio Intermunicipal de Desenvolvimento dos rios Miranda e Apa – CIDEMA
- Associação Brasileira de Águas Subterrâneas – Regional de Minas Gerais - ABAS/MG
- Associação Brasileira de Engenharia Sanitária – Regional de Minas Gerais - ABES/MG
- Associação Brasileira de Recursos Hídricos – Regional de Minas Gerais - ABRH/MG
- Associação Brasileira de Águas Subterrâneas – Regional do Rio Grande do Sul - ABAS/RS
- Comitê de Bacia Hidrográfica do rio Taquari – Antas
- Associação Brasileira de Águas Subterrâneas – Regional do Paraná - ABAS/PR
- Comitê de Bacia Hidrográfica do Rio Araguari
- Conselho Regional de Engenharia, Agronomia e Arquitetura – CREA/RS
- Fórum Gaucho de Comitês de Bacias Hidrográficas
- Instituto Biguá / Movimento Grito das Águas (ONG)
- Coalisão Rios Vivos (ONG)
- Fundação Educacional do Município de Assis - FEMA

Paraguay

- Ceamso
- Alter Vida
- Asociación de Geólogos del Paraguay
- Sociedad Paraguaya de Agua Subterránea
- Sobrevivencia – Apoyo Integral a Comunidades Nativas y Ecosistemas

Uruguay

- Asociación Soriano para la Defensa de los Recursos Naturales
- Centro Interdisciplinario de Estudio Sobre el Desarrollo
- Grupo Ñangapire
- Instituto de Ecología del Río Uruguay
- Comisión Técnica Mixta de Salto Grande

## 9. PRIVATE SECTOR ORGANIZATIONS

Paraguay

- Grupo Minero Guaraní
- Hidrógeno
- Sociedad de Estudios de la Tierra (SETI)

**Additional  
Annex 16**

**LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

**Letters of Endorsement**

The Letters of Endorsement have been received and are attached separately.

**Additional  
Annex 17**

**LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

**GEF STAP Review**

**TECHNICAL REVIEW**

**" Project for the Environmental Protection and Sustainable Development of the Guarani Aquifer System"**

Review carried out by:

Edwin D. Ongley PhD.  
Emeritus Scientist, National Water Research Institute  
Environment Canada

August 4, 2001

*The response to the STAP Reviewer's comments is presented below in italics and is organized according to numbering in the Reviewer's submission.*

**1. General Comments and Overview**

This Project Brief (PB) is especially well prepared, comprehensive, and contains all the information that one would expect in a GEF application. In some respects, the PB is perhaps too comprehensive as it tends to be repetitive. Also, certain points tend to get lost in the text. Given the size of the PB (88 pages), it would be improved with a Table of Contents.

*A Table of Contents has been included in this Project Brief.*

This technical review includes a focus on certain aspects that, in the opinion of this reviewer, require some brief explanation and which may serve to clarify these issues in the mind of the GEF Council.

The only significant deficiency in this PB is the absence of hard data on the problems of the aquifer. This leads to certain technical questions raised below. Recognising that the TDA will deal with this in greater detail, one might, however, expect a brief technical summary of what is known (and not known) about the aquifer, as a basis for justifying some of the actions proposed. (refer to section 4 below).

## **2. Relevance to GEF**

This project clearly fall within that set of criteria defined by International Waters. It is particularly gratifying to see a project come forward that is anticipatory rather than remedial in its major dimensions. This should be encouraged where important transboundary issues are in play.

## **3. Objectives**

The proposed objective are clearly stated and are entirely appropriate to the nature of the issue and the range of solutions that are realistic and implementable.

The objectives are well focused in the PB, and are certainly achievable given the caveats and implementation schedule proposed. The PB is particularly well focused on the scheduling of related activities and has a realistic view of what is achievable in the timeframe available. The Project proponents clearly have much experience in this area. There are no objectives that should be changed and none of consequence that should be added.

## **4. Approach**

The approach to this project (the six [+ administrative] components) is clearly defined and appears to be technically sound (given the absence of hard technical information in the PB). The implementation steps and related technical detail outlined in Annexes 1 and 2 seem reasonable.

As noted below, certain aspects of this approach would benefit from some explanation.

- a) The fact that the TDA is not listed in Annex 1 as a major activity seems strange (compare with the SAP which is clearly noted).
- b) It is not clear to this reviewer how the project components are sequenced relative to the production of the TDA and the SAP (ref. Annex 2, Component 2) which are, it seems, major outcomes of this project (one learns this on page 33).
- c) It would be useful to have an explanation of how the substantive components of this project differ from (or link to) what would be recommended in the SAP (once it is developed). In other words, some of the components are what one would expect to see in the SAP, but appear here to be implemented prior to development of the SAP.

For example:

Component One presumably, is critical to both the TDA and SAP, yet neither are mentioned on page 12.

Component Two: how does this differ from what one would expect as a recommendation of the SAP, when it is developed.

*4.a),b),c) One of the innovative concepts of this project is related to the fact that it does not only focus on studies and preparatory activities during the four years of its implementation, but that it provides some action from the beginning in order to maintain and maximize stakeholders' interest. This is in line with the recommendations at the First GEF International Waters Conference in Budapest in October 2000 during which it was pointed out that SAP and TDA formulation periods have been too long in a number of GEF-supported International Waters projects. It is especially reflected in components 1 and 5, which will provide more information about the aquifer system and help implement pilot activities. At the same time, it cannot be expected that within four years everything would be known about this large groundwater body, nor that a full institutional/legal framework would be in place. In fact, the project explicitly states that the objective is to reach a consensus proposal for such framework. Therefore the SAP will have to make use of the results of the different components, which will provide both lessons learned, identification of knowledge and action gaps, as well as needs for future financing of identified activities. The TDA is considered a part of the SAP process and therefore does not appear as a separate component in Annex 1. It is mentioned as a part of the SAP in both Annexes 1 and 2. It will, however, constitute a monitorable line item of its own in the terms of reference for the SAP.*

d. Transboundary Issue: The transboundary nature of this project seems to be based mainly on the fact that the aquifer is shared by four countries. However the project document does not demonstrate that there is, in fact, a transboundary threat or to what extent a common approach to management is essential. The real question, and which presumably will be answered in the TDA will be the extent to which threats in one country (e.g. groundwater contamination around Sao Paulo) have the potential to damage quality and quantity in adjacent countries. This seems to be assumed in the PB. A common management approach is only required when it can be demonstrated that a threat in one country constitutes a threat in adjacent countries. If this cannot be established, then a common approach to monitoring and evaluation would be the main focus.

*4 d) It has been established through technical studies that clear transboundary issues exist in the border areas of Argentina/Uruguay (well yields are diminishing and some cross border disputes are apparent due to the importance of these geothermal wells for tourism) and Uruguay/Brazil (pollution between sister cities across the border). The nature of the aquifer system, i.e. very large volumes of mainly confined aquifer storage compared to significant – but smaller and much more localized – volumes of active recharge, mean that there is a possibility that major development could provoke large drawdowns with the potential for conflict between competing users. This is the more significant, given the fact that the most valued exploitation is in the form of 'overflowing geothermal wells' and conservation of such artesian heads is managerially more demanding than normal aquifer management.*

*In addition, the recharge area in Paraguay, bordering Brazil and Argentina, is a potential area for transboundary impact. These three areas have been included as Hot Spots to be addressed by the project. In addition, the area of São Paulo is the one experiencing the most extraction and pollution in the entire aquifer system area. While it is highly unlikely that pollution in São Paulo would reach the other countries, the technical and institutional assessments have shown that this area can provide important lessons in terms of decentralized management and monitoring approaches. All four countries agree that the institutional management framework for the Guarani Aquifer System needs to be as light as possible, precisely due to its size. Therefore it will be necessary to test which types of measures will work in border areas and also in areas of significant national importance. This information has been added to the Project Brief.*

Other related environmental issues:

e. Surface and Groundwater linkage: The linkage between this project and surface water management is important, especially in the context of an absence of common management practices (especially in water quality management) for the Paraná River Basin which is also common to all four countries and overlies, more or less, the Guarani Aquifer. Also, some countries, such as Argentina, have very poorly developed legal approaches to water quality objectives or standards for controlling effluents for surface water. How will this lack of a legal framework for surface water management affect this much more complex task of developing legal criteria for managing groundwater? Have the proponents of this project considered what linkages are necessary between surface and groundwater management at the transboundary scale in order to ensure success of this particular project? More pointedly, can the groundwater component proceed in the absence of a suitable parallel framework for surface water quality management? The linkage between this and other CAS projects has not been made.

A related issue is the linkage between increasing use of groundwater when, in fact, there is much surface water. Is better surface water management part of the solution? It seems hard to image that surface water management will not be part of the overall management plan.

*4 e) 90% of the Guarani Aquifer System is confined and 10% constitute recharge areas. Thus, given the geomorphology and hydrogeology of the area there are few locations where surface watercourses are recharging the unconfined aquifer system. For this reason the interaction between ground- and surface water is strongly limited in most of its reach. It means that management can be tackled semi-independently of that of surface water. One of the results of the project, especially Component 1, will be a clearer knowledge about the recharge areas, which are not completely defined as yet. A major effort will be made, for instance, in the border area in Eastern Paraguay to model surface/subsurface interactions. It is anticipated that these results will provide the information necessary to design appropriate mechanisms for the interaction with relevant surface water areas. – An issue of importance is the role and significance of the aquifer system in providing baseflow to river systems (especially the Rio Uruguay) and sustaining wetlands in Misiones and Corrientes Provinces of Argentina, which is an important unknown in terms of transboundary waters, but will be under investigation in the project.*

f. Perhaps I missed it, but I do not see reference to the determination of allowable (sustainable) yield as one of the main technical outputs.

*4 f) Given the complexity of this aquifer system, quantity is an issue in some parts (e.g. Uruguay/Argentina; São Paulo), but less in other – less developed – parts. Based on the technical assessments to be carried out during the project, sustainable yield estimates would be one of the outputs for subareas of concern.*

g. The reference to a GIS system (e.g Annex 2 : Component 2b) should focus on an Information System and not a GIS system. GIS is only one of the necessary tools in such a system. For example, GIS does not handle documents (required in this project); GIS does not do decision-support (undoubtedly will be required). GIS systems are poor at numerical analysis and numerical modelling (required for this project).

*4 g) In Spanish/Portuguese, the Information System will actually be called SISAG (Sistema de Información del Sistema Acuífero Guaraní), for the reasons correctly pointed out by the reviewer. This has been adjusted in the Project Brief.*

h. Beneficiaries: I did not see any reference to use of the aquifer for agricultural (irrigation) purposes. Perhaps there is no such use. If there is, then this use should be identified and quantified, as it may be the most intractable management issue. A related issue is the contamination of groundwater by agriculture, especially by nitrogen which is usually the most widespread of groundwater contaminant in America and Europe.

*4 h). This issue will be addressed in Component 1.4 (see Annex 1) “Water quality is assessed and pollution patterns distinguished in terms of the origin, impacts and ways to remediate pollution”. As mentioned in the same paragraph, this will also include recharge/discharge areas where irrigation may play a major role.*

i. Annex 13 – Root Cause - issue is not that WB has/not a policy on groundwater, but what are the institutional frameworks that already exist elsewhere and which may work here. Reference to the UN’s transboundary water convention would be useful.

*4 i) The fact that the World Bank does not have a policy on groundwater was mentioned in the context of useful lessons to be learned from this project as to future endeavors in other countries, in which the World Bank may be involved. It is not mentioned as a root cause. As to general international legal frameworks, the UN transboundary water convention is only of limited use, given that it does not include confined aquifers. As previously noted, the Guarani Aquifer System is 90% confined and only 10% free, thus constituting a hybrid case, for which innovative measures will have to be sought. The guidance from the Convention will be taken into account as appropriate.*

Root Causes (Para 4) : these are almost never quantifiable and it would be unwise to offer this as an output. In some respects, the “root cause” analysis is less appropriate for this study, than a “threat analysis” in that the system seems to be not yet severely impacted.

*4 i) The correct wording should have been “The root causes of existing and potential problems will be identified during this project.” The sentence has been corrected in the present Project Brief.*

j. Transboundary Diagnostic Analysis (TDA). This is a key activity that is too often done poorly. A high degree of rigour, discipline, and technical oversight, needs to be brought to bear on this activity. This activity should lead to a “threat analysis” and not solely to a diagnostic analysis (what, where, when).

*4 j) See response to comments 4 a),b),c)*

k. Process Indicators:

- What is the probability of obtaining a four-country agreement on management of the Aquifer?
- “the existence of a functioning monitoring network” - this needs to include an harmonized

monitoring network based upon agreed priorities and using modern principles of groundwater quality monitoring. (not so easy as it sounds as it includes, amongst other things, international acceptance of a common standard for data quality).

- While a legal framework is required, an indicator should reflect the willingness of the participants to enforce this legal framework (legal frameworks are common in Latin America, but willingness or ability to enforcement is less so).
- Following the TDA there needs to be some assessment of the capacity (technical and institutional) of each country to carry out the work that is identified, and what capacity development may be necessary to overcome any identified deficiencies. As an example, Brazil is said to have the technical capacity to analyze only 30% of the active ingredients of pesticides used in that country.

*4 k) The probability that the countries will come to a consensus proposal is high. Given that the final adoption of any legal framework is dependent on the governments and legislature of each country, the project does not have the actual adoption as one of its outputs. It will be one of the challenges of the project to design a framework that is light and therefore feasible in order to increase the likelihood that legal and institutional agreements are followed up in practice. An important design feature of the project is to include subnational levels of government as well as other stakeholders (academia and other civil society groups). This is expected to help disseminate project results and hopefully generate pressure to comply with jointly agreed actions, such as joint monitoring standards. A capacity assessment was carried out during project preparation and a more in-depth assessment will be part of project implementation.*

l. Stress Reduction Indicators

“identified and quantified water quality threats and their evolution” - should this not be “*evaluation*” rather than *evolution*?

*4 l) Evolution in this context refers to forecasts about the future developments of these threats (stable, increasing, etc.)*

m. Environmental Status Indicators:

“implementation of an up-to-date, functioning GIS...” This should focus on an “information system” and not GIS per se. (or a GIS-based information system)

*4 m) See response to comment 4 g)*

## 5. Background Information

Annex 12 (Aquifer Description) – more detail would have been useful. This is very short and not very complete. Eg. in Annex 12 and 13, and elsewhere, document says that “significant pollution” is occurring -- A fuller description would have been useful. Eg. what is known about pollution of aquifer – microbiological (municipal, animal wastes)? industrial contaminants? (See para. 3.5.) Agricultural (especially N); etc. Root Cause analysis focuses on pollution status and degradation potential (Para. 3). Is this hearsay evidence or hard evidence? Or does it fall into the category that it has been said so many times that everyone believes it.

Generally, the PB provides little technical information nor cites informed sources to justify some of the central claims. This is NOT a major oversight insofar as detailed technical information is usually lacking in such situations, however something MUST be known about the aquifer in order to initiate country actions to involve the GEF on this issue.

*5. Further information on the aquifer characteristics has been added to Annex 12 of the Project Brief in response to this comment.*

## **6. Funding Level**

Relative allocation of funds amongst the various components seems reasonable, although I personally believe that not more than 10% of the total should be devoted to project management per se (here, 13%). The total amount seems reasonable given the major activities anticipated.

*6) Given the regional nature of this project (and large geographical area that it covers, with numerous local stakeholders) the project coordination activities are considered both critical to the project's success and necessary to be well funded in order to achieve their objectives. We feel that the proposed allocation is well justified based on the needs of this type of project.*

What is the potential of default by Argentina on promised counterpart funding under this economic climate?

*The project will be included in the national budget. In addition, a significant part of Argentina's contribution will be in kind.*

## **7. Innovation**

The action of developing an international management plan for a major aquifer will be truly innovative, and will provide a useful example for other similar problems world-wide.

The fact that the GEF does not fund research, the need to gather information and carry out investigations is an ESSENTIAL part of this project. It is this reviewer's opinion that many GEF projects suffer because of an assumption that new knowledge is not needed to bring the project to a successful conclusion. It is gratifying to see that a significant proportion of the budget is targeted to this activity.

*(This summarizes comments which have been responded to above).*

## **8. Strengths/Weaknesses**

The greatest strength of this project is the ability to take proactive action against future degradation threats.

In my view, the PB is mainly weakened by the lack of evidence to support the supposition that there are threats (especially contamination issues) which are transboundary in nature. Also, the

lack of linkage with surface water quality management would appear to be a weakness. Neither of these are, however, reason to cause the proponents to develop a new strategy – only that some explanation would improve the quality of this proposal.

## **9. Conclusion**

This is thoughtful, comprehensive, and well designed project. The proponents are to be congratulated. The risks are transparent and manageable. While some limited weaknesses are apparent it is highly likely that a brief explanation will put these matters to rest. This is an excellent example of use of the GEF for pro-active purposes and should be greatly encouraged.

**Additional  
Annex 18**

**LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

**Component 5: Development of Management and Mitigation Measures within Identified “Hot Spots” - Detailed Description**

**Background**

The objective of this component is to establish and test local groundwater management practices, which will be carried out according to sustainability and environmental protection criteria in transboundary areas in which conflicts already exist or may potentially arise. The pilot projects involve the generation and analysis of new and more in-depth data through a broad spectrum technical, scientific, institutional, legal and educational activities as well as communication and public participation in selected Hot Spots of the Guarani Aquifer System. The results of the pilot projects will permit to detail and reorient future steps of the project, and will provide replicable experiences to the benefit of other localities in the Guarani Aquifer System and other groundwater areas worldwide.

Component 5 consists of 4 subcomponents, one for each Pilot Project, each one with its own phases, arrangements and tasks. Two of these, the pilots in the Hot Spots of Concordia/ (Argentina) and Salto (Uruguay) as well as Rivera (Uruguay) and Santana do Livramento (Brazil) will be carried out through umbrella consultancy contracts, one each for technical/scientific studies and services, and for public participation and environmental education.

The Pilot Project in eastern Paraguay will be developed in cooperation with the BGR. In this case, the National Project Executing Unit of Paraguay will define the pilot area jointly with the BGR and the Guarani Secretariat to maintain coherence with the overall project and in order to define the public participation, social assessment and environmental education activities, which will be carried out through the project itself.

For the Pilot Project in Ribeirão Preto, Brazil, the project's input will focus on social assessment, public participation and Technical Assistance to develop aquifer management structures while the technical and scientific investments have already been made or are on-going through in-country and bilateral arrangements.

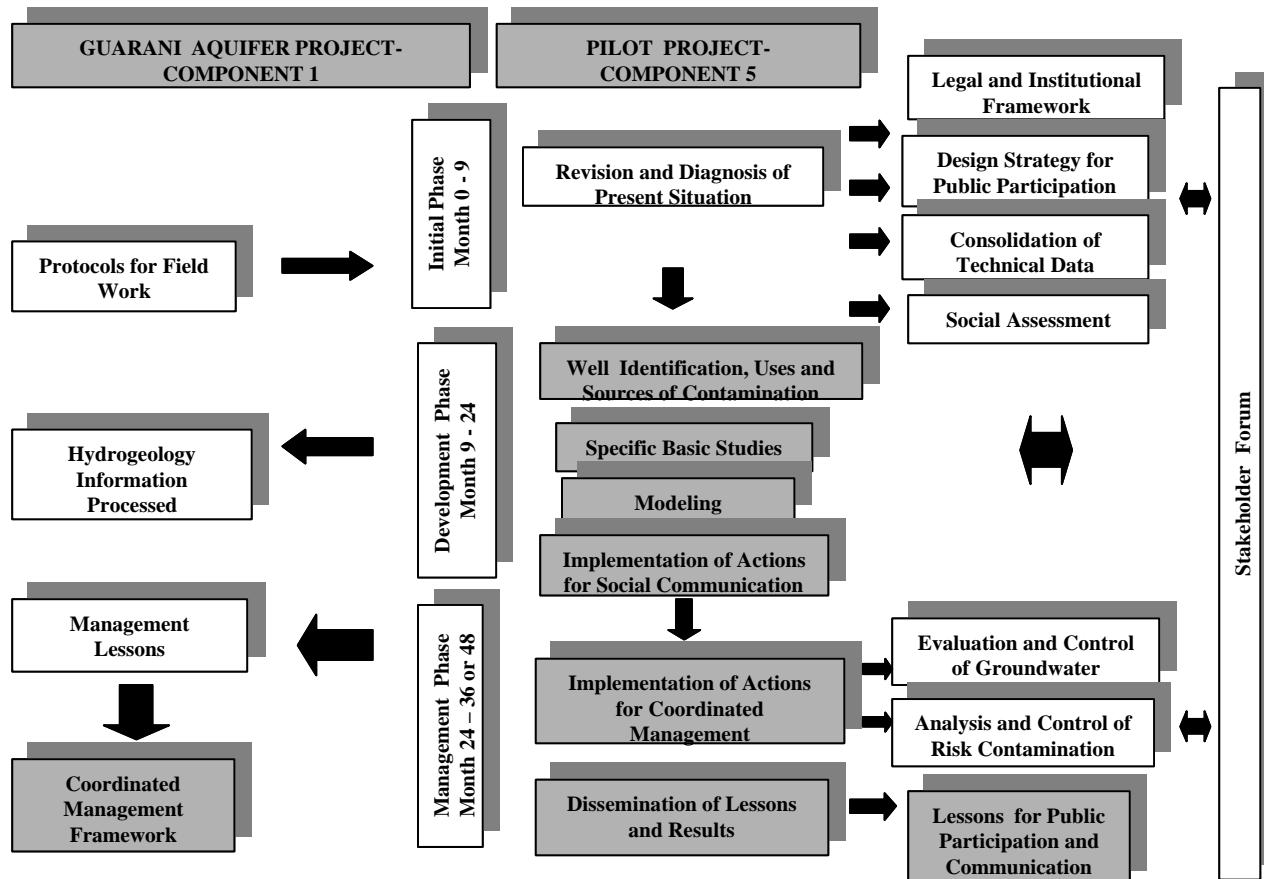
The integration of the actions in the case of all contracts will be defined in their respective TORs. It will be the responsibility of the Guarani Secretariat, in close cooperation with the national coordinators to maintain coherence and complementarity of the components while making sure that investments are adapted to local needs.

There is an important interaction between Component 5 and the aquifer system wide Component 1. Figure A18-1 presents the interrelationships between activities of Component 1 and Component 5 during the implementation period of the project. It also permits to identify the

production of information required through Component 1, which is necessary for the development of technical studies foreseen in the Hot Spots. The Figure also illustrates the activities and support that the studies and experiences provide in the pilot areas for the overall Guarani Aquifer System.

This set-up makes clear that through the pilot projects activities, which are more closely linked to local conditions, information will be generated to define the concrete objectives for management and subsequent actions at the overall Guarani Aquifer System level.

Figure A180-1:



### Description of Pilot Project Activities, Sequencing and Tasks

#### 1.a Concordia (Argentina) / Salto (Uruguay)

The area, which has numerous deep wells, is subject to major, current and potential hydrothermal exploitation of the aquifer. It is located on both banks of the Uruguay River which separates both countries, with its center in the cities of Concordia and Salto and covering territories of the Province of Entre Ríos (AR) and the Departments of Paysandú, Salto and Artigas (UY).

This pilot project's objective is to prepare and test in situ methodologies and processes for the identification, design, implementation and sustainable participatory management of the thermal

zones of the Guarani Aquifer System in the confined zone adjacent to the Uruguay River in both countries. The area has been designated as a Hot Spot in light of current and potential exploitation trends stemming from intensive and diversified uses, which may be replicated and applied in other similar areas of the SAG. Secondly, the development of the pilot project in this area is strongly related to the geothermal assessment activities planned for component VI.

#### (1.a.1) Planning Stage

The objective of this planning stage is to collect all existing information, perform a diagnostic and define the groundwork for the implementation and management needed for the subsequent stages. It will have a duration of six to nine months. It will be carried out in close coordination with regional activities to characterize the aquifer, such as establishment of a monitoring network and implementation of a regional information system for the Guarani Aquifer System. The following tasks will be performed:

- Management and coordination of the pilot project's technical, scientific, legal and institutional tasks
- Evaluation of existing activities, diagnostic and definition of strategies
- Preparation of basic cartography and linkage with SISAG
- Analysis of existing managerial, legal and institutional framework
- Organization of workshops and meetings to enable public participation
- Social assessment
- Design and establishment of a participatory management scheme

#### (1.a.2) Development Stage

Development of a database on the local system that is sufficient to provide the basis for analyzing options and identifying preventive management actions. It will complement the existing level of knowledge regarding the geology, stratigraphy, hydrogeology and hydrochemistry in the pilot area, of the current and potential land and aquifer uses as well as sources of contamination. It will have an estimated duration of 12 to 15 months. The following tasks will be performed:

- Identification of wells and water uses and sampling
- Geological and Geophysical Studies
- Hydrogeological Studies
- Hydrogeochemical Studies
- Hydrogeological and Hydrogeochemical Modeling
- Analysis of the local aquifer sub-system behavior due to current and potential uses, assessment of their environmental impacts and risks
- Organization of workshops and public meetings
- Preparation of partial and final reports for broad dissemination
- Design and implementation of participatory communication actions

#### (1.a.3) Management Stage

During the management stage, an analysis will be made of indicators related to the achievement of project objectives, and actions for their follow-up, linkage and dissemination under the scope of

the general SAG project will be identified. The duration will be from 12 to 15 months, during which time the following tasks will be performed:

- Preparation and development of proposals to implement management measures, actions and instruments, including
  - (i) Development of well protection measures
  - (ii) Establishment and/or strengthening of a local monitoring network
  - (iii) Development of management options
  - (iv) Organization of workshops and public meetings.
- Design of a pilot project monitoring indicators
- Design of a project for project dissemination and extension
- Preparation of partial and final reports for broad dissemination

Total sub-component cost: US\$ 1,344,600.

#### ***1.b Rivera(Uruguay) / Santana do Livramento (Brasil)***

Located on the frontier dividing Brazil (State of Rio Grande do Sul) and Uruguay (Department of Rivera), Livramento and Rivera are sister cities with intense exchanges and constitute the largest urban center in the sandstone outcropping zone, which is located from north to south in the central region of Rio Grande do Sul and Uruguay, containing Guarani Aquifer System waters (Botucatú in Brasil and Tacuarembó in Uruguay). Due to agricultural and cattle raising activities as well as small commercial and service industries, the area has a significant demand for water, most of it supplied by the Guarani Aquifer System. This has led to risks of localized and dispersed urban and industrial contamination in the recharge zone.

The pilot project's general objective is to prepare and test methodological developments for the identification, design and participatory management of criteria, guidelines and instruments for the sustainable management and protection of the Guarani Aquifer System in outcropping zones and nearby confined areas, in relation to the potential risks of urban, industrial and agricultural contamination and of conflicts of use due to intensive extraction. The results and experiences may be replicated and applied in other aquifer areas with similar characteristics, under the framework of the integrated ground- and surface water management and of joint management of quality and quantity

##### **(1.b.1) Planning Stage**

The existing data needed for the proposed pilot will be collected, including at least a climatological and hydrological, geological, hydrogeological, hydrochemical, hydrodynamic characterization, sources of contamination, and soil uses. Based on such data, a diagnostic will be made, which will identify the major gaps in technical and scientific knowledge about the aquifer system and its management in the Hot Spot region. This stage will have a duration of 6 to 9 months and will include the following tasks:

- Management of the pilot project's technical, scientific and institutional tasks

- Evaluation of existing actions, diagnostic and definition of strategies
- Preparation of basic cartography
- Analysis of existing managerial, institutional and legal framework
- Organization of workshops and sectoral meetings and participatory social assessment
- Design and implementation of a participatory management scheme for the development of the pilot project

(1.b.2) Development Stage

Development of a database on the local system that is sufficient to provide the basis for analyzing options and identifying preventive management actions and complement the existing level of knowledge of the local SAG . It will have an average duration of 12 to 15 months and include the following tasks:

- Inventory of wells and uses
- Inventory of sources of localized and scattered contamination
- Geological and geophysical studies
- Hydrogeological studies
- Hydrochemical studies
- Conceptual and computerized hydrogeological modeling
- Analysis of current/potential water uses and risks of conflict
- Organization of workshops and sectoral meetings
- Design and instrumentation of social communication and environmental education actions

(1.b.3) Management Stage

During the management stage, an analysis will be made of indicators of the achievement of pilot project objectives, and actions will be identified for their follow-up, linkage and dissemination under the scope of the general Guarani Aquifer Project in the 12 to 15 months in which they will be carried out:

- Preparation and development of proposals for the implementation of identified management measures and actions.  
This task will seek to identify, design and propose management criteria, measures and instruments for the sustainable use and protection of the non-confined to confined aquifer systems, aimed at this resource in the recharge area. As a follow-up action, this task will seek to identify technical guidelines and regulations, draft laws, decrees and regulations and other concurrent actions at governmental, non-governmental, user and private sector level in general. The management instruments to be implemented include:
  - (i) Development of Well Protection Measures
  - (ii) Mapping of Vulnerability
  - (iii) Establishment and strengthening of local monitoring network
  - (iv) Studies of management scenarios
  - (v) Organization of workshops and sectoral meetings.
- Design of a project to monitor indicators

- Design of a product dissemination and extension project
- Preparation of partial and final reports for broad dissemination

Total sub-component cost: US\$ 1,474,600.

#### *1.c Encarnación – Ciudad del Este – Caaguazú*

The border corridor between Paraguay and Brazil/Argentina overlies part of the Guarani Aquifer System, between the large development centers in the eastern region, namely Ciudad del Este and Encarnación. It is a large zone of groundwater recharge, discharge, sandstone outcroppings and basalt cover with large direct faults, exposed to contamination from biocides and agricultural fertilizers (due to the agricultural expansion that has taken place). Therefore risk exists due to the potential of urban and industrial irrigation in the region. This Pilot Project will provide critical information regarding such areas in the Guarani Aquifer System and address concerns with regard to its vulnerability to human disturbance. The exact sub-area for the Pilot Project will be defined by project effectiveness.

The Government of Paraguay, in cooperation with BGR, will conduct a series of specific, trans-border technical studies with the objective of evaluating the needs and potential for improved management and the protection of groundwater in a non-confined aquifer, as well as its relationship with the confined aquifer. These studies will be carried out in the first two years of the project execution phase and may subsequently be extended to adjacent areas, including areas in neighboring countries.

This pilot will take place in two phases:

**Phase (1):** In the first two years, emphasis will be placed on data gathering, conceptual and mathematical modeling of the aquifer and the recharge area in the western part of Paraguay. This will be undertaken with Technical Assistance from the German Government (BGR – Bundesanstalt fuer Geowissenschaften und Rohstoffe).

Specifically, activities will include

- an inventory of wells and uses
- inventory of sources of localized and dispersed contamination
- geological and geophysical studies
- hydrogeological studies, and
- conceptual and computerized hydrogeological modeling.

The results expected in this pilot project will be of importance in the regional context of the Guarani Aquifer System since they deal with key areas, with relatively little existing information. The inputting of data in a database, thematic maps to SISAG, will be ensured by Paraguay's National Project Execution Unit, in close collaboration with the Guarani Secretariat.

In addition to the above technical studies, an in-depth participatory social assessment will be

undertaken in the area. As outlined in Annex 12, this activity will include a specific focus on indigenous groups. The social assessment will provide the basis for appropriate involvement of stakeholders for Phase 2.

**Phase (2):** Based on the expanded knowledge about this aquifer area acquired during Phase 1 activities, public education and participation activities will be designed and implemented in years 3 and 4 of the project. The extent and nature of these activities will depend, *inter alia*, on the results regarding aquifer vulnerability in the area due to recharge and possible pollution patterns.

Total sub-component cost: US\$ 552,100.

**1.d Ribeirão Preto (Brazil)**

From an environmental standpoint, this area is highly critical. The intensity of the aquifer's exploitation and the risks of contamination in the outcropping region distinguish it from other zones in Brazil and the rest of the region. The area is located in the northeastern part of the State of São Paulo, in the municipality and city of Ribeirão Preto. The program is of great importance because of its coexistence in a critical zone, the intensity and diversity of uses, pollution conditions and the recharge zone, and it is thus aimed at mitigating negative effects on waters flowing to other regions and countries. Therefore, it is a comprehensive pilot program that is of interest to the four countries.

Significant investments in local aquifer description and modeling have already been carried out in this area. Using this information base as a starting point, GEF financing will be made available for the Ribeirão Preto pilot project with the objective of encouraging public participation in the development of aquifer management in this Hot Spot.

Activities to be financed would include (i) participatory social assessment, (ii) information dissemination, including education materials, (iii) consultations and (iv) Technical Assistance related to local aquifer management planning.

This pilot project is characterized by its strong counterpart financial support, including through existing bilateral agreements, and high level of accountability for execution and follow-up, attitudes which had already been taken and faced by federal and state governments through their management agencies and development programs.

Total sub-component cost: US\$ 359.600.

## **Additional Annex 19**

### **LATIN AMERICA: Environmental Protection and Sustainable Development of the Guarani Aquifer System Project**

#### **Project Monitoring and Evaluation**

##### **A. Project and system objectives**

The stated long-term project objective is the sustainable, integrated management and use of the Guarani Aquifer System. The proposed project would contribute towards achievement of such objective by providing support to the four countries involved in jointly elaborating and implementing a common institutional and technical framework for managing and preserving the aquifer for current and future generations. The purpose of the project's monitoring and evaluation system is to allow project management to oversee project activities and check on progress made toward achievement of physical, financial and development targets.

##### **B. System description**

###### **B.1. Conceptual basis**

Given the decentralized nature of project activities, adequate monitoring will be essential for efficient project implementation. In order to provide effective supervision of activities implemented, as well as an assessment of the outcomes and possible impact of project interventions, a comprehensive Operational Monitoring and Evaluation System (OM&ES) will be established. It will be coordinated by an area at the central level within the General Secretariat that would be specially created to undertake responsibility for overall project operational M&E. This special area will work in close coordination with the NPEUs (the operational branches of the Secretariat at the country level) and other implementing agencies for data gathering, recording, processing, sharing and disseminating, as well as for project monitoring at the local level. A computerized Management Information System (MIS) will be set in place to provide the necessary technical support for efficient data recording and information processing and sharing.

The MIS will not only encompass the technical and data processing support for the operational aspects of project implementation, but it will also provide lateral links to other project outputs like the GIS and aquifer monitoring systems (described elsewhere) and forward links to the project Web page, so that the information generated would be readily available and disseminated to all parties involved. Thus, the operational monitoring and evaluation carried out in Component IV is a horizontal activity that transects all of the project components, including the activity of the aquifer monitoring system included in Component I, to which is closely linked and whose outputs utilized for project monitoring and evaluation purposes.

###### **B.2. System structure**

Strictly from an operational point of view, the *structure* of the MIS would cover three different areas: programming and administration (PA); physical and financial monitoring (PFM); and

performance evaluation (PE). The OM&ES would enable tracking of inputs and outputs from project activities, as well as their outcomes. This would be accomplished through the use of a set of indicators (see Table A19-1) belonging to two main groups, general performance (physical, financial and development performance including input, output, outcome, process and impact indicators) and environmental performance (including stress reduction and environmental status indicators).

The quantitative and temporal elements of performance indicators, along with the full and schematic Project Implementation Plan (see appendix A19-1) will allow the executing agency, in collaboration and coordination with the Secretariat and the NPEUs, to prepare annual operation plans, budgets, work plans and implementation schedules, and control adequate and timely supply of inputs, completion of activities and delivery of project products. In addition, during project implementation efficacy indicators could be developed and used if found appropriate, thus completing the conceptual basis for the M&E framework. M&E activities would be based on the first two groups of indicators, while the third group could be developed and used for management purposes by the unit within Secretariat responsible for the technical oversight of the project.

### B.3. Main activities

*Monitoring.* Tracking of project activity progress would be based on a group of physical-financial process indicators (PFM). The MIS-PA module would support preparation of the Annual Operating Plans (POAs), to and provide the necessary background information to assess implementation progress. The MIS-PFM module would provide the necessary up to date information to allow monitoring of project physical and financial implementation, and also to verify that implementation is consistent with the rules and criteria included in the Project Manual.

*Evaluation.* Evaluation of overall implementation performance and development impact of project activities would be coordinated by the Secretariat and its inputs and outputs would be contained in the MIS-PE module. Evaluation would involve miscellaneous activities of different scope, including assessment of physical and financial implementation performance based on the comparison of programmed target and actual values of a set of input and output indicators. This would be coupled with development evaluation activities based on particular studies focused on a complementary set of outcome, process and impact indicators, to determine the specific results and impacts attained by the activities financed by the project. Furthermore, the MIS-PE module would contain the information regarding achievement of development objectives. Information would come from two different areas of activity: a continuous evaluation area and an independent system encompassing the performance evaluation activities *per se*. *Continuous evaluation* would be closely associated to the monitoring system and it would be based on the evolution of a small group of indicators of “potential development” based on known relationships between activities’ outputs and development impacts. Actual *global evaluation of development impact* would be based on a series of studies, including a baseline study, as well as midterm and final evaluation reports. These activities would allow, in the medium term defined by the project life, to measure trends toward attainment of the development objectives defined at the outset both for the different components and for the project as a whole.

In coordination with other project-related meetings, Secretariat would conduct annual participatory monitoring and evaluation meetings with representatives of the NPEU's and other institutions and organizations involved with the project. This would allow not only ample feedback about project implementation progress in the eyes and opinions of all parties involved, as well as provide the basis for a participatory mechanism to conduct adjustments to project implementation as needed, as well as a mechanism to disseminate achievements of project implementation.

### C. Management Information System

The system would allow the Secretariat to collect and process information uniformly and periodically on the set of indicators needed by the M&E system to achieve its objectives. Indicators would be divided into two main categories: a) general –physical/financial/development-performance (divided in up to five categories: input, output, outcome, process and impact); and b) environmental performance (divided into two categories: stress reduction and environmental status), plus an optional third category, c) efficacy (divided into two categories: efficiency and effectiveness) thus providing the conceptual basis for the M&E framework. M&E activities would be based on the first two groups of indicators, while the third group could be developed and used by the different implementation sectors for management purposes.

The MIS system and associated indicators structure would help Secretariat: support monitoring and evaluation efforts of the executing institutions; compile and prepare reports required by the Bank for administrative and monitoring purposes; and produce implementation progress reports that would be submitted to the Bank twice a year, in time for the biannual Bank supervision missions.

*Project monitoring.* The Project Monitoring Plan would be based on the POAs. Besides, diagrammatic POAs will be produced based on the structure agreed for the schematic Project Implementation Plan, and would basically show in matrix format, the tasks planned for implementation during the year, the period during which each task would be implemented, the timing and amount of physical output expected from each task, as well as the timing and amount of expenditures associated with each task. Based on this tool, the Secretariat will be able on a monthly basis to review physical and financial implementation progress with the NPEUs, and take corrective actions as necessary.

*Evaluation of Project Implementation and Impact Performance.* The evaluation of the overall implementation performance and development impact of the project would be coordinated by the Secretariat. It would involve different areas of activity, including; evaluation of project implementation performance, and both continuous and global evaluation of development impact. In all, these activities would entail the assessment of physical and financial implementation performance based on input, output and outcome indicators, coupled with specific evaluations based on a complementary set of performance indicators, to determine the specific outcomes and impacts attained by the activities to be financed by the project.

Information regarding attainment of development objectives would come from two different areas

of activity: a continuous evaluation area and an independent system encompassing the performance evaluation activities per se. *Continuous evaluation* would be closely associated to the monitoring system and it would be based on the evolution of a small group of indicators of “potential development” based on known relationships between activities’ outputs and development impacts. Based on the information about these indicators the MIS would allow assessment of the project’s ability to achieve its proposed development objectives. Actual *evaluation of development impact* would be based on a series of studies, including a baseline, a midterm and a final evaluation study. These activities would allow, in the medium term defined by the project life, to measure trends toward attainment of the development objectives defined at the outset both for the different sub-components and for the project as a whole.

A list of basic physical implementation performance indicators to be monitored is provided in Table A20-1. Based on the set, a sub-group of selected key indicators would be developed, agreed upon during negotiations and included in the Project Implementation Letter. In addition, it is expected that initially undefined targets as well as other indicators and their targets will also be defined during project implementation, as results from the studies financed become available and consensus is reached with regards to new lines of action and goals to be pursued.

*System reporting:* The Secretariat would be responsible for the preparation of the following types of progress reports:

Annual budget and work plans would be produced, no later than December 15 of each year, describing all project activities to be done in the subsequent year along with their corresponding budgets.

Semiannual reports on all project activities in the previous six months would be produced no later than July 15 of each year. The reports would have a format and coverage acceptable to the Bank, including presentation of project implementation indicators. The reports would basically contain a physical and financial analysis along with an update of input, output and outcome indicators, stemming from a synthesis of MIS data, indicating implementation progress to June 30.

Annual reviews would be produced no later than January 31 of each year. The annual review would cover project implementation in the past year (to December 31) and analyze the proposed budget and work plan for the subsequent year with respect to the project’s implementation indicators and agree on any necessary changes in implementation. This Report would utilize the standard format of the semiannual Project Progress Report agreed upon with the Bank, but would include a summary of the status of all Project Performance Indicators; status of specific activities; compliance with procedures outlined in the Project Implementation Manual; and analyses and recommendations relevant for optimizing project implementation, based on technical studies.

Project midterm review report. A midterm review (MTR) of the project would be held to evaluate overall progress with project implementation, to assess results and to define measures to reorient the project as necessary. Data for the MTR would include all information about project expenditures and physical implementation progress. All data would be complete for the first 24 months of project implementation. Besides the quantitative data, the MTR report would also

include an overall project evaluation and individual program evaluations that would be especially carried out as part of the review process.

The MTR's function would be to evaluate the project's overall performance in terms of achieving its expected outcomes. The MTR would assist the governments of the four countries, the Secretariat and the World Bank in identifying positive experiences as well as problems occurring during the initial years of project implementation. This evaluation would recommend any adjustments required during the second half of project implementation. The MTR would evaluate the efficiency and effectiveness of project activities; the performance of the institutions involved in implementation; management performance; the supervision mechanisms and the MIS; the effectiveness of institutional strengthening and technical assistance activities; and the project's targeting mechanisms.

The MTR would be based on the management monitoring reports, the Semi-Annual and Annual Reports, technical studies and socioeconomic assessments. At negotiations, GOIC and Bank would agree: a) that the Secretariat would prepare a framework for the formulation of the TORs for the MTR; and b) to make necessary adjustments in project implementation as recommended by the MTR.

#### **D. Institutional Responsibilities and Organizational Arrangements**

The Secretariat would have overall responsibility for monitoring and evaluation efforts. Institutions participating in project implementation would collect data on agreed indicators regarding the activities they execute. The Secretariat would ensure that these institutions carefully record the required information in the central database, and monitor the respective institutional performances in project implementation. They would also be required to submit full periodic progress reports to the Secretariat, as well as other relevant project information.

The new centralized MIS would be developed and implemented, among other things, to collect and process data to monitor physical and financial progress of the project, as well as data for ongoing impact evaluation. The MIS would provide the basis for standardizing, coordinating, processing, consolidating and reporting the input and output data generated by the individual agencies involved in project implementation.

The new system would have a centralized data storage location at the Secretariat level, with decentralized data input and access features to avoid duplication of data recording efforts, maximize system usefulness at all users levels, and promote ownership of and commitment to recording of up to date quality data. Local level users would be able to use the data they collect to generate their own specific planning and monitoring information, but still share it with the central level who would use it for overall project planning, monitoring and evaluation purposes.

The Secretariat would also be responsible for leading the process to introduce any modifications needed to overcome constraints to adequate project implementation and to guide participating agencies to adjust their actions. Using MIS data, together with periodic controls on the performance of other participating institutions, field visits, etc., the Secretariat would have a good

understanding of the overall implementation of the project and its components and programs. Due to the comprehensive monitoring, the Secretariat would be able to quickly detect slower performing areas, identify the cause of the weaknesses, and take appropriate corrective measures. Annual participatory monitoring and evaluation meetings between the Secretariat and representatives of the NPEU's and other institutions and organizations involved with the project, would allow feedback from all parties involved, and provide the basis for a participatory mechanism to introduce adjustments to project implementation as needed.

The MIS would also provide a basis to validate the Annual Plans (APs), and facilitate the introduction of adjustments to those plans and their corresponding annual budgets.

#### **E. Indicators**

Tracking of project activity progress would be based on two different groups of performance indicators. The following table shows both groups of indicators and their associated targets.

**Table A19-1****Basic Physical Performance Indicators**

Indicator	Comp.	Unit	Target				
			Global	Year	Year	Year	Year
				1	2	3	4
<u>General Development Performance Indicators</u>							
<i>Input:</i>							
Annual project operating plans produced and agreed upon by the four countries by the month of November	P	#	4	1	1	1	1
Proofs of annual national budget allocations, contemplating counterpart funds in agreement with the project operating plans produced, by the month of December	P	#	16	4	4	4	4
UNEPs with a min. of one full time staff-person established	P	#	4	4			
Agreements with co-financiers finalized and signed	P	#	3	3			
Studies for Component 1 contracted to firms	1	#	10	8	2		
Minimum wells visited and sampled	1	#	1,000	400	400	200	
Studies for Component 2 contracted to firms	2	#	8	3	4	1	
Studies for Component 2 contracted to individuals	2	#	63	10	33	10	10
Computer equip. packages for GIS nodes purchased/installed	2	#	4				
Studies for Component 3 contracted to firms	3	#	6	1	5		
Studies for Component 3 contracted to individuals	3	#	2		2		
Studies for Component 4 contracted to firms	4	#	1	1			
Studies for Component 5 contracted to firms	5	#	9	9			
Studies for Component 6 contracted to firms	6	#	1		1		
Studies for Component 6 contracted to individuals	6	#	4		4		
TA consultancy contracts for Component 7 assigned to individuals	7	#	11	8	3		
Computer equipment packages for SG purchased/installed	7	#	6				
<i>Output:</i>							
Water sample analyses carried out	1A	#	1,000	400	400	200	
Isotope determinations and conclusions produced	1A	#	600	300	300		
Workshops on technical issues	1A	#	15	4	4	4	3
Incremental number of wells being monitored per year (cum.)	2A	#	184	36	148	184	184
SISAG modules installed	2B	#	4	4			
Workshops on Information System and Well Monitoring Network	2A/B	#	6	1	2	2	1
Events – seminars, meetings, workshops– held to improve water management (450 participants each).	2.C	#	9	1	2	3	3

Twinning Programs carried out by water managers	2C	#	40	5	15	15	5
Short Term TA consulting contracts for Water Mgmt. Institutions	2C	#	50	10	20	10	10
Training scholarships (program fees and stipends)	2C	#	50		20	20	10
Workshops and meetings held between stakeholders at multiple levels, to arrive at sustainable agreements	2D	#	16	4	4	4	4
Bi-annual workshops held for technical discussions, consultations and project progress information and feedback	3	#	32	8	8	8	8
Grant amounts (US\$) awarded to CSOs from the FGC	3	#	200,000	75,000	75,000	50,000	
Public monitoring workshops carried out	4	#	4	1	1	1	1
Comprehensive progress reports along with project result and performance reports, generated and disseminated	4	#	4	1	1	1	1
International events with participation of project/country stakeholders	4	#	4	1	1	1	1
Project annual workshops held after year 2	4	#	3		1	1	1
Stakeholder assessments in pilot areas carried out	5	#	4	4			
Scientific studies executed within the pilot project areas	5	#	30	10	14	6	
Geological, hydro-geological and hydro-geochemical maps available via SISAG	5	#	30		10	20	
Specific sub-regional digital hydro-geological models available for decision-making support	5	#	3			3	
Community communication programs implemented	5	#	4	4			
<i>Outcome:</i>							
Minimum percentage of all wells with water use, availability, quantity, and quality assessed by year 2	1A/2	%	70	50	70	70+	70+
Regional hydro-geological maps produced	1A	#	8	3	3	2	
Conceptual Models and Specific Hydro-geological Maps produced	1A	#	6	3	3		
Persons (government/universities/public utilities etc.) trained in improved water management	2C	#	4,000	400	900	1,350	1,350
Percentage of population in the aquifer region reached to heighten their awareness about the aquifer existence and importance by year 4	3	#	10				10
<i>Process</i>							
Multi-country agreement on the institutional and technical framework for the mgmt of the SAG, reached.	P (2C)	%					100
Trans-boundary Diagnostic Analysis, identifying the primary threats to the SAG, carried out:	P (2E)	%					
- initial diagnostic					100		
- final diagnostic							100
Strategic Action Program for the sustainable management of the aquifer, as defined in the PAD, developed.	P (2C)	%		25	50	75	100
Consensus proposal for a joint legal framework for the	2C	%.					100

management of the SAG set forth.							
Monitoring network implemented and functioning.	2A	%		100			
Mitigation and management measures regarding groundwater pollution and depletion in “hot spots” implemented and monitored.	5	%				100	
<i>Impact (initially non-targeted):</i>							
Pollution risks diminished or controlled.	P						
Overdraft risks diminished or stabilized.	P						
Risk of future inter-country groundwater conflicts diminished.	P						
Future mitigation and stabilization costs reduced	P						
<i>Environmental Performance Indicators</i>							
<i>Stress Reduction:</i>							
Operational communications campaign (with a defined percentage of the target population reached) implemented.	3(B,C,D )	%			30	60	100
Water quality threats identified, quantified and their evolution monitored.	1A, 2A	%		100			
Norms for well design, construction and maintenance issued taking into account sub-regional variations.	1B	%.		50	100		
Groundwater pollution and depletion in specific “hot spots” identified.	5	%		50	100		
<i>Environmental Status:</i>							
Goals, criteria and standards for the trans-boundary diagnostic analysis and sustainable management of the SAG, agreed upon:	P (2E)	%					
- for initial diagnostic			100				
- for final diagnostic						100	
SAG Western and Southern boundaries, recharge and discharge areas, surge zones and vulnerable defined.	1A	%		100			
Conceptual and mathematical models of the aquifer system completed.	1A	%			100		
Up-to-date, operative, shared Information System, implemented for trans-boundary information dissemination, decision-making support, and management of the SAG.	1B	%			100		

## C. Costs and funding

Component IV costs will total US \$ 0.48 million including a US \$ 0.26 million GEF contribution.

A sizeable portion of available funds (up to US \$ 0.2 million) will be destined to develop and implement the computerized MIS that will be the backbone of monitoring efforts for effective project implementation. However, up to 50% of the budget allocated will support information processing and dissemination of project results within and outside of the Guarani Aquifer System region. This effort will enhance capacity of human resources within local and regional government institutions and promote widespread disclosure of results and lessons learned, with a view to possibly replicate project results under similar conditions and circumstances elsewhere in the Guarani Aquifer System region and in other transboundary groundwater areas.

## Guaraní Aquifer Project - International Waters Mercosul (GEF)

### Draft Schematic Project Implementation Plan Component 1

Pre- eff.	Year 1												Year 2												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10			
1.- Expand\Consolidate Knowledge Base SAG																									
Prepare draft TOR for UC1																									
1.a.- Update\Disseminate CKB SAG																									
1.a.1.- Component Coordination Unit (UC1)																									
Select\contract UC1																									
Prepare documents																									
Call bids																									
Select																									
Contract\Install UC1																									
UC1 operation																									
1.a.1.(i)- Data integration and Research Plan																									
Task implementation period																									
Compile\Integrate info\prelim. diagnosis																									
Preliminary well location map																									
Final well location map and db for SISAG																									
Interim diagnosis																									
Final diagnosis, db for models and (PEA) Action Plan																									
1.a.1.(ii)- SAG Hydrogeological\dynamic Characterization																									
Task implementation period																									
Regional hydrogeological map																									
Iso-transmissibility\productivity maps; SISAG																									
1.a.1.(iii)- Recharge\transit\discharge Studies																									
Task implementation period																									
Maps based on output form 1.a.3																									
( regional potentiometric & flow network )																									
Rsr\vrchrg\dschrg estimates; regional maps; SISAG																									
Task implementation period																									
Produce maps																									
Regional rsr\vrchrg\dschrg estimates (input for iv,v,1.a.6)																									
1.a.1.(iv)- Surge Studies																									
Delimit surge areas, produce regional maps and tech. norms																									
1.a.1.(v)- Connection of Fractured Aquifers																									
Task implementation period																									
Preliminary diagnosis and action plan for study																									
Final report and Management Plan for connections																									
1.a.2.- Well Inventory and Survey																									
Contract processing																									
Prepare documents																									
Call bids																									
Select																									
Contract																									
Task implementation period																									
1.a.2.(i)- Data Compilation and Analysis																									
Workshop: field work protocols																									
Inventory and preliminary db																									
1.a.2.(ii)- Field Survey (input for 1.b.)																									
Complete survey: final db and samples																									
1.a.3.- Geology and Geophysics																									
Contract processing																									
Select and contract consultancy to prepare TORs																									
Prepare TORs																									
Prepare documents																									
Call bids																									
Select																									
Contract																									
Task implementation period																									
Opening workshop and Action Plan																									
Test W & S SAG limits																									
Data compilation and diagnosis																									
Produce maps																									
Map & delimit SAG in Paraguay																									
Data compilation and diagnosis																									
Produce maps																									
SAG tectonic structure and geometry																									
Data compilation and diagnosis																									
Produce maps																									
Closing workshop																									
Prepare TOR																									
Contract Task																									
Task implementation period																									
Produce preliminary report																									
Produce final report																									



