

## *Conjunctive Management of Water Resources*

Framework Program for the Sustainable Management of  
the Water Resources of the La Plata Basin with respect  
to the Effects of Climate Variability and Change.



**The La Plata Basin (LPB) drains  
one-fifth of South America,  
3.1 million km<sup>2</sup>**

**La Plata Sub-basins:**

**Paraguay River  
Paraná River  
Uruguay River  
La Plata River**

**Demographic Information:**

- Population: 101.700.000 hab
- 5 countries' capitals





INSTITUTIONAL  
STRENGTHENING

+

WATER  
RESOURCES

+

ENVIROMENT

+

HYDROCLIMATOLOGY

**TDA**

Transboundary  
Diagnostic  
Analysis

## Critical Transboundary Problems

- Extreme hydrologic events linked to climate variability and change.
- Water quality degradation.
- Biodiversity alteration.
- Unsustainable management of fisheries resources and aquifers.
- Conflicts and environmental impacts generated by water use for irrigated crops.
- Lack of contingency plans to face disasters.
- Unsafe water and environmental sanitation conditions.

**SAP**  
Strategic  
Action  
Program







More than 1300 participants  
More than 180 events



- Pilot demonstration project
- Agua Boa projects
- PPF projects

10 thematic groups  
with the participation of  
decision-making institutions  
from the 5 countries plus  
research institutions

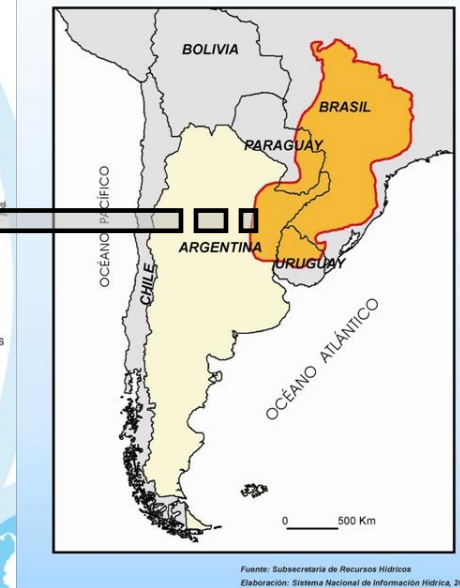


# INTEGRATED MANAGEMENT of LA PLATA BASIN and TRANSBOUNDARY AQUIFERS

## Yrendá-Toba-Tarijeño Aquifer System



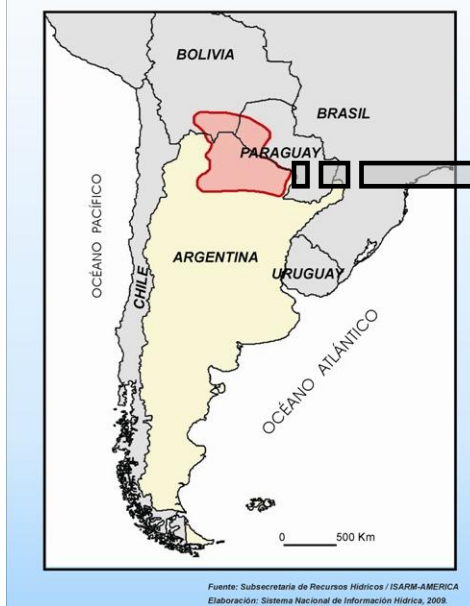
## Guaraní Aquifer System



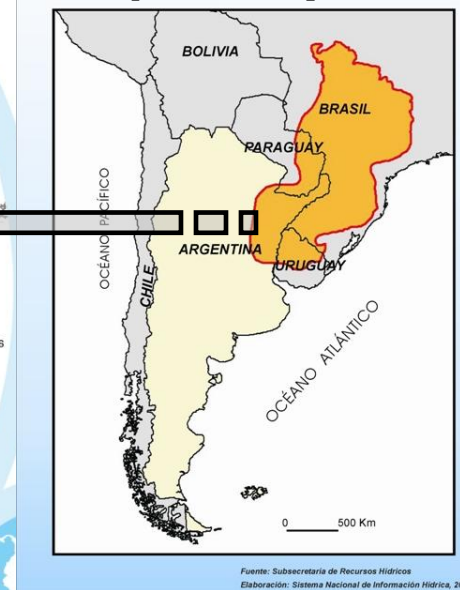


# INTEGRATED MANAGEMENT of LA PLATA BASIN and TRANSBOUNDARY AQUIFERS

## Yrendá-Toba-Tarijeño Aquifer System



## Guarani Aquifer System



**CUAREIM-QUARAÍ  
PILOT DEMOSTRATION PROJECT**







**Cuareim-Quaraí River Basin (Brazil-Uruguay)**  
**A Pilot project for Integrated and Shared water**  
**resources management**  
**A Pilot Project for regional integration**





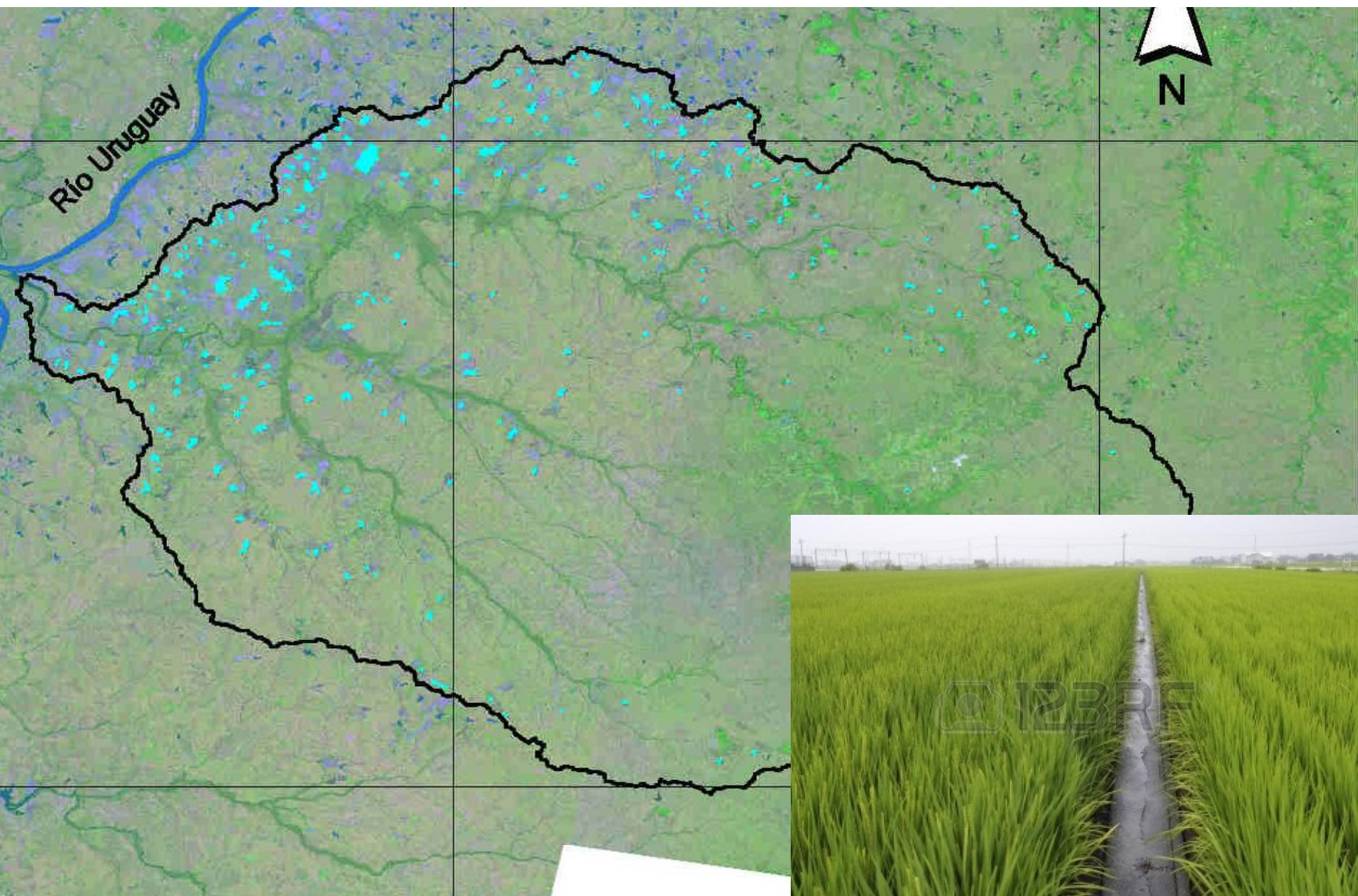
Image © 2007 DigitalGlobe

©2006 Google™

Puntero 30°23'31.26" S 56°27'23.76" O Secuencia ||||| 100%

Alt. ojo 397 m





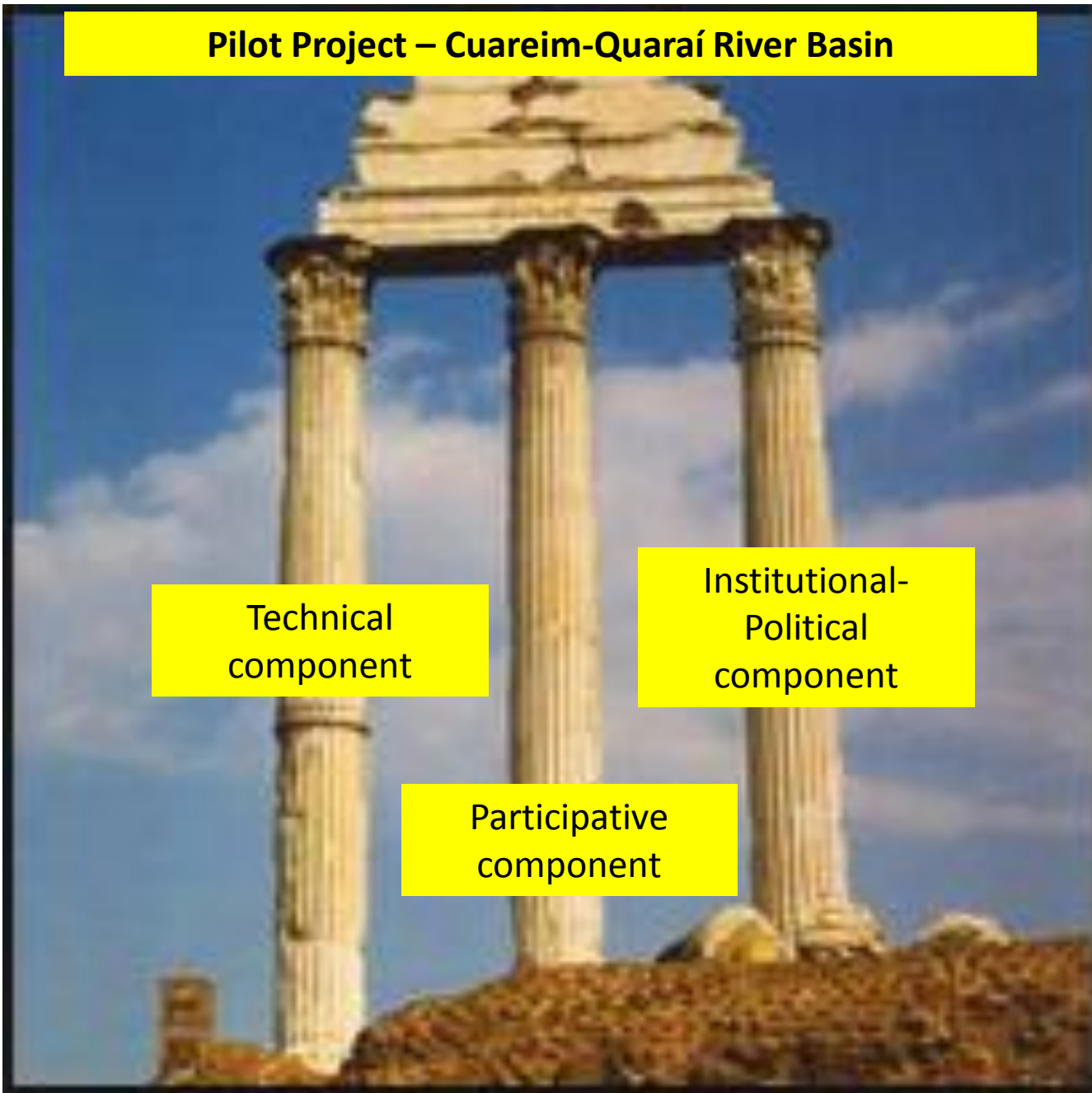


## Pilot Project – Cuareim-Quaraí River Basin

Technical  
component

Institutional-  
Political  
component

Participative  
component






# Diagnosis by local stakeholders Binational Workshop

Quaraí, April 10 - 2013

Participative  
component







Diagnosis by technical representatives of all thematic groups (1 per group and per country) and also with local stakeholders representatives

Binational Workshop

Porto Alegre, April 24-25 - 2013

Technical  
component

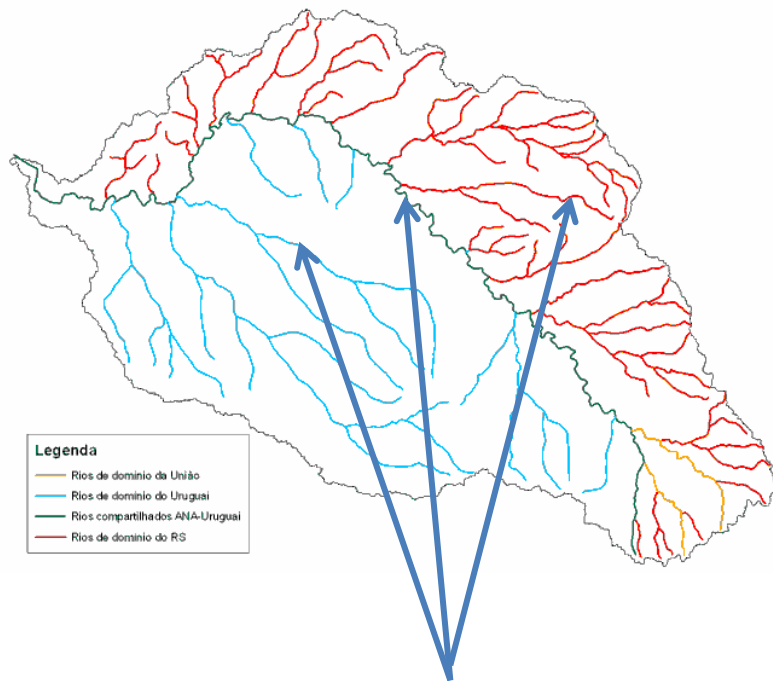




# Pilot Project Work Plan 2013 -2016



# Regional Institutional tool



## CRC-CRQ

### Binational River Commission Cuareim-Quaraí

With agreement of cooperation signed in 1991 for the use of its water resources and the development of the basin

*At the beginning and at the end,  
But absent during the project*





**How did we balance this weakness?**



**...by creating and strengthening  
the institutions at the basin level**

**Cuareim River  
Commission–  
uruguayan  
territory–  
(since 2013)**

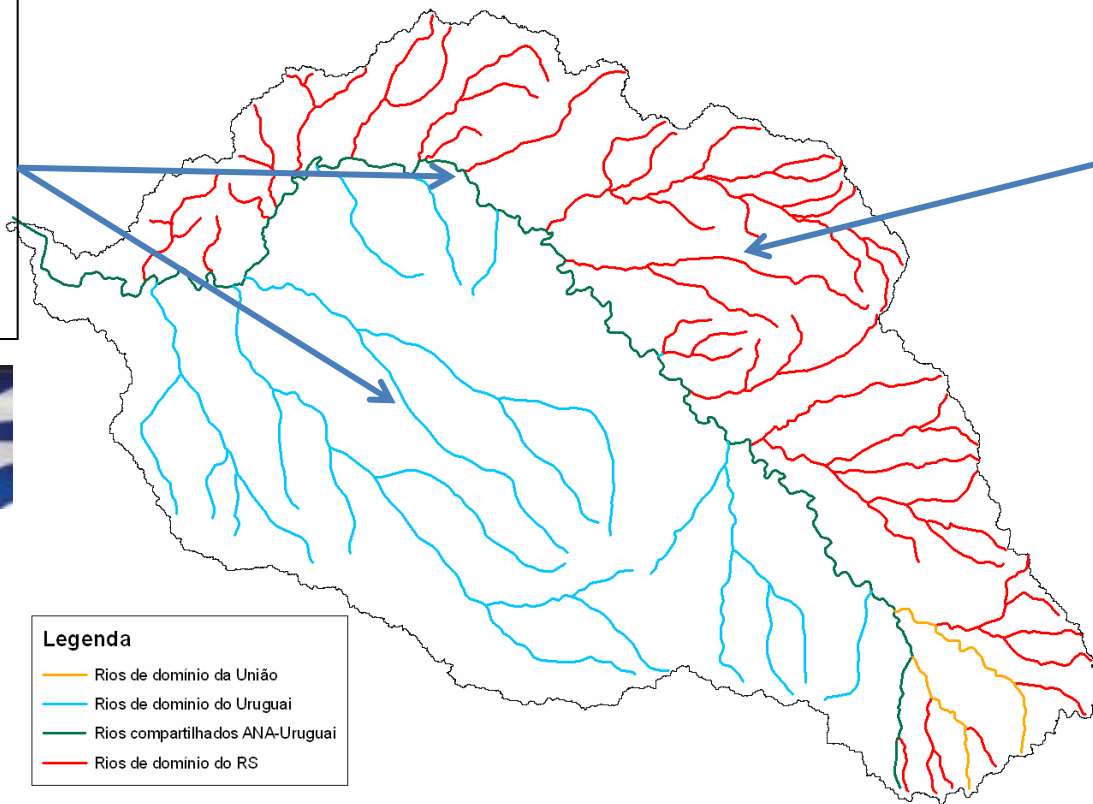


**Rio Grande do  
Sul State River  
Commission –  
brazilian  
territory  
(since 2008)**

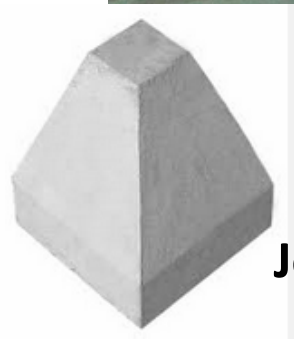


**Legenda**

- Rios de domínio da União
- Rios de domínio do Uruguai
- Rios compartilhados ANA-Uruguai
- Rios de domínio do RS







**Joint meetings of both Commissions every 4 months since June 2, 2015**

## In addition to:

- **Solid relationship** among the water authority of Brazil both at Federal and State Level with the water authority in Uruguay
- **Technical presence** of the meteorological, hydrological and geological services of both countries



**Groundwater is just one component considered in the Pilot Project to advance in the integrated water resources management**



**Knowledge Development and Management Tools**

# I. Geologic Map

Developped based on different information sources.

In addition:

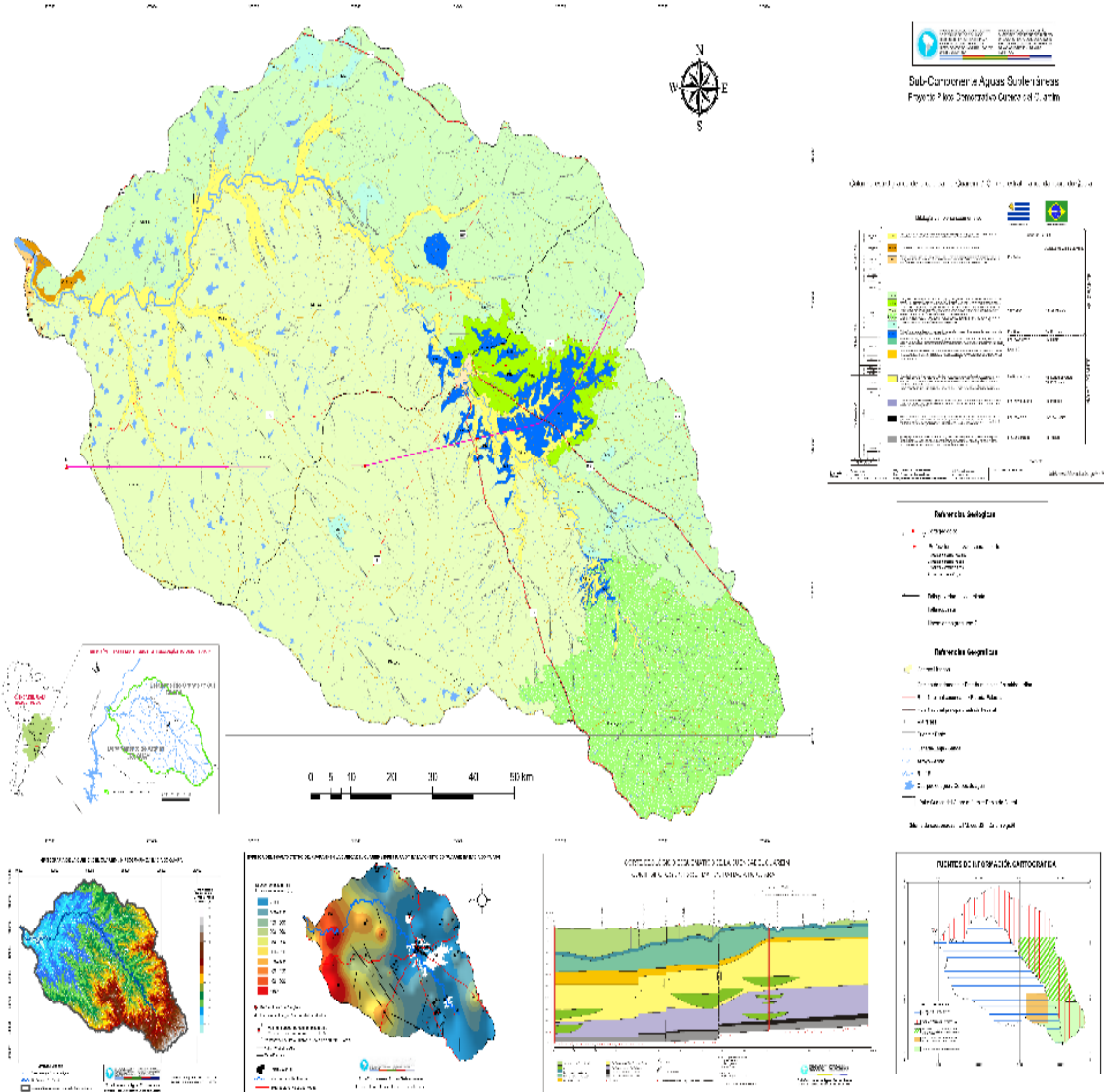
**Hypsography map**

**Basalt thickness (Roof of the Guaraní Aquifer)**

**Stratigraphic column** showing equivalent formations in both countries

**Schematic geological section**

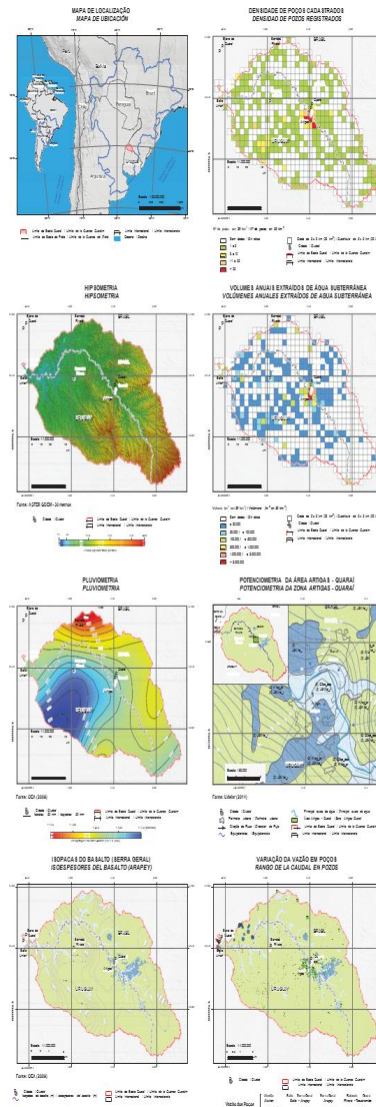
## CARTA GEOLÓGICA DE LA CUENCA DEL CUAREIM / CARTA GEOLÓGICA DA BACIA DO QUARAÍ





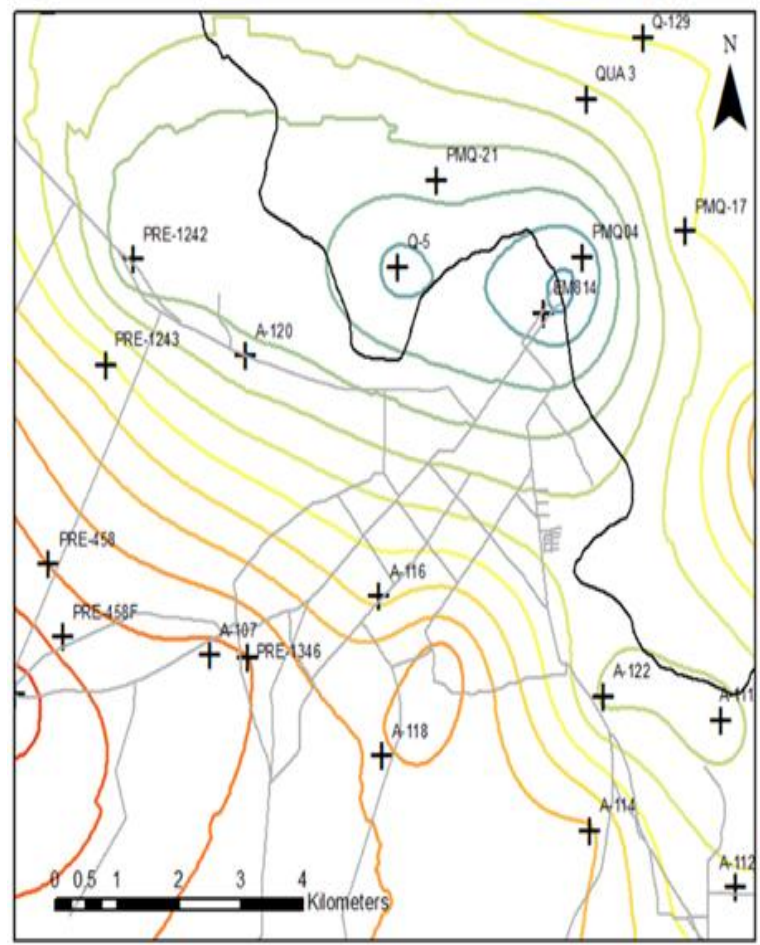
**In addition it presents:**

- density of water wells
- volume of water annually extracted;
- annual average precipitation;
- potentiometric map of the area of the cities of Artigas and Quaraí.

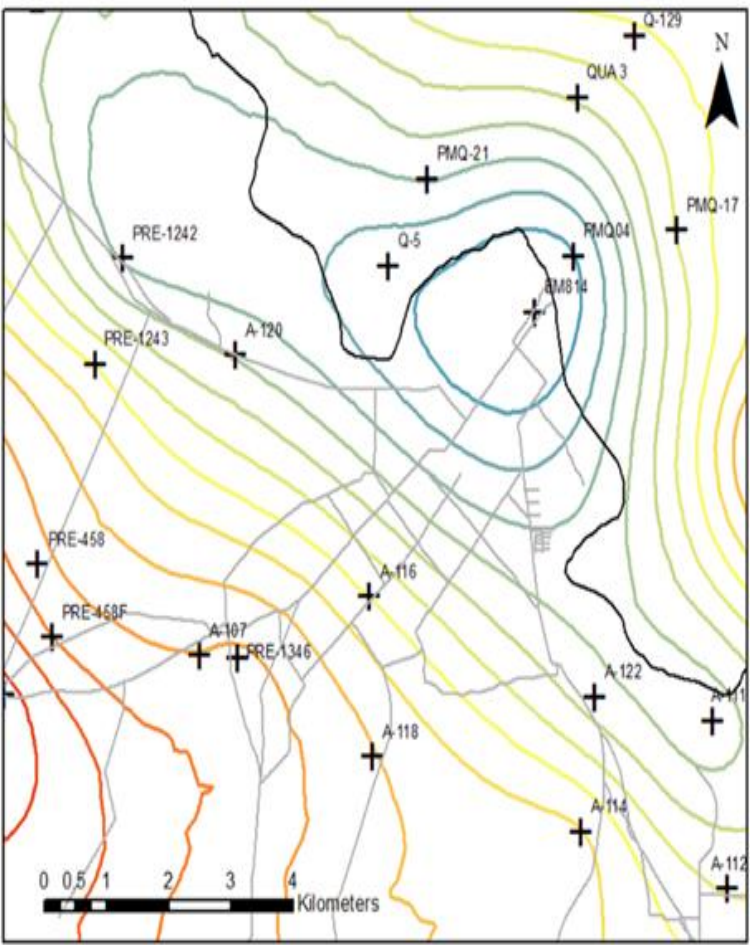


# III. Potentiometric Map in Artigas-Quaraí area

2005



2014



**Legenda**

**Piezometria 2014**

**Prediction Map**

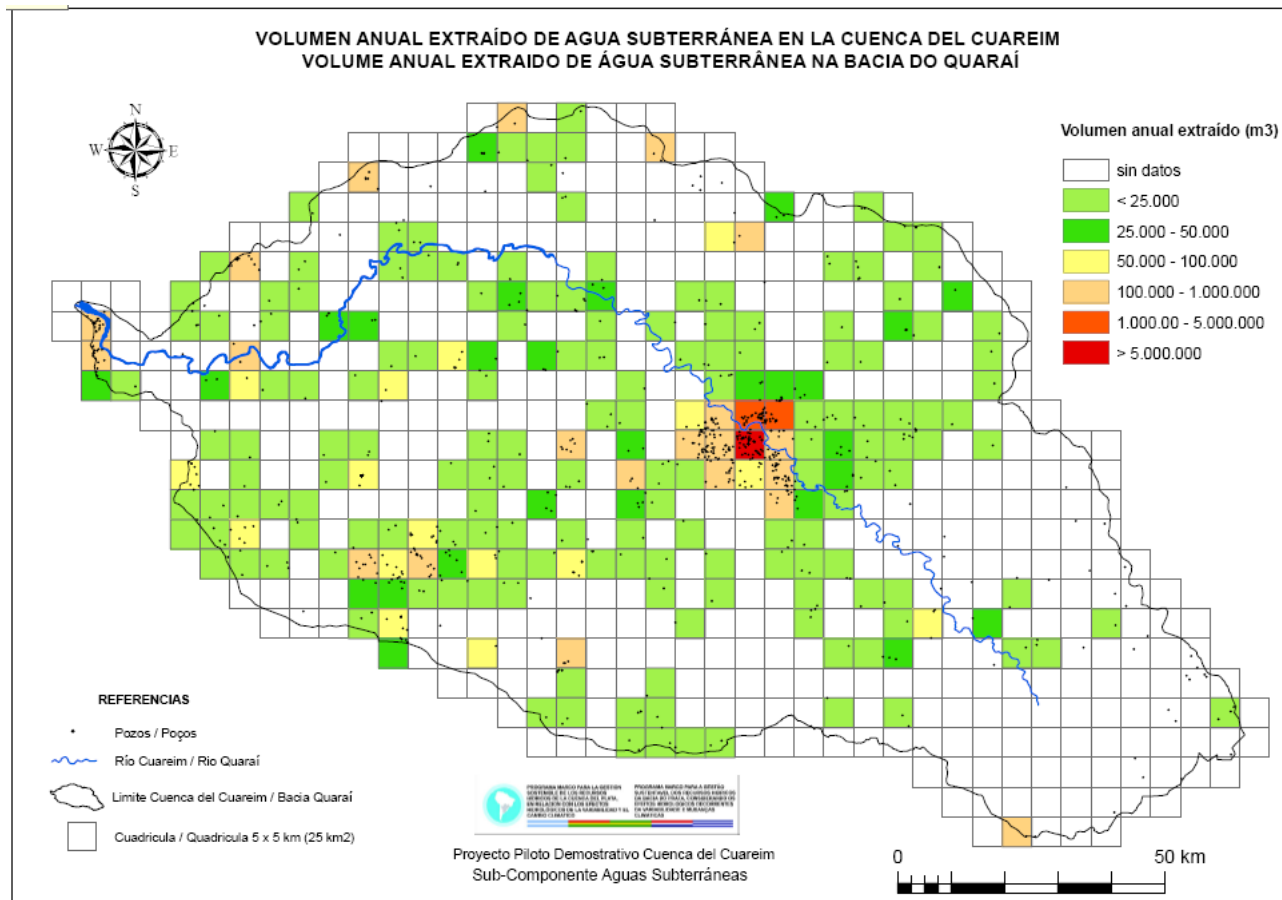
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**Contours**

- 89
- 91
- 93
- 95
- 97
- 99
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- 107
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- 111
- 113
- 115
- 117



# IV. Annual volume of groundwater extractions



Taking into account all the water wells registered both in Brazil and Uruguay.

**Management tools are developed to be used by the Binational Commission (CRC-CRQ) and specially by the local commissions of both countries.**

**The hydrologic connection between groundwater and surface water is considered in the tool proposed to allocate water and administer water rights in the Cuareim-Quaraí River Basin**



# Water allocation model

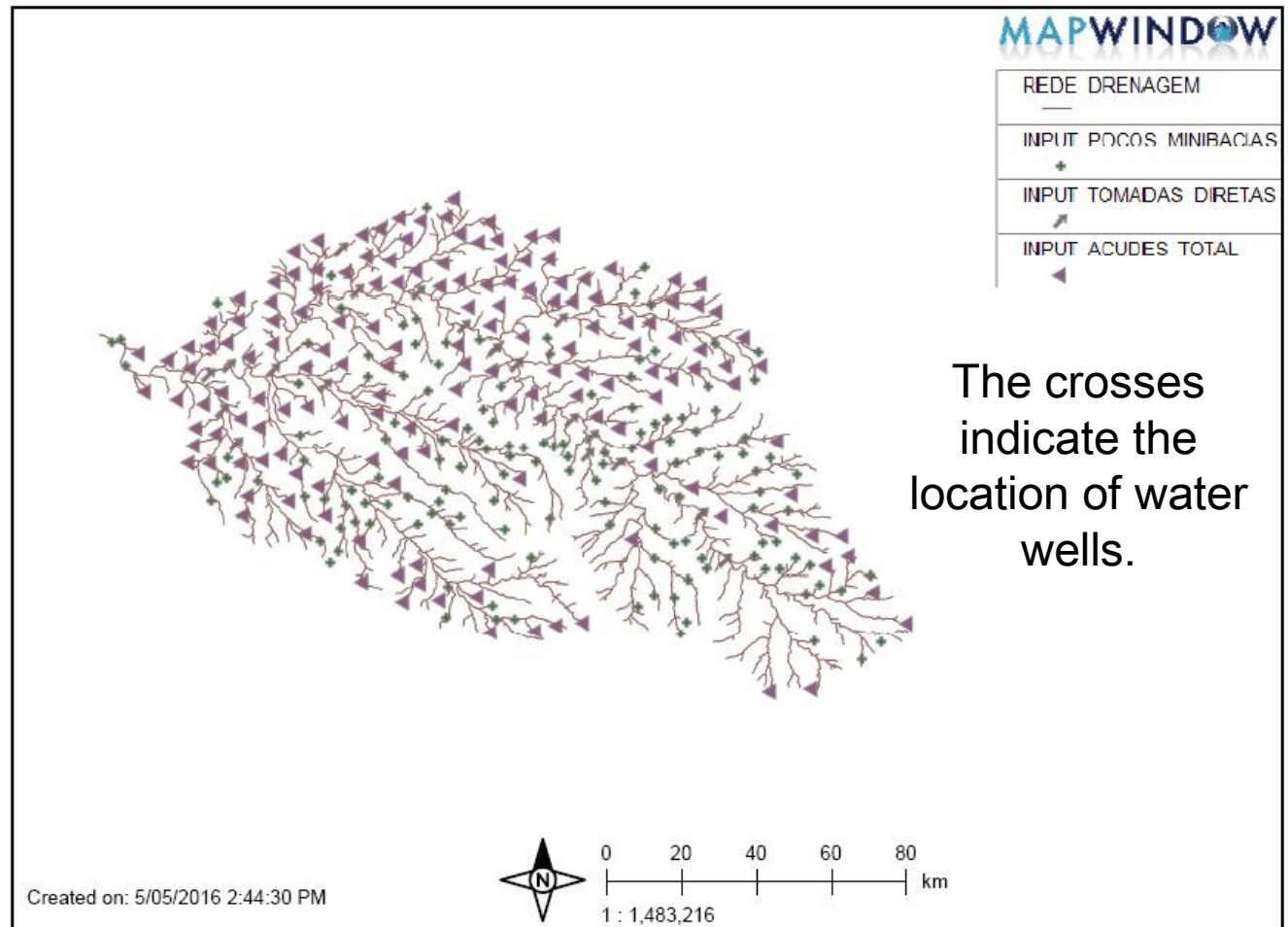
Each water well was associated to the closest stream segment of the drainage network, and it was incorporated to the model as “direct intakes”, similarly to surface direct intakes. Mainly, the relationship surface and groundwater was included in the demands.

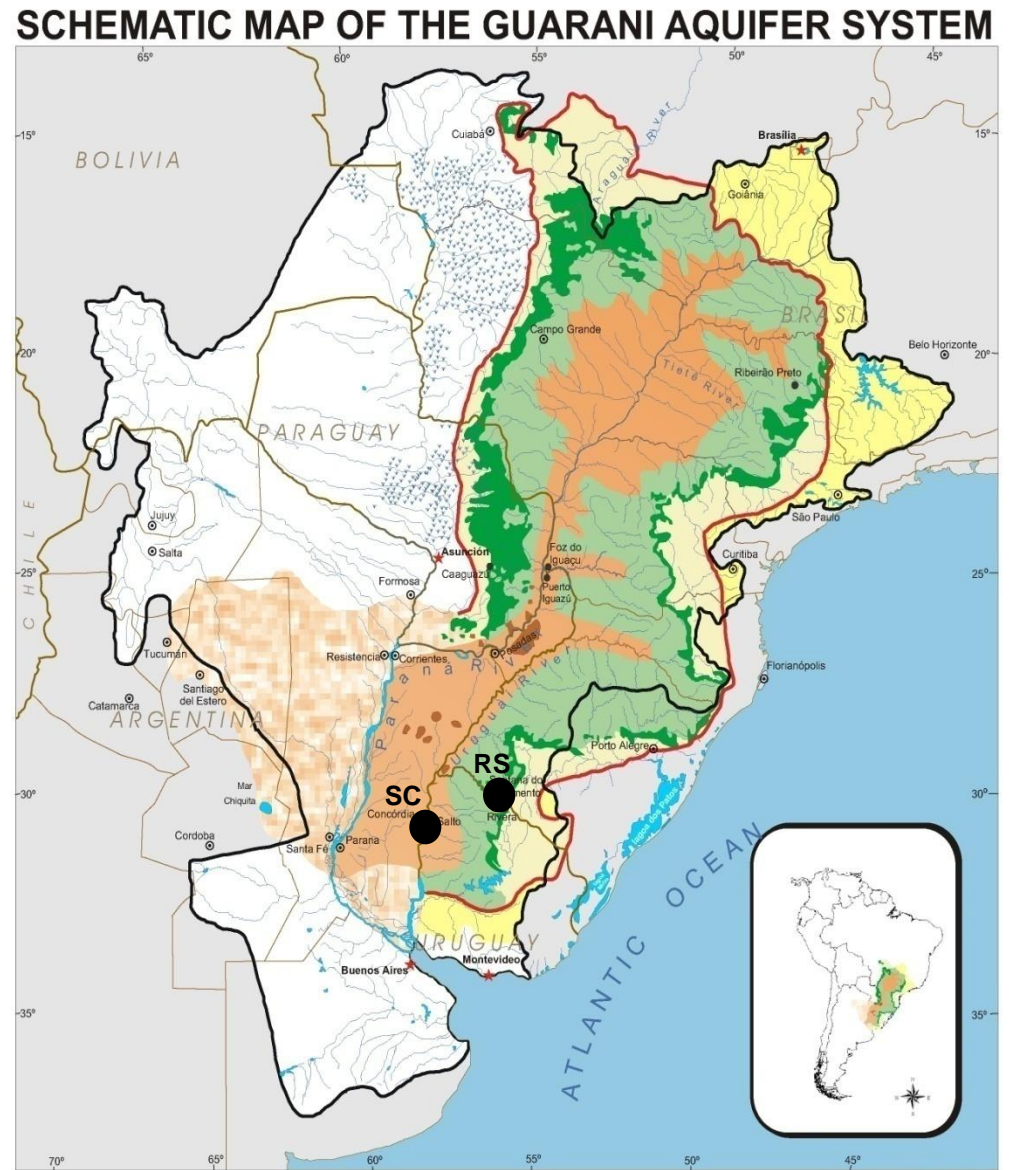


The direct intake flow was set equal to the annual volume extraction, distributed uniformly during the whole year.



Therefore the balance between water availability and demand, and the analysis of availability for new demands using the MGB-SAD model incorporates both surface intakes and “groundwater intakes”.





**Pilot Projects – Guaraní Aquifer System –  
Rivera-Santana do Livramento and Salto-Concordia**



*THANK YOU*



Framework Program for the Sustainable  
Management of La Plata Basin's Water Resources



GEF / FMAM



UNEP / PNUMA



OAS / OEA

