Itaipú Dam
“The sound of a stone”

“The largest operational hydroelectric plant in the world”

Itaipú Dam

- Objectives of the project
- Owners and financing
- Technical description of project
- Technical challenges
- Technical successes
- Major issues that arose
- Benefits and DisBenefits
- Anything else that makes it remarkable


70°
60°
50°
40°
Bogotá
VENEZUELA
GUYANA
FRENCH GUIANA
SURINAME
COLOMBIA
Boa Vista
ATLANTIC OCEAN
MARAJÓ ISLAND
Macapá
Marajó Bay
0°
Equator
Negro
GUIANA HIGHLANDS
Belém
São Marcos Bay
Manaus
Santarém
Tefé
São Luís
Fortaleza
Cape São Roque
Teresina
Natal
João Pessoa
Campina Grande
Porto Velho
Rio Branco
BRAZILIAN HIGHLANDS
BANANAL ISLAND
Palmas
São Francisco
Recife
10°
Maceió
Aracaju
PERU
PARECIS MTS.
Almas Peak 6,068 ft.
Salvador
ANDES MOUNTAINS
Lake Titicaca
Cuiabá
All Saints Bay
Brasília
Itabuna
BOLIVIA
PANTANAL
Goiânia
La Paz
Sucre
ESPINHAÇO MOUNTAINS
PACIFIC OCEAN
São José do Rio Prêto
Belo Horizonte
20°
Campo Grande
Vitória
PARAGUAY
Nova Iguaçu
Duque de Caxias
São Gonçalo
Tropic of Capricorn
Santo André
Rio de Janeiro
Asunción
São Paulo
CHILE
ARGENTINA
Iguaçu
Curitiba
Florianópolis
Passo Fundo
Caxias do Sul
Novo Hamburgo
Canoas
ATLANTIC OCEAN
30°
Pôrto Alegre
Rio Grande
Patos Lagoon
URUGUAY
0 250 500 mi
0 250 500 km
Montevideo
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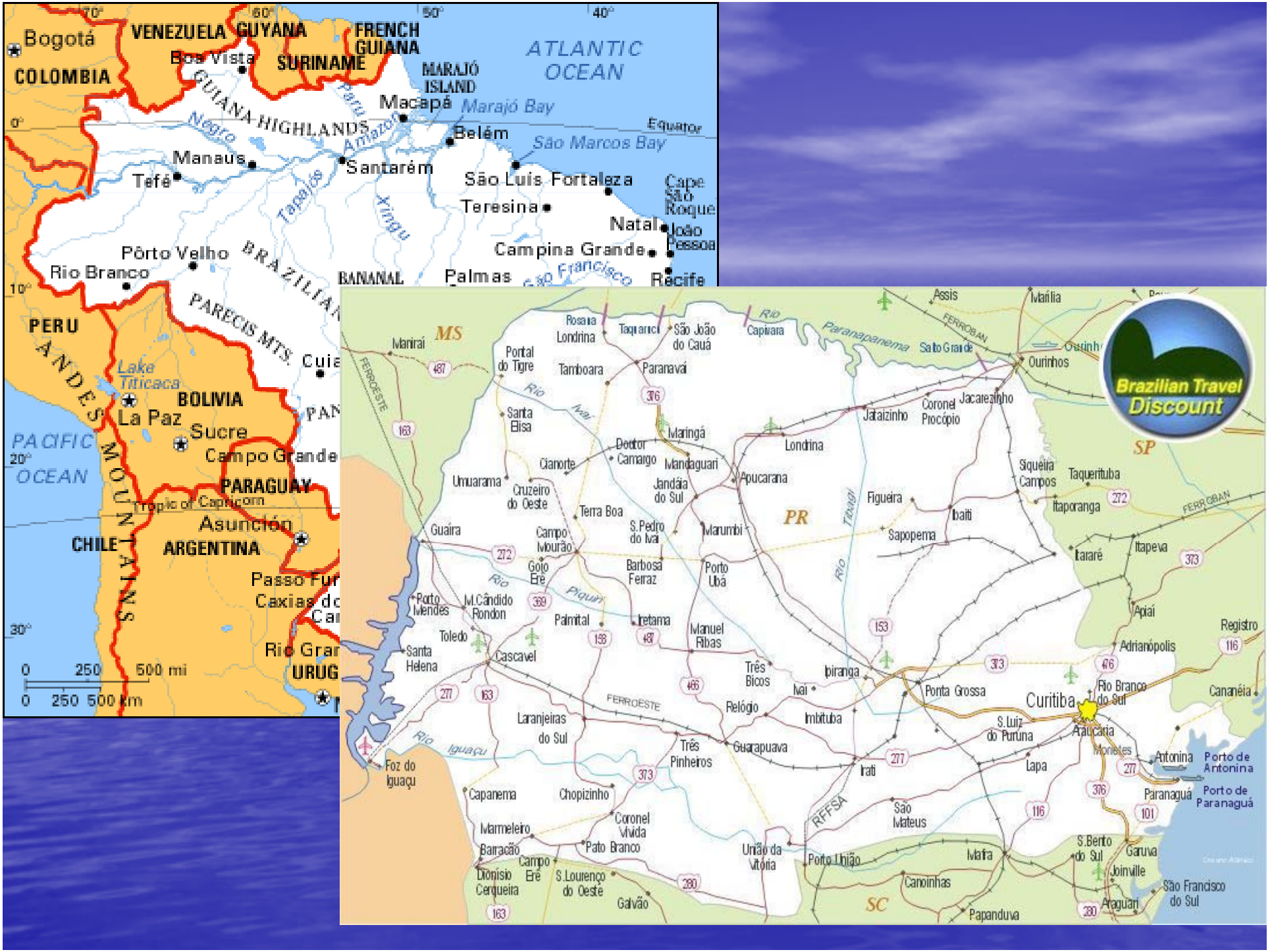
Bogotá
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Tropic of Capricorn
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Passo Fur
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Rio Gran
URUG
0 250 500 mi
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MS
Maniraí
Rosana
Londrina
Taquaruçu
São João do Cauá
Rio Capivara
Paranapanema
Salto Grande
Assis
Ourinhos
Marília
Portal do Tigre
Tamboara
Paranavaí
Rio Ivaí
Santa Elisa
Ivaiporã
Doutor Camargo
Cianorte
Mandaguari
Jandaia do Sul
Apucarana
Londrina
Jataizinho
Coronel Procópio
Jacarezinho
Siqueira Campos
Taquarituba
Itaporanga
SP
Unuarama
Cruzeiro do Oeste
Terra Boa
S.Pedro do Ivaí
Marumbi
PR
Figueira
Ibaiti
Sapopema
Itararé
Itapeva
Guaíra
Campo Mourão
Goio Erê
Barbosa Ferraz
Porto Ubá
Rio Tibagi
Rio Piquiri
Porto Mendes
M.Cândido Rondon
Palmital
Iretama
Manuel Ribas
Apiaí
Registro
Toledo
Cascavel
Santa Helena
Três Bicos
Ipiranga
Ponta Grossa
Curitiba
Adrianópolis
Rio Branco do Sul
Cananéia
FERROESTE
Relógio
Imbituba
S.Luiz do Purunã
Araucária
Laranjeiras do Sul
Guarapuava
Três Pinheiros
Irati
Lapa
Antonina
Porto de Antonina
Rio Iguaçu
Foz do Iguaçu
Capanema
Chopinzinho
Coronel Vivida
Ivaí
São Mateus
Paranaguá
Porto de Paranaguá
Ivaiporã
Barracão
Pato Branco
Campo Erê
S.Lourenço do Oeste
Dionísio Cerqueira
Galvão
União da Vitória
Porto União
RFFSA
Canoinhas
Ivaiporã
S.Bento do Sul
Garuva
Joinville
São Francisco do Sul
Araquari
Papanduva
SC
Brazilian Travel Discount

Objectives of the project

- On July 22, 1966 Brazil and Paraguay concluded negotiations for the Ata do Iguaçu (Iguaçu Act)
- The Act was a joint declaration of the mutual interest in studying the exploitation of hydric resources that the two countries shared in the section of the Paraná River

Owners and financing

- IECO (USA) & ELC Electroconsult S.p.A. (Italy) won the international competition for doing the studies and realization of the dam
- On April 26, 1973 the Itaipú Treaty was signed by Brazil and Paraguay as the legal instrument for the hydroelectric exploitation of the river by the two countries.

Owners and financing

- Itaipú Binacional was created in May 1974 and is the company that now runs the Itaipú Dam
- Mission Statement: To generate quality electricity via socially and environmentally responsible practices, and to foster sustainable economic, tourist, and technological development in Brazil and Paraguay

Technical description of project

Technical description of project

- On October 12, 1978 the Paraná River was rerouted to allow the riverbed section to dry for the construction process
- The reservoir began its formation on October 13, 1982 after dam works were completed and the side canal's gates were closed. During this time, the water rose 100 meters and reached the gates of the spillway 14 days later.
- The dam itself consists of various types of dams with a total distance of 7,744 meters and a crest elevation of 225 meters.

Technical description of project

- The concrete Main Dam
  - hollow gravity type
- The spillway
- The connecting buttress-type Wing Dam
- The ends
  - One earth dam
  - One rock dam

Technical description of project

- Once the dam construction was completed, construction soon began on the generation units
- 18 generator were installed at the rate of two to three a year, finishing in 1991
- In 2006 two more generators were installed to make the total 20
  - Interesting fact is that only 18 can be running at any one time period because of the original treaty. As a result 18 run while 2 are under maintenance

Technical description of project

Technical challenges

- Energy differences
  - Paraguay uses 50 Hz, Brazil uses 60 Hz
  - 9 generators run on each frequency
  - Power converter on Brazilian side
- Military Dictatorships
  - Argentina scared of Buenos Aires being flooded by Brazil as an act of war
  - “Acordo Tripartite” signed in Oct 1979 restricting allowed river levels

Technical successes

- The generation capacity of the plant is 14 GW
  - Can only use 12.6 GW
- In 2000 it achieved its generating record of 93.4 billion kWh
  - Which supplied 93% of the energy consumed by Paraguay and 20% of that consumed by Brazil
- In 1994 the American Society of Civil Engineers elected the dam as one of the "Seven Wonders of the Modern World"

Major issues that arose

- Transportation of entire pieces of public roads. The first wheel of the turbine, weighing 300 tons, left São Paulo on December 4, 1981, and arrived on site only on March 3, 1982.
- The filling of the Itaipú reservoir lead to operation Mymba Kuera meaning “animal catching”. The operation saves the lives of 36,450 animals living in the area to be flooded by the lake
- Approximately 10,00 families living beside the Paraná River were dislodged from their plots to make way for the dam.
  - Many of these families became part of the MST, one of Brazil’s largest social movements

Benefits

- The City of Foz do Iguaçu is the 4th largest city in the state of Paraná
- Energy supplied to both countries
- Tourism serves as a huge income for both countries.
- Peace between both countries
- As Cataratas do Iguaçu

As Cataratas do Iguaçu

Cataratas do Iguaçu

Cataratas do Iguaçu

Cataratas do Iguaçu

DisBenefits

- The reservoir filled up the “Sete Quedas” or Seven Falls national park
- Removal of animals from natural habitat
- Dislodging of 10,000 families

Remarkable

- The Paraná River is the 7th largest in the world and was shifted along with 50 million tones of earth and rock. 5 times greater than that of the Channel Tunnel between France and England
- The amount of concrete used would be enough to build 210 football stadiums the size of Maracanã (capacity 110,000)

Remarkable

- The iron and steel used would allow for the construction of 380 Eiffel Towers
- The spillways maximum flow is 62.2 cubic meters per second. 40 times the average flow of the Iguaçu Falls


Any Questions?