



INITIATIVES POUR L'AVENIR  
DES GRANDS FLEUVES  
INITIATIVES FOR THE FUTURE  
OF GREAT RIVERS

# Synopsis sheets

Rivers of the World

# THE PARANA

# The Parana

Formed in the north by the confluence of the Paranaíba River and the Grande River in the Brazilian Highlands, the Parana River flows into the estuary of the River Plate where it joins the Paraguay River, north of Buenos Aires. The surface area of its watershed and the magnitude of its discharge have made it a major stake at the heart of South American relations over the last fifty years.



## Belated exploitation

### The origins

Although the first hydrometric measures were performed at the beginning of the 20<sup>th</sup> century, it was necessary to wait until the 1960s for awareness to dawn of the Parana's energy potential, driven by Brazil. The Itaipu Agreement (1966), which started cooperation between Brazil and Paraguay regarding the hydroelectricity that could be generated from the river, became more concrete with the Itaipu Treaty in 1973. This was rapidly followed by the Yacyreta Treaty signed by Argentina and Paraguay in the same year. These treaties signalled the launching of two major structures on the river: the dams of Itaipu and Yacyreta. A large number of bilateral and multinational agreements relating to the management of the Parana and its tributaries were signed from the 1970s onwards.

### Technical sheet

<u>Discharge</u>	16,800 m <sup>3</sup> /s at the mouth
<u>Length</u>	4,099 km
<u>Watershed</u>	2,582,672 km <sup>2</sup>
<u>Countries crossed</u>	Brazil, Paraguay, Argentina (watershed + Bolivia, Uruguay)

Section	Type of flow
Upper Parana (Source- Confluence with the River Paraguay)	Plateau river with waterfalls and rapids - Stepped bed longitudinal section
Middle Parana (Confluence with the Paraguay/ Diamante)	Wide plain river Side branches, ponds and marshes Numerous islands - Shallower slope
Lower- Parana (Diamante/Confluence with the River Uruguay)	Numerous branches Numerous islands Long floodable plain - Delta

# The Parana

## A hydroelectricity giant

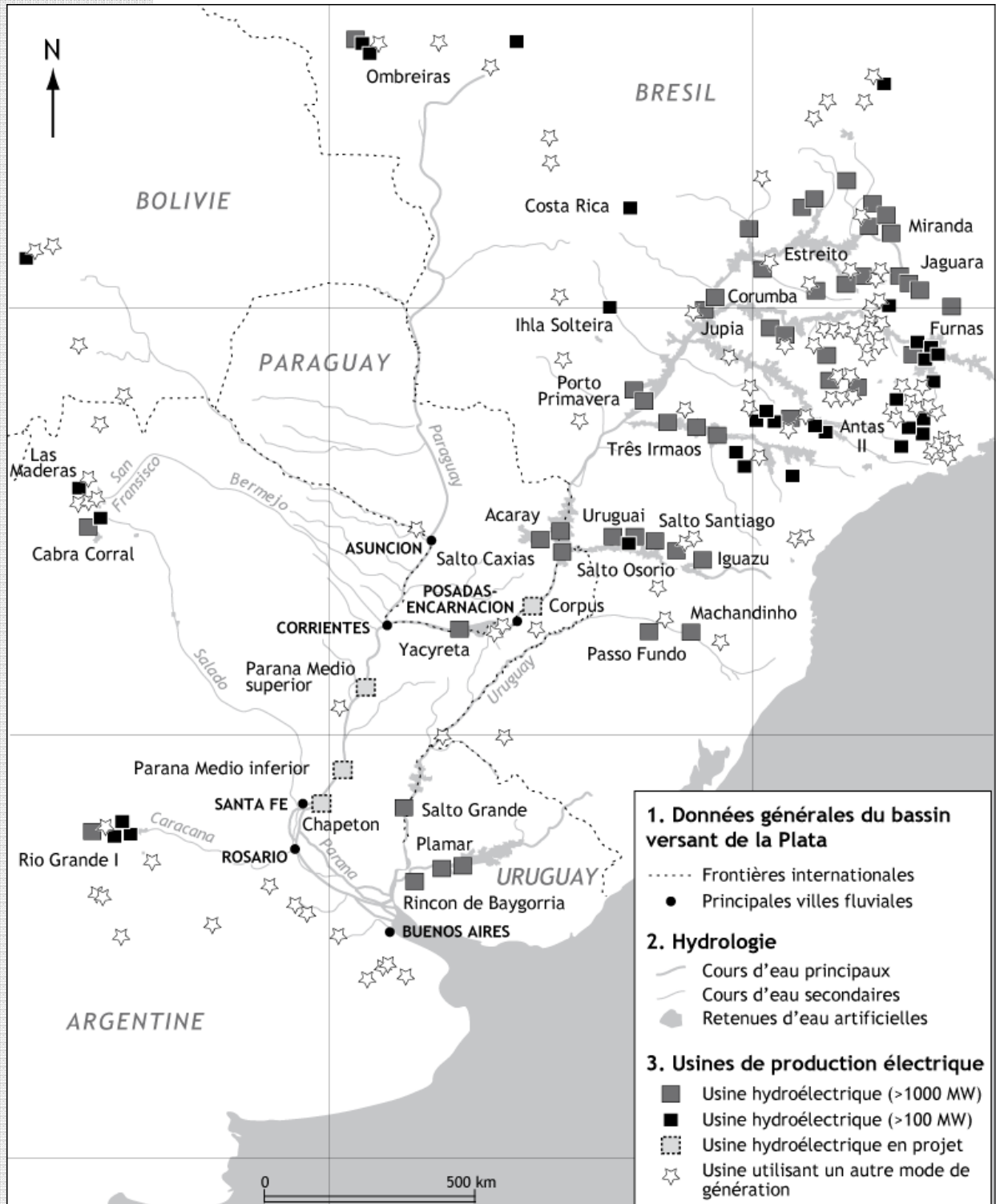
Among the 106 largest watersheds in the world, the Parana basin is that with the largest number of infrastructures, with the construction of 14 large dams (1998). However, there is a strong imbalance between the Brazilian and Argentinian parts. This difference can be explained by the river's characteristics, less advantageous for hydroelectricity production in the downstream section, and by later positioning by the Argentinian government regarding hydroelectricity.

Key structures	Characteristics
Itaipu	Rank: The world's no. 1 dam in terms of energy produced Manager: Itaipu Binacional Localisation: 1,950km from Buenos Aires
Yacyreta	Rank: Manager: Sociedad binacional Yacireta (EBY) Localisation: about 1,455 km from Buenos Aires
Porto Primavera	Rank: Brazil's 2 <sup>nd</sup> largest hydropower dam, Commissioned: 1999 Localisation: 2,350 km from Buenos Aires  <i>Conflicts linked to environmental and social impacts (flooded land, displaced population), as well as runaway costs (\$9 billion).</i>
Jupia	Rank: 2 <sup>nd</sup> largest hydropower complex in the world
Ilha Solheira	Localisation: about 2,650km from Buenos Aires

The Rio de la Plata basin has a production capacity of 92 000 megawatts, of which 60% are already exploited. The main part of the hydroelectric potential of the watershed is located on the Parana and the Uruguay, and most hydroelectric installations are the binational plants of Itaipu (Brazil and Paraguay: installed capacity of 14 000 MW), Yacyreta (Argentina and Paraguay: 3 000 MW), and the project of an hydroelectric plant of Corpus (Argentina and Paraguay: 3 200 MW), 1 597 km away from Buenos Aires. The project started in 1971 but is not yet agreed.

# The Parana

## A hydroelectricity giant



Source : Données statistiques du CIC (2005) ; Réalisation M.E Forget

# The Parana

## A hydroelectricity giant

### Itaipu dam

<b>Localisation</b>	Brazil/Paraguay border
<b>Construction</b>	Between 1975 and 1991 (2 additional turbines in 2005 and 2006)
<b>Annual average production</b>	96,400 GWh <b>(Highest production in the world)</b>
<b>Installed capacity</b>	14,000 MW (2 <sup>nd</sup> in world)
<b>Number of turbine units</b>	20 (18 units in operation simultaneously)
<b>Actors involved</b>	Itaipu Binacional – Management company Eletrobras – Brazilian National Electricity Company, main purchaser of electricity from Itaipu – ANDE (Administration Nacional de Electricidad), Paraguay

### History

**22 July 1966:** Ata do Iguaçu (Iguaçu Agreement), Brazil and Paraguay showed their joint interest in exploiting their shared resources.

**1973:** The treaty was ratified:

- It officialises a right of 50% consumption by each country of the installed capacity and the energy produced.
- Paraguay undertook to sell its surplus energy exclusively to Brazil at a fixed price until the review of the financial terms by 2025.

**1974:** the binational Itaipu company was founded

**1984:** the first electricity production unit was commissioned

**2009:** the treaty of 1973 was renegotiated in 2009 at the instigation of Paraguay: it is now authorised to sell energy directly on the Brazilian market. Today, 90% of the energy produced is supplied to Brazil.

# The Parana

## A hydroelectricity giant

### Yacyreta dam

<b>Localisation</b>	Argentinian/Paraguayan border
<b>Construction</b>	Between 1983 and 2001
<b>Annual average production</b>	19.000 GWh ( 1/ 3 of the Argentinian electricity market)
<b>Installed capacity</b>	4,050MW
<b>Number of turbine units</b>	20
<b>Actors involved</b>	EBY- management company Eriday- consortium of European, Argentinian and Paraguayan companies responsible for building the dam (leader: Dumez + an Italian company).
<b>Fish lift</b>	2

### History

**1905:** first hydrometric observations and measures

**1958:** Agreement between Argentina/Paraguay to set up the Yacyreta-Apipe Commission

**3 December 1973:** Yacyreta Agreement

**1983:** selection of the consortium assigned to build the dam

**1994:** commissioning of the dam

### The ambitions that stand out

*"The contracting parties shall build, jointly and in conformity with the provisions stipulated in the present treaty, the hydroelectricity development scheme, improve the conditions of navigability of the Parana River next to the island of Yacyreta and, if necessary, mitigate the harmful effects of severe floods."*

The Yacyreta treaty stands out in several ways. It aims to:

- Preserve the navigability of the Parana for the benefit of the ports of Encarnacion and Posadas (upstream of Yacyreta) and plan for the construction of a lock on the left bank;
- Provide installations to irrigate the land on both sides of the river, and preserve the fish fauna (through the use of fish lifts).
- Maintain, downstream, a sufficiently high water level for recreational navigation and animal life.

The construction of a compensating dam 88 km downstream of Yacyreta has been planned to fulfil these different aims.

# The Parana

## Other uses

### ***Navigation and hydroelectricity production: uses to be reconciled***

River transport, which thrived for more than a century (1830-1950), is now attracting interest once again. This growth is to a great extent due to the development of cereal crops and the soya bean boom which have generated new requirements for transport. Thus the river is being developed as a means of reaching the maritime outlet of Buenos Aires, in particular for the Brazilian provinces of the Mato Grosso and the Paraguayan province of Misiones. Up to now the crops were exported overland to the ports of Rio de Janeiro and Santos.

However, this ambition has come up against hydropower developments poorly adapted to the continuous stretches of river needed by river transport. The dam of Yacyreta comprises a lock capable of accommodating push-tow convoys, but it risks being too small to allow the passage of increasingly large vessels. The head of the reservoir of 83 metres is an additional problem for boats to overcome.

The dam of Itaipu is even more problematic as it was built without a lock, obliging goods to transit via the logistics platforms of La Paz-Hernandarias and Puerto Franco-Três Fronteiras up and downstream of the reservoir. The goods are carried by truck for thirty eight kilometres. Three locks separated by a canal must be built. The executive project will be presented to both governments in August 2018 for their review.

### ***Water supply: domestic, industrial and agricultural uses***

70% of the drinking water consumed in the regions bordering the Parana comes from the river's surface water. This represents 13% of water consumption supplied by the Parana river system, while irrigation consumes 70% and cattle and industry consume 9% and 8%, respectively.

### ***Fishing***

River fishing has increased continually since it started in the 1990s. However, developments such as the Yacyreta dam prevent migrating species from spawning in the waters of the Upper Parana and threaten the renewal of fish populations. Itaipu produces over 1,200 000 fish per year and has an ambitious program to increase substantially this number.

### ***Tourism and leisure***

Certain cities, like that of Rosario in Argentina, seek to regain possession of the river in view to pursuing sustainable development. The coastal strip has been returned to the public and the city has launched a project to create a "green corridor" along the river. The rights of way of the railways and the port have been densified to free the river front for leisure and cultural facilities.

# The Parana

## Governance and international cooperation

### **An international management system**

#### **The treaties**

Cooperation between the different States of the Plate basin is regulated by a large number of treaties.

#### **Bilateral agreements**

- 26 April 1973: Itaipu Treaty
- 19 November 1973: Rio de la Plata Treaty (Argentina/Uruguay)
- 3 December 1973: Yacyreta Treaty

#### **Multilateral texts**

- 3 June 1971: Resolution adopted by the five foreign ministries of the Plate basin. They form the general common reference for actions to develop hydropower resources, although they set out few constraints.
- 19 October 1979: Tripartite Itaipu Corpus Agreement (Argentina, Brazil and Paraguay) relating to the compatibility of the Itaipu and Corpus dams and the navigability of the Parana, downstream of Itaipu. It also sets the maximum height of the reservoir at 105m above sea level.

#### **The actors**

##### **The committees:**

Commissions were rapidly set up to formulate a clear legal framework. Created punctually, they are generally intended to manage navigation and the development of balanced and sustainable energy generation:

- **CARP** (Comision Administradora del Rio de la Plata)
- **CIC** (Intergovernmental Coordination Committee of the Countries of the Plate Basin, set up in 1968)
- **COMIP** (Joint Argentine-Paraguayan Commission of the River Parana constituted in 1971)
- **CIH** (Intergovernmental Committee of the Hidrovia Paraná-Paraguay constituted in 1989)

Although they are endowed with quite considerable powers, as the representatives of the member countries can take decisions that commit their countries, these commissions provide frameworks for reflection rather than projects for concrete developments.

##### **Basin organisations**

- RELOB – RELOC: Latin American Network of Basin Organisations
- REBOB: Brazilian Network of Basin Organisations

##### **Other actors involved**

- SEMA – Brazil: government secretariat for the environment and water resources
- SUDERHSA – Brazil: Water and drainage management
- FNCBH – Brazil: National Forum of Hydrographic Basin Committees of Brazil
- Local coordination councils are being set up (e.g. Consejo de Coordinación Local (CCL) - Uruguay / Brazil).



# The Parana

## Governance and international cooperation

### ***Governmental control faced with an increasing number of actors***

#### **Governmental planning and management**

The second half of the 20<sup>th</sup> century saw South America sway between democracy and dictatorship. In the 1970s, development policy above all took the form of major public investments in transport and hydroelectricity. The State was strong, the economy was planned; conditions favoured the launching of major national projects such as building dams.

In the framework of two major infrastructural projects, Itaipu and Yacyreta, both started in 1973, the governments concerned opted to set up binational companies endowed with legal, financial, administrative and technical powers to study, manage, build, commission and then operate these structures.

#### **Towards the fragmentation of decision-making levels**

The push towards decentralisation in the 1990s caused a partial upheaval of the management system dedicated to the Parana. For example, in Argentina, the law of 1994 granted provinces "the first right over the natural resources present in the territories". Different levels now share the prerogatives related to water:

- Water supply management: the provinces and municipalities
- Energy production and environmental protection: the provinces
- Questions on international energy resources and navigation: the State.

#### **Today: between public management and deregulation**

These binational structures still withstand the political and economic variations linked to economic deregulation. In the 1990s the governments of Argentina and Paraguay considered the partial privatisation of EBY, the manager of Yacyreta dam, to pay off the company's massive debts. This plan was never concretised, on the one hand because the governments preferred to stake on the future revenues generated by the completion of the dam, and on the other hand through fear of creating a monopoly. However, the major public energy companies were turned into concessions while new semi-public/private structures emerged as governance structures, notably in the case of the Corpus dam, still in the design stage.

The resource currently suffers from the absence of a centralised national regulation system, and the lack of cooperation between the actors.

# The Parana

## What river for tomorrow?

The Parana river has a strong strategic significance, with nearly 100 million people living in its watershed, which represents 80% of the combined GDP of Brazil, Argentina, Paraguay, Uruguay and Bolivia. Important agricultural and farming zones are located there.

### ***Satisfying the growing demand for energy***

The issues of harnessing the Parana's resources have now become essential in view of the growth in energy demand in the countries of the Plate basin. For example, energy demand will increase by 5.2% in Argentina, according to the energy scenario for 2005/2020. Although this rate is slightly lower than the increase observed over the previous 14 years, the need to manage peaks in consumption and the growth of energy hungry activities places the river at the heart of current and future challenges.

For these countries, the answer to the energy crisis is to increase hydroelectricity production and decrease reliance on oil and gas, and thus reduce their energy dependence on oil producing countries.

However, many challenges have to be overcome, especially relating to the social, environmental and political issues linked to the structures.

### ***Environmental challenges***

Wastewater loaded with pesticides and nitrates is still discharged into the river without hardly any treatment. Although the lack of initiatives to remedy this situation can still be excused by the Parana's considerable discharge, capable of absorbing part of the pollution contaminating the water, it will certainly become a sensitive issue in the coming years.

Local initiatives have emerged to promote the responsible development of the river: in particular the Argentinian foundation, Oga, has launched an initiative to organise activities in the general interest (culture, heritage, education, economic innovation, tourism): the Thematic Centre of the Rio Parana. This initiative will lead to the construction of a building near the town of San Nicolás.

# The Parana

## What river for tomorrow?

### ***A structure of governance in need of rethinking***

Despite the relative stability of the often binational structures set up to ensure the governance of the dams, the procedures followed to manage hydraulic resources now appear in need of renewal.

- The system of governance between the States of the basin still seems asymmetric. Bolivia and Paraguay are now dependent on the countries downstream of the river since the Parana remains the only direct route for their exports to the port of Buenos Aires. Despite the joint multinational commissions that have been set up, national projects in the hydrographic network of the basin do not require the agreement of neighbouring countries at present.
- There is also the question of the increasing power of actors in civil society that are tending to appropriate the major projects linked to the Parana's resources, by taking position as protectors of the environment and the communities living close to the river. By way of example, the "South American network against reservoirs and for rivers, their communities and water", gathered at Posadas in 2006 to debate on the region's economic and energy models, protest against the adverse effects of the Yacreta dam, and submit new projects for agreement by their governments.

### ***Technological advances and international governance***

Whatever the case, the technological advances already experimented for the large run-of-the-river hydropower plants of Jirau and San Antonio, lead to the assumption that conciliation between environmental and energy objectives is possible. The installation of turbines without building dams and thus reservoirs would reduce both impacts on the river and on local populations.

Furthermore, two projects started by the CIC in the 2000s aim to create, with the support of the United Nations (UN), the Organization of American States (OAS) and the International Monetary Fund (IMF), an integrated management plan for the hydrological resources of the Plata basin confronted by global climate change. This framework agreement (Marco Plan) will be completed by the construction of a geographic information system "Plan Mapa Digital" to identify the different branches of the hydrographic system and thus the hydraulic developments of the Plata basin.