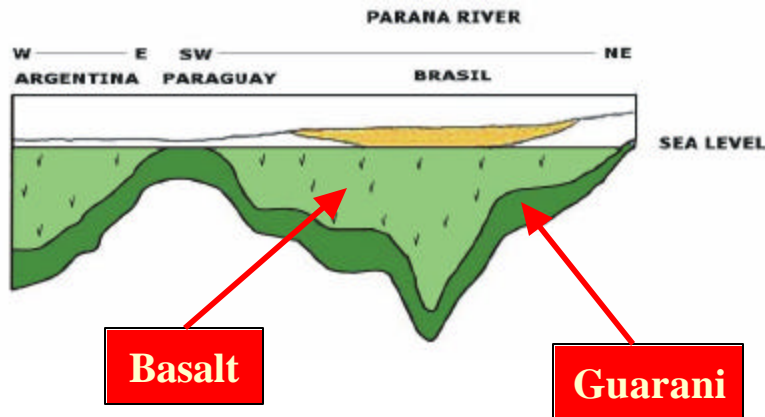


The Guarani Aquifer System: A key element for an Integrated Water Resources Management Strategy in La Plata Basin

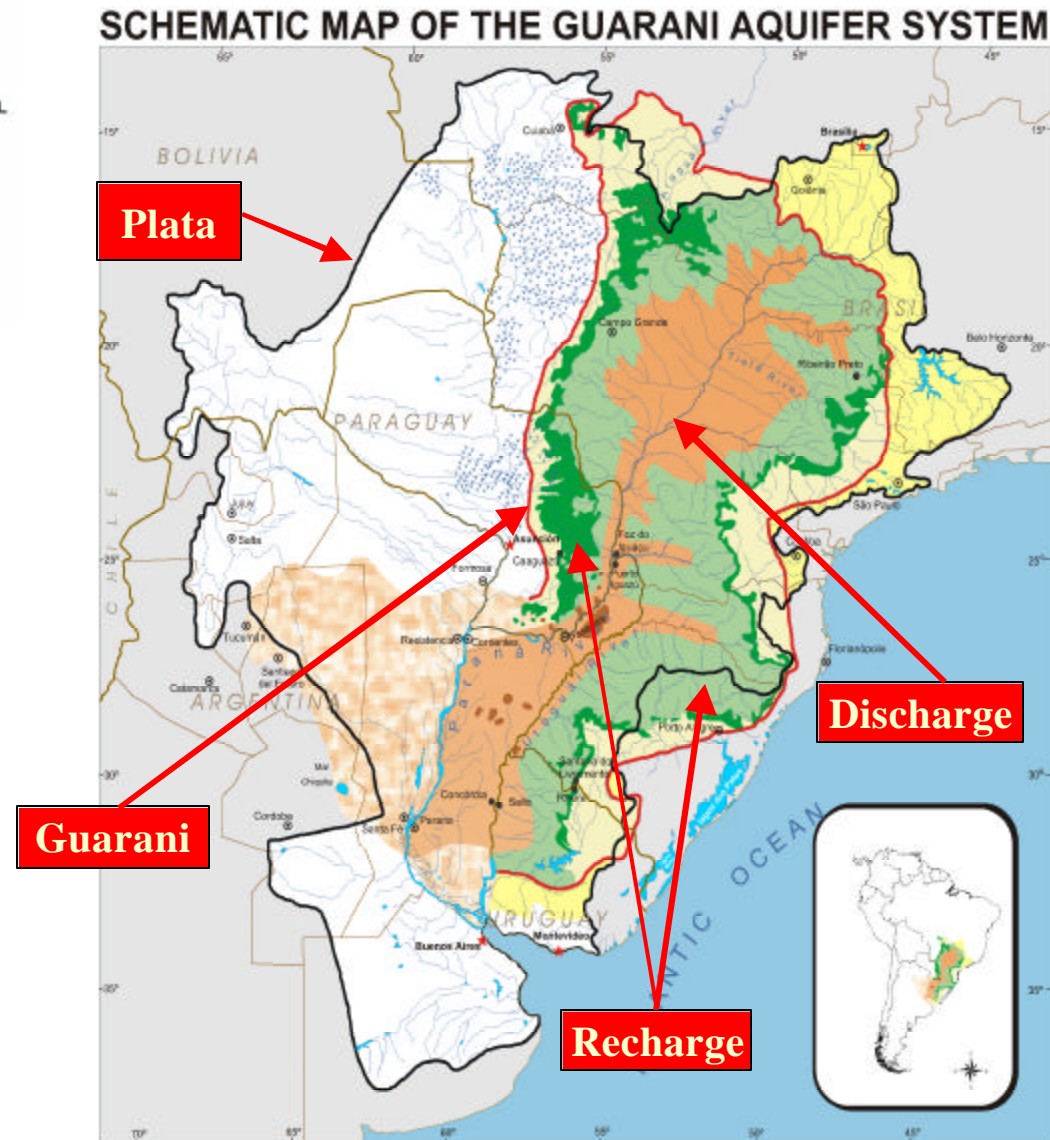
Luis Alberto Lopez Zayas
(Minister of Environment, Paraguay)
Abel Mejia (World Bank)
Samuel Taffesse (World Bank)
Luiz Amore (Guarani Secretariat)



Guarani Aquifer System: Main Characteristics

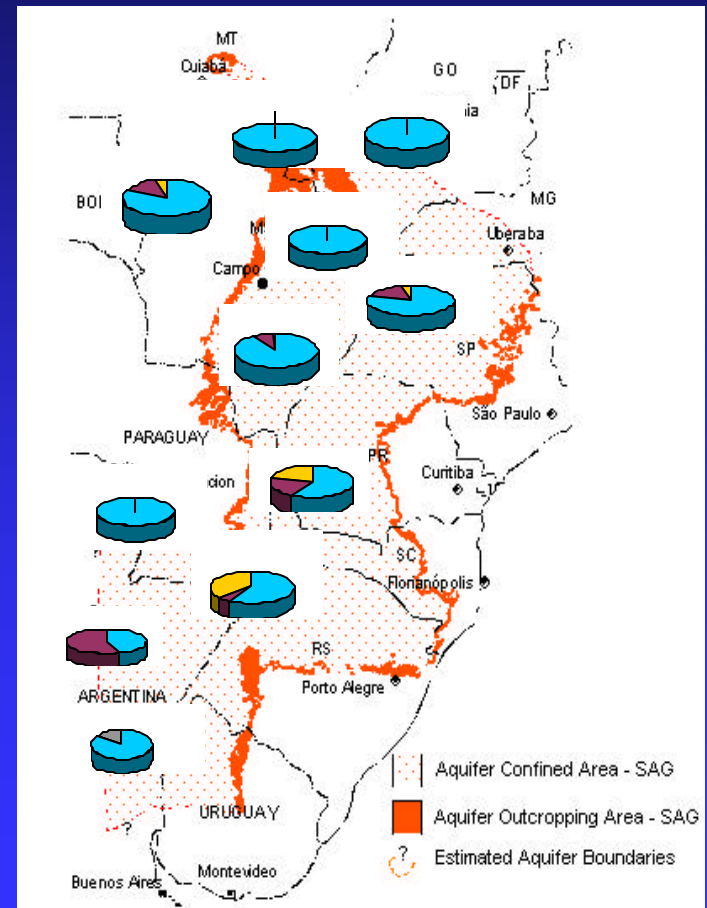
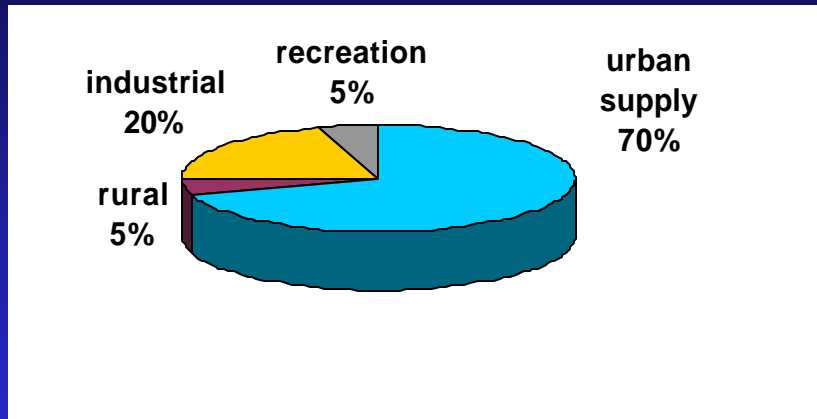


- Area: 1.2 million km²
- Population: 70 million
- Reserves: 40,000 – 150,000 km³
- Recharge: 40 – 60 km³/year
- Depth: 0 to -1800 m
- Thickness: 250 m
- Temperature: 33°C - 85°C



Existing Uses of Guarani System

Usage: 2-4 km³/Year (50 to 100 M³/S)
Number of wells: 2600+ (500 cities)



The Guarani System and La Plata Basin

Indicator	Guarani	Parana	La Plata	Mercosur
Area Mill. km²	1.2 (100)	1.56 (100)	3.1 (100)	11.9
Argentina	.23 (19)	.6 (37.5)	.9 (29)	2.78
Brazil	.84 (71)	.9 (59)	1.4 (45)	8.54
Paraguay	.071 (6)	.06 (3.5)	.4 (13)	0.40
Uruguay	.045 (4)		.2 (6.5)	0.17
Bolivia	----		.2 (6.5)	
Population Mill.	70	80	90	214
GDP US\$ billions	325	350	370	573

Guarani Aquifer System Region: Institutional Background

➤ Argentina



- Decision making authority over water lies within the provinces
- Existence of national and provincial laws on water resources
- Limited information: 9 deep wells, undefined Guarani western border

➤ Brazil



- Decision making authority over groundwater lies under state governments
- Mineral, thermal and water bottling use governed by federal concession regime
- Federal and state laws on water resources, groundwater and Guarani
- Considerable but dispersed information on groundwater
- 500 cities partially or entirely supplied by the Guarani

➤ Paraguay



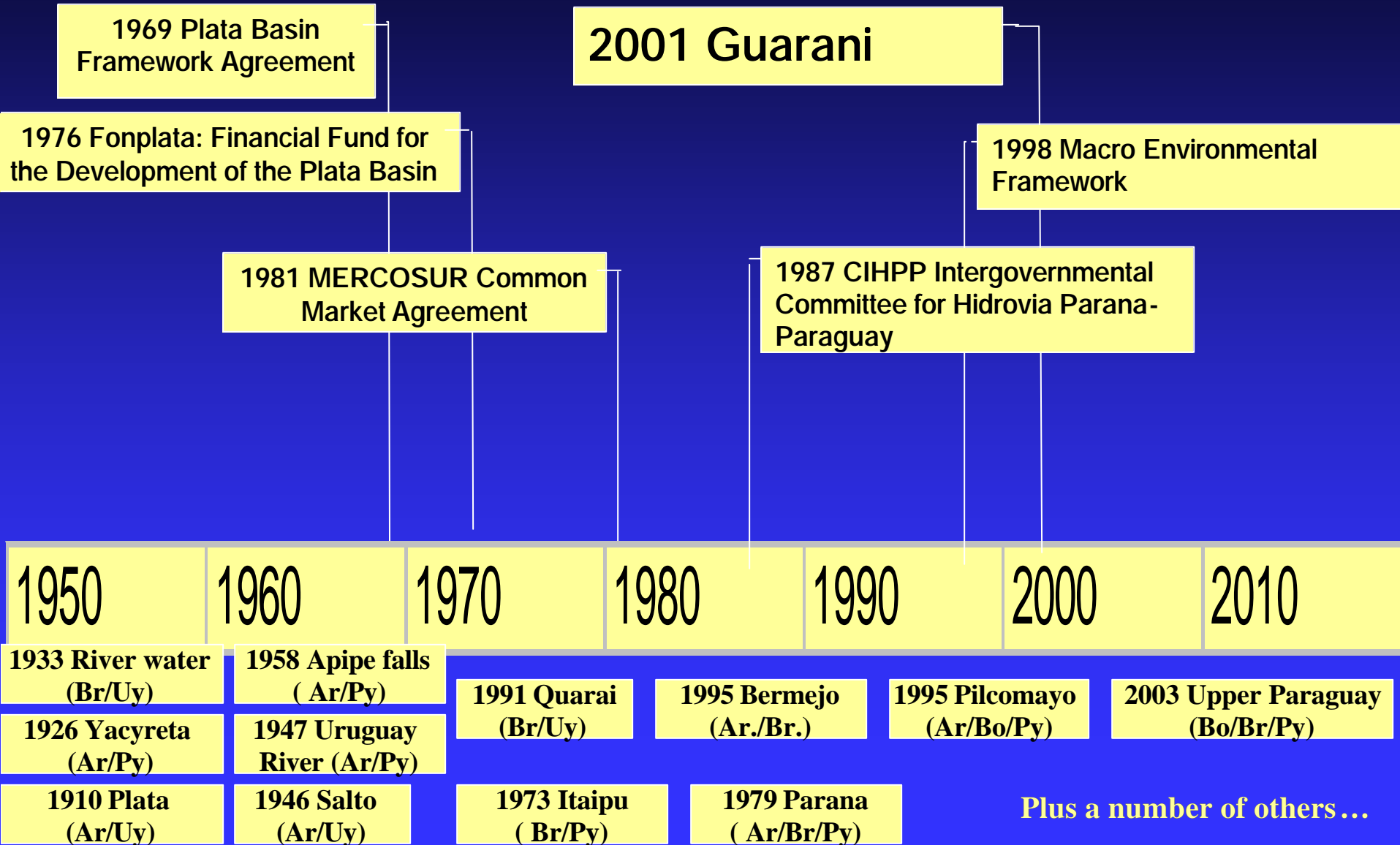
- Unitary State
- Water resources law in formulation
- Limited information available
- more than 200 wells mainly for domestic water supply

➤ Uruguay

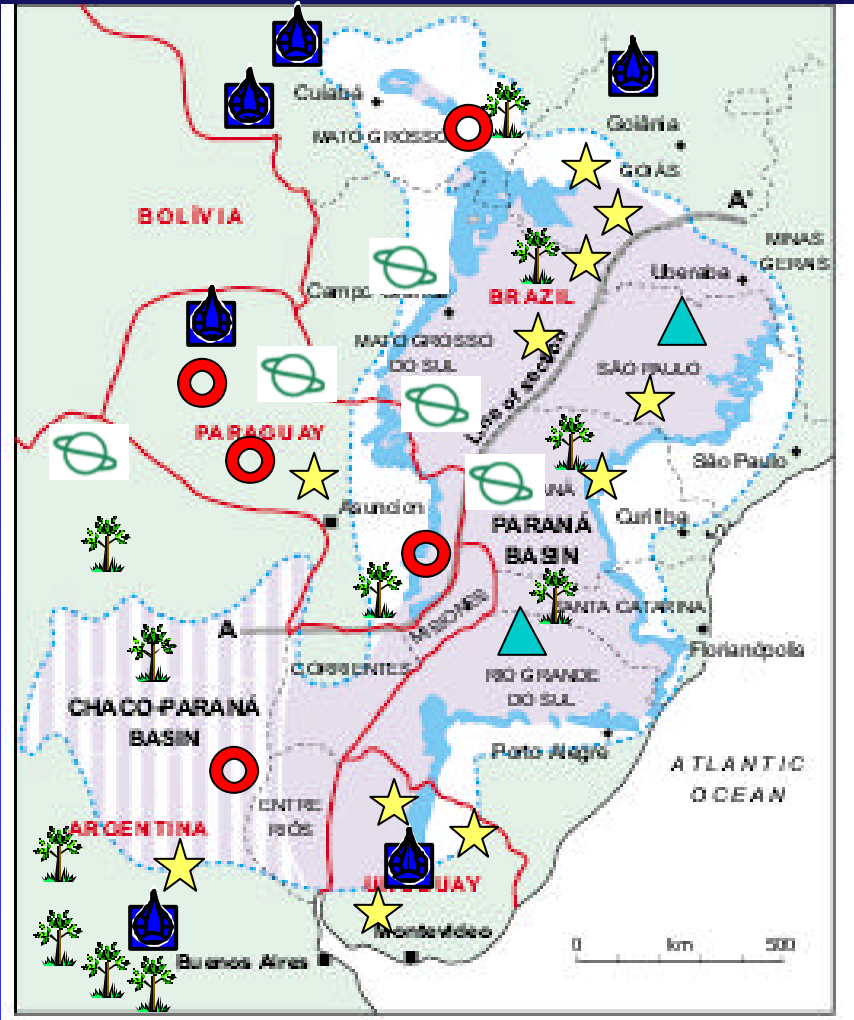


- Unitary State
- Existence of water law and decrees related to thermal use of the Guarani
- Considerable information available
- 135 wells for public water supply, irrigation and thermal tourism

Landmark Treaties in La Plata Basin relevant to IWRM



Selected WB and GEF Projects in La Plata Basin



WB – Water 6 projects \$550 million



WB – Land Management 2 projects (\$155m)



WB – NRM 11 projects (\$841 million)



GEF Biodiversity 11 projects (\$84 million)



Medium size Biodiversity, 5 projects \$4.7 million (not including enabling activity)



GEF 5 projects international water \$53.3 mill.

A total of 40 (GEF and WB) Projects and Commitment (Loans and Grants) of US\$1,688 million.

The Guarani System: A Strategic Link in IWRM of La Plata Basin

- ❖ Consolidation of joint collaboration
- ❖ Integration of Surface and groundwater
- ❖ An opportunity to integrate the different interventions
- ❖ Recognition of the economic importance of the resource to the Region

Towards harmonizing policy in IWRM

Issues

- a) Uncoordinated sectoral activities
- b) Possible conflicts among transboundary localities
- c) Uncontrolled water extraction
- d) Pollution in some localities
- e) Sustainable groundwater management not yet fully recognized

Implications

- a) Establish cross sectoral forum
- b) Empower local governments across frontier in joint SAP formulation
- c) Establishment and harmonization of rules and regulations that govern the use and extraction of water
- d) Identify environmentally friendly use in stressed areas – e.g. tourism
- e) Make groundwater management an integral part of IWRM

Project Rationale and Objective

Rationale for intervention

- Growing use and increasing demand
- Pollution in recharge area
- Prevention is less expensive
- Signs of scarcity and pollution in transboundary and national Hot Spots
- Need to account for groundwater in water resource planning and management

Objective

Support Argentina, Brazil, Paraguay and Uruguay to jointly elaborate and implement a coordinated institutional framework for managing and preserving the transboundary Guarani Aquifer System for current and future generations.

Project components and expected results

Components

- I. **Improve knowledge base about Guarani**
- II. **Guarani management framework**
- III. **Participation, education & communication**
- IV. **Monitoring and dissemination of results**
- V. **Pilot projects in identified Hot Spots**
- VI. **Assessment of geothermal energy, and**
- VII. **Project coordination.**

Main Outcomes

- a) **Multi-country agreement on institutional and technical framework**
- b) **Functioning information system and monitoring network**
- c) **Strategic Action Program**
- d) **Transboundary Diagnostic Analysis**
- e) **Proposal for joint legal framework**

Key Technical issues to be addressed by the project

- Identify limit of the Aquifer (West) → { Determines provincial, municipal & local governments role
- Identify areas of recharge and discharge → { Prepare strategic action plan to prevent resource pollution
- Quantify recharge and discharge and flow behavior → { Establish quantitative targets to prevent over exploitation and landscape management practices
- Evaluate geo-thermal potential → { Integrate groundwater into energy plan for the region
- Assess vulnerability and risk → { Introduce risk mitigation and vulnerability reduction measures (e.g. use of pesticide)
- Determine water balance at the Guarani → { Promote integrated water resource management

The project will support policy makers on:

- The formulation and harmonization of legal, technical and institutional arrangements of riparian countries
- Mainstreaming best practices in groundwater management into each country's development agenda
- Integrating the management of surface and groundwater
- The establishment of local management and planning, especially at transboundary (hot spot) areas

Achievements to date....

- Strengthened commitment to jointly develop the Guarani (e.g. CSDP, GS-GAS, political support...)
- Improved knowledge and participation of users and policymakers alike
- Initiated good management practice in identified “hot spots” – transboundary commissions
- Garnered international interest
- Created forums for dialogue
- Engaged Universities and NGOs

Lessons Learned

- Groundwater is an integral part of the overall water resource management at regional level
- Align the project into the broad assistance strategy of the GEF, the Bank and other donors..with converging sustainable development objectives
- Management of groundwater requires strong cross-sector collaboration and cooperation among national and sub-national governments
- Managing transboundary groundwater has unique complexities: difficult to visualize common issues, different legal/institutional frameworks, international sensitivities
- Strategic communication is needed early in project preparation
- Garner support at local level – i.e. Champions/local coordinators at Hot Spots
- Transparency, adequate financial resources and timing are critical elements in building participatory process..create constituency..keep momentum

Challenges – Looking ahead

- Provide a catalytic input to the establishment of a framework for integrated water resources management at La Plata Basin
- Coordination of intervention (projects) and donors in La Plata Basin and under the Mercosur agreement for the environment, towards a common goal of sustainable water resources management
- Ensure the financial and technical sustainability of the monitoring and evaluation systems to be established under the project
- Assist governments in harmonizing rules and regulations at country level that govern the sustainable management of the Guarani
- Maintain the framework and best practices to be developed under the project in support of transboundary management of groundwater, including conflict resolution, at local level.