EVIDENCE-BASED POLICIES IN A WORLD OF INCREASING WATER SHORTAGE

Jerson Kelman
jerson@kelman.com.br

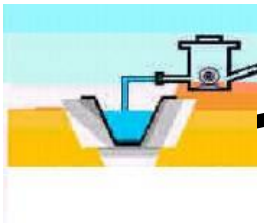
66 SBPC, Rio Branco, Acre
24 julho 2014

What are the perceived major issues for water governance?

- Multiple use of the rivers
- Water supply and sanitation

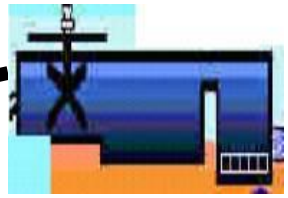
Management of multiple use of the rivers, including abstraction of bulk water and dumping of effluents

Water treatment
Water distribution
Sewage collection
Sewage treatment

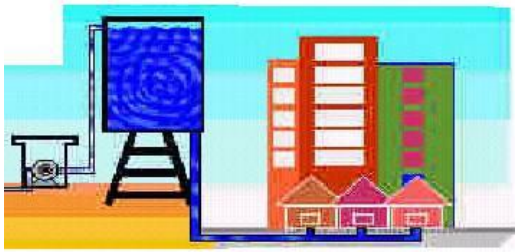


CAPTAÇÃO DA ÁGUA BRUTA

ADUÇÃO DA ÁGUA BRUTA



TRATAMENTO DA ÁGUA BRUTA



RESERVAÇÃO DA ÁGUA TRATADA

DISTRIBUIÇÃO DA ÁGUA TRATADA

Multiple use of the rivers

ABASTECIMENTO

HIDROELETRICIDADE

NAVEGAÇÃO

ABASTECIMENTO INDUSTRIAL

CONTROLE DE CHEIA

IRRIGAÇÃO

RECREAÇÃO E TURISMO

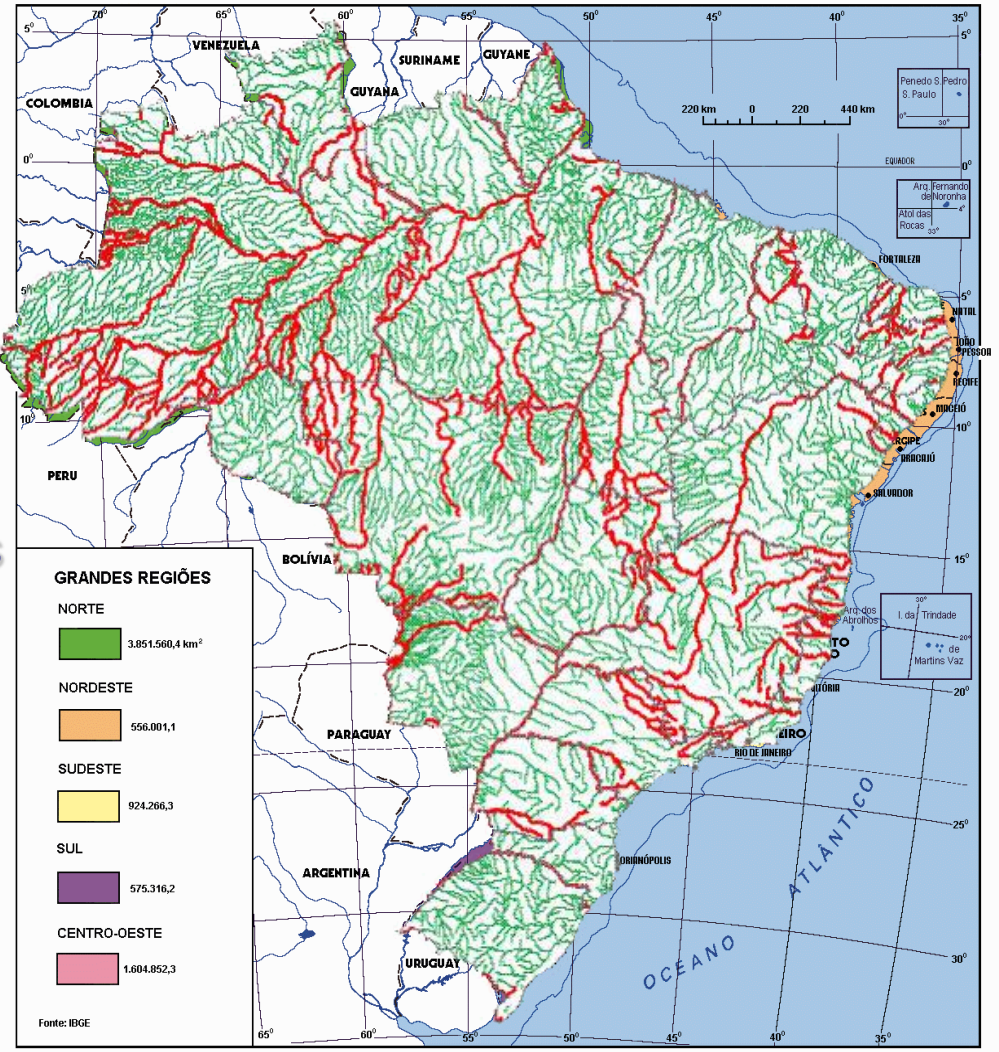
PESCA E AQUICULTURA

Integrated water resources information system countrywide
A challenge for federated countries

Brazil, a Federative Republic
One Federal Government
27 State Governments

12 % of freshwater available in the world

Water use and infrastructure permits are issued by the State Governments or by the Federal Government

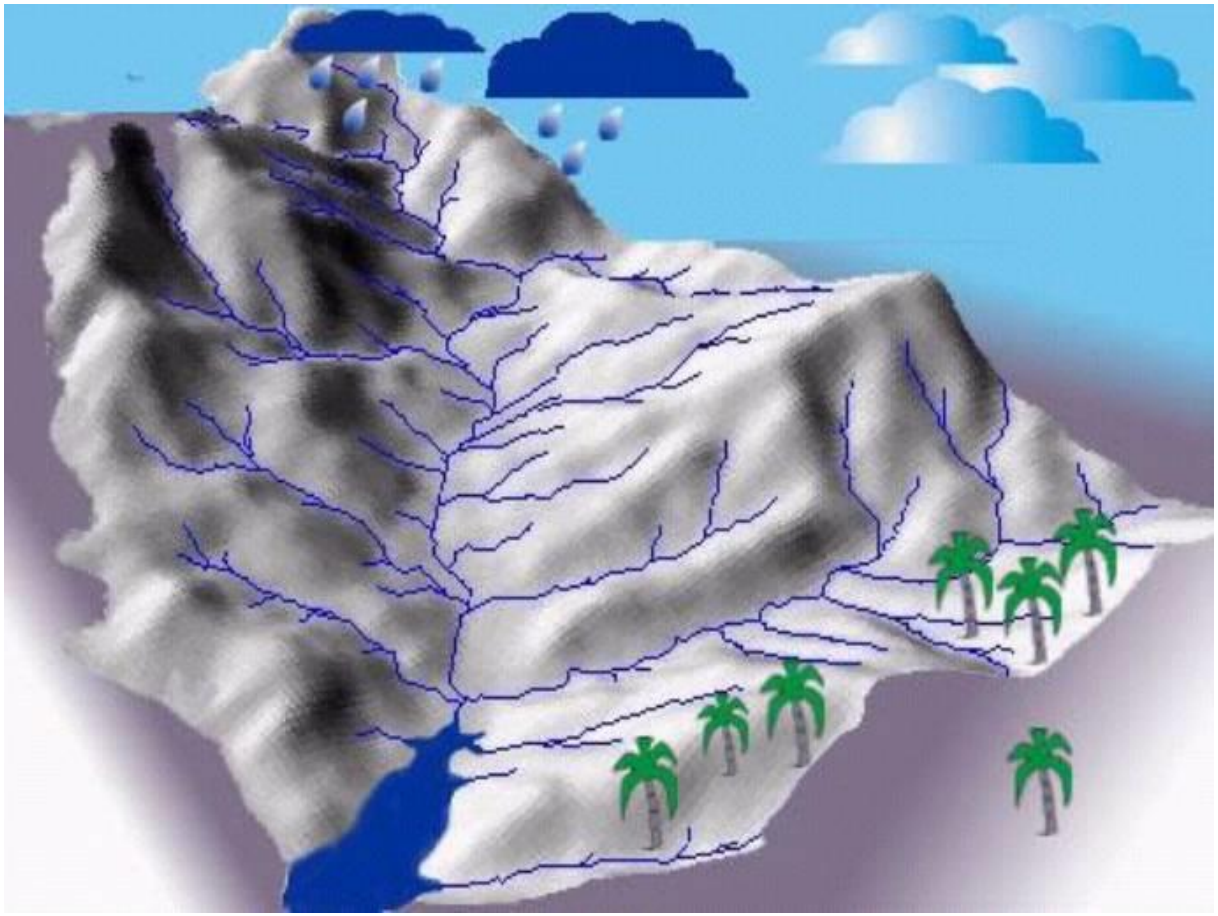


State jurisdiction

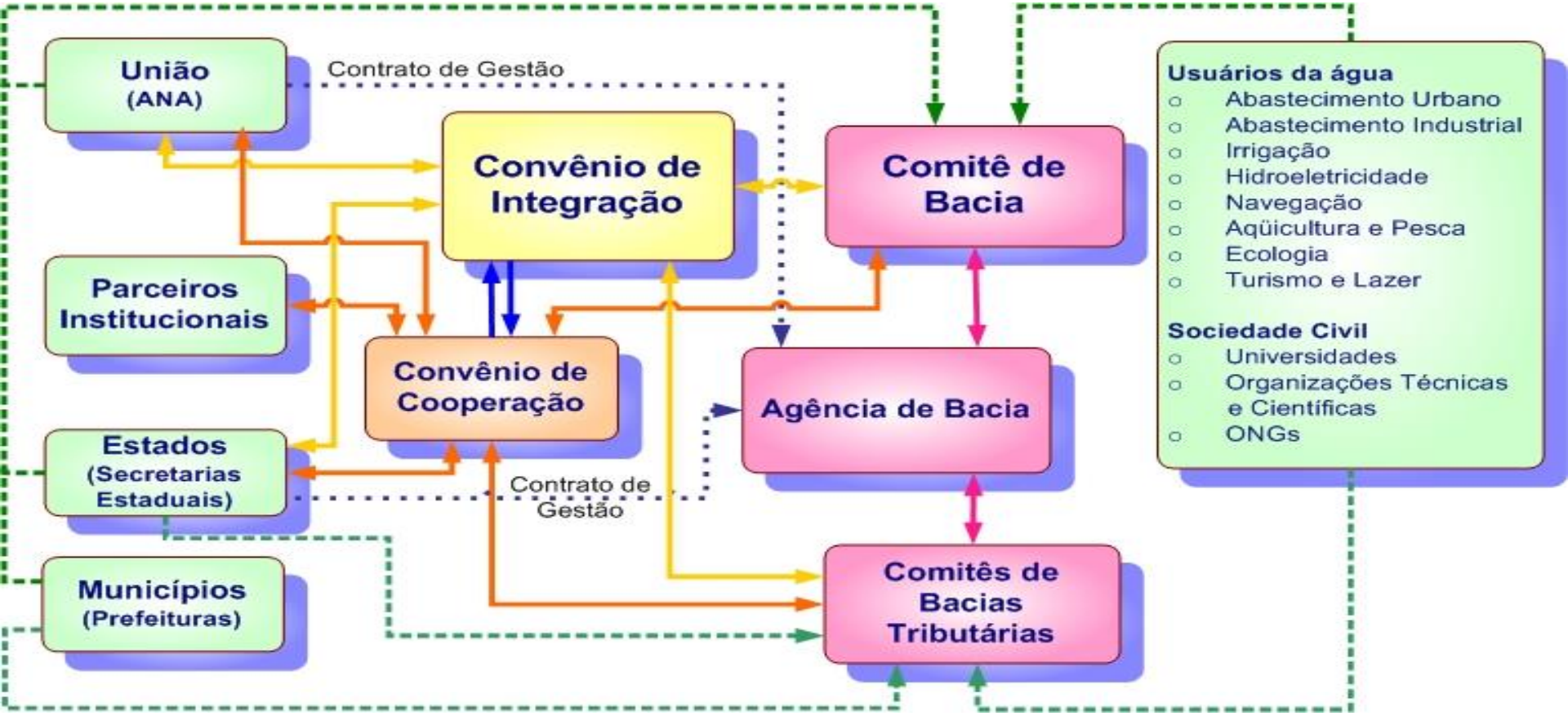
Federal jurisdiction

Water that flows in a river administrated by State A will be used downstream by citizens of State B.

Decisions about water use should consider the river basin as a whole



Institutional complexity



Saneamento

No Brasil, 45% das cidades ainda não têm esgoto; em 25% dos municípios, há racionamento de água

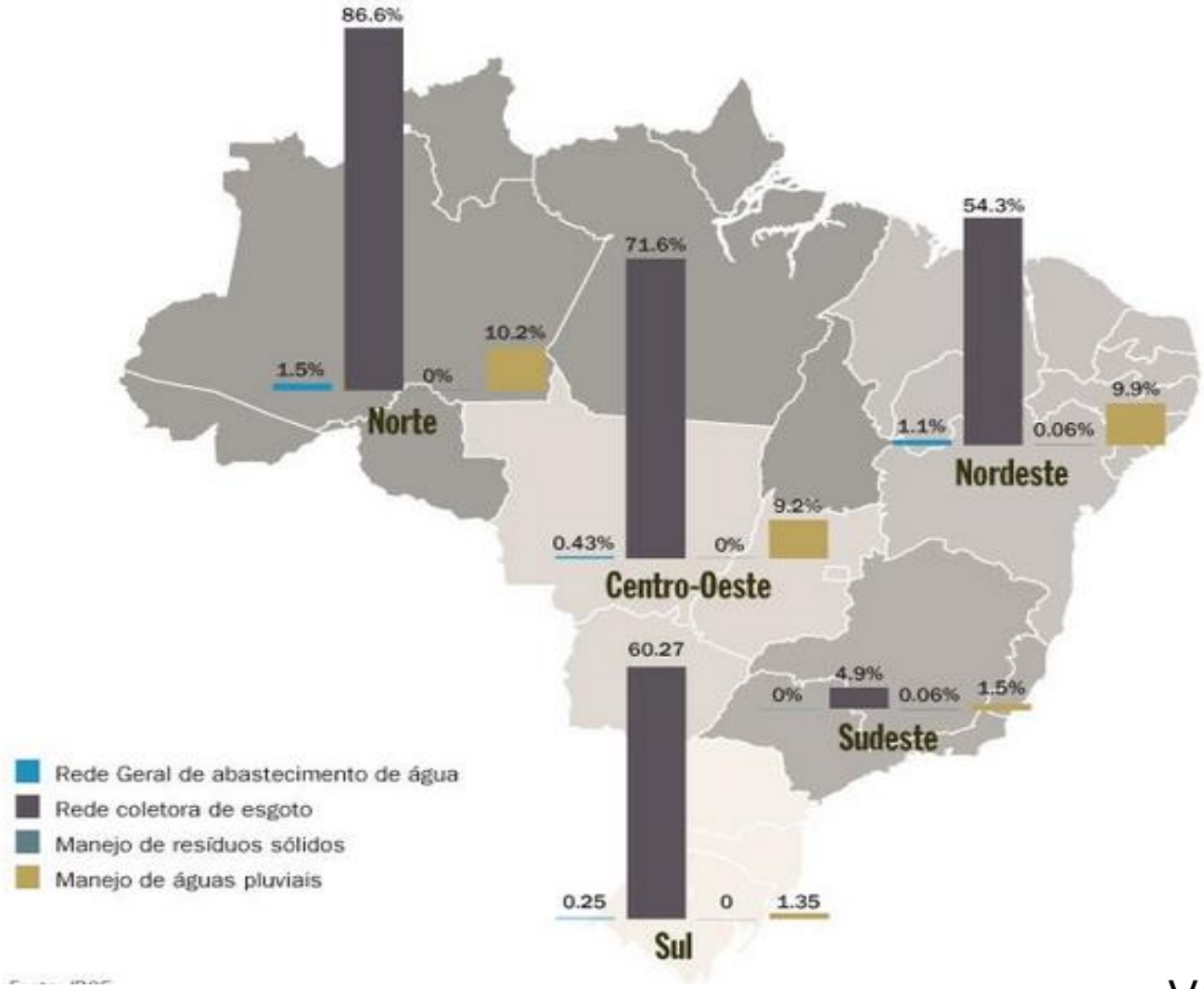
Atlas de Saneamento do IBGE, com dados de 2008, mostra que diferenças regionais persistem. Enquanto no Sudeste 95% têm rede de esgoto, no Norte só 13% dispõem do serviço

Esgoto no bairro de Marambaia, Belém (PA) (Filipe Araújo/AE)

Veja, 19/10/2011

Serviços ausentes nas cidades brasileiras

Proporção de municípios sem saneamento básico, por tipo de serviço (%) – 2008



Veja, 19/10/2011

What are the major challenges in the structure of the existing global water governance approach?

- Bulk water is a commodity?
- Water footprint?
- Global water governance?

The meeting aims to discuss the concerns of policy makers based on policy work, policy-related research work, and day-to-day experiences.

Four case studies

1) ANA: effective subsidies for sanitation
2) Water supply to SP and RJ
3) Water transfer from the São Francisco
4) Water infrastructure in Amazonian rivers

Case 1

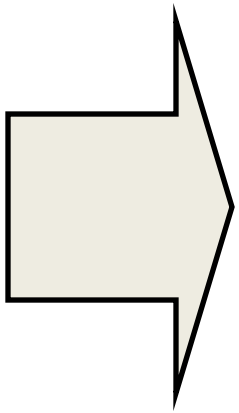
ANA: EFFECTIVE SUBSIDIES

needs of the poor…

needs of the community...

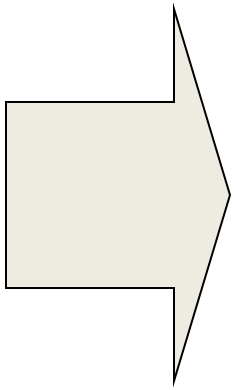
Subsidies for WHOM ?

Water supply and sewage collection



poor people

Sewage treatment



community

SOLUTION.....

Paying for results

Not for promises

ANA

AGÊNCIA NACIONAL DE ÁGUAS

River basin pollution abatement program

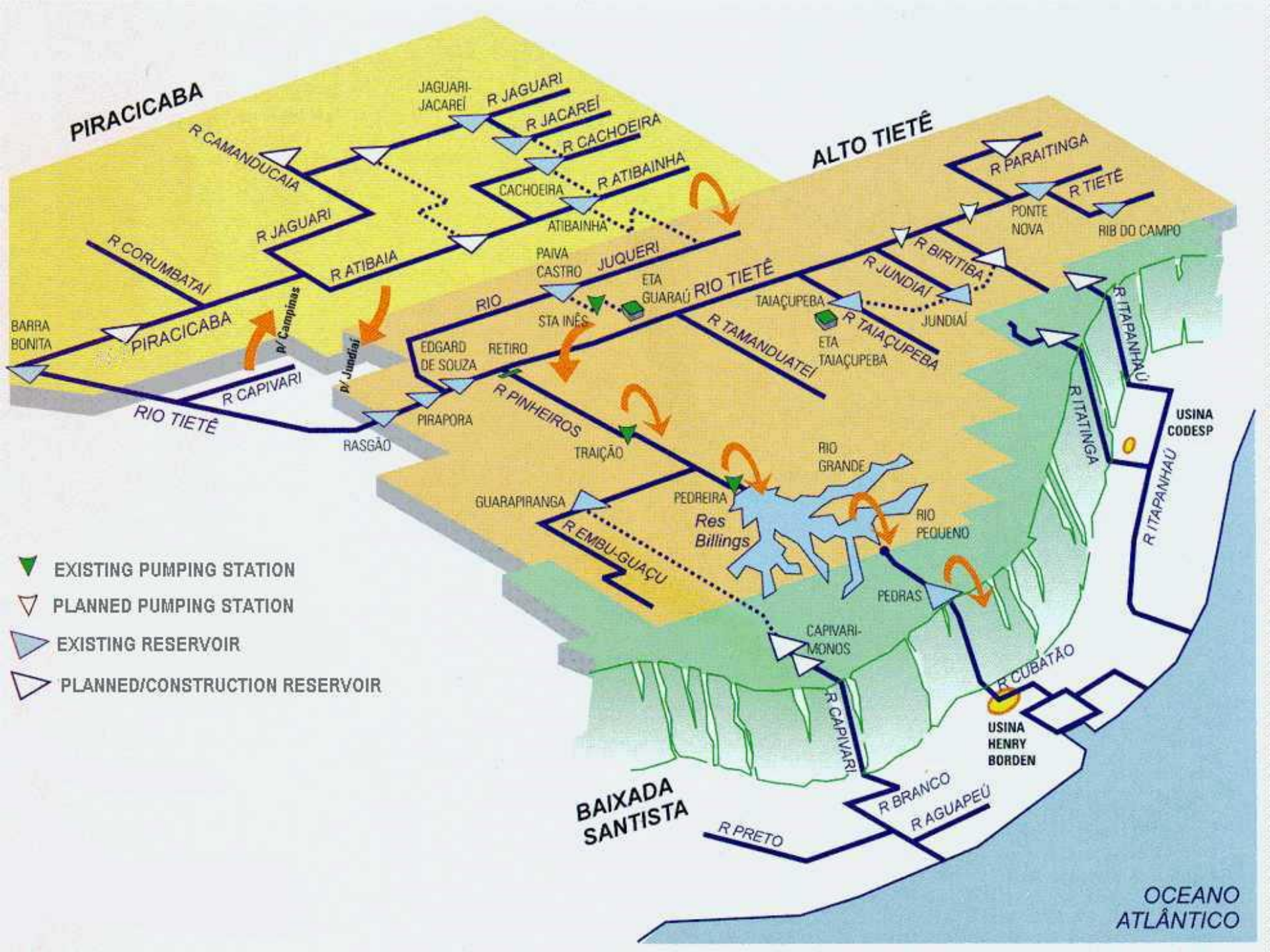
PRODES

PRODES pays for:
50% of the Sewage Treatment Plant average implementation costs

Requirements:
Achievement of pollution abatement goals

Case 2

Water supply to SP and RJ


PIRACICABA
ALTO TIETÊ
BAIXADA SANTISTA
OCEANO ATLÂNTICO
JAGUARI-JACAREÍ
R JAGUARI
R JACAREÍ
R CACHOEIRA
R CAMANDUCAIA
CACHOEIRA
R ATIBAINHA
ATIBAINHA
R JAGUARI
R ATIBAIA
R CORUMBATAÍ
BARRA BONITA
PIRACICABA
R CAPIVARI
RIO TIETÊ
RASGÃO
P/ Campinas
P/ Jundiaí
PAIVA CASTRO
JUQUERI
RIO
STA INÊS
ETA GUARAÚ
RIO TIETÊ
EDGARD DE SOUZA
RETIRO
PIRAPORA
R PINHEIROS
TRAIÇÃO
R TAMANDUATEÍ
R PARAITINGA
R TIETÊ
PONTE NOVA
RIB DO CAMPO
R BIRITIBA
R JUNDIAÍ
JUNDIAÍ
TAIAÇUPEBA
R TAIAÇUPEBA
ETA TAIAÇUPEBA
R ITAPANHAÚ
R ITATINGA
USINA CODESP
R ITAPANHAÚ
RIO GRANDE
GUARAPIRANGA
PEDREIRA
Res Billings
RIO PEQUENO
R EMBU-GUAÇU
PEDRAS
CAPIVARI-MONOS
R CUBATÃO
R CAPIVARI
USINA HENRY BORDEN
R BRANCO
R AGUAPEÚ
R PRETO
EXISTING PUMPING STATION
PLANNED PUMPING STATION
EXISTING RESERVOIR
PLANNED/CONSTRUCTION RESERVOIR


SÃO PAULO
AV. PAULISTA
820 m
ETA GUARAÚ
830 m
REPRESA
ÁGUAS CLARAS
860 m
TÚNEL 2
TÚNEL 1
E
TÚNEL 4
ESTAÇÃO
ELEVATÓRIA
SANTA INÊS
CONDUTO
DE RECALQUE
REPRESA
PAIVA
CASTRO
745 m
CANAL
CHAMINÉ DE
EQUILÍBRIO
TÚNEL 3
CASA DE MÁQUINAS
TÚNEL 5
REPRESA
ATIBAINHA
787 m
TÚNEL 6
REPRESA
CACHOEIRA
822 m
TÚNEL 7
REPRESA
JAGUARI-JACAREÍ
844 m

SISTEMA CANTAREIRA

Produz 33.000 l/s e abastece 9 milhões de habitantes. Zonas norte, central, leste, oeste de SP e São Caetano do Sul.

ETA GUARAÚ

Capacidade de produção: 33m³/s

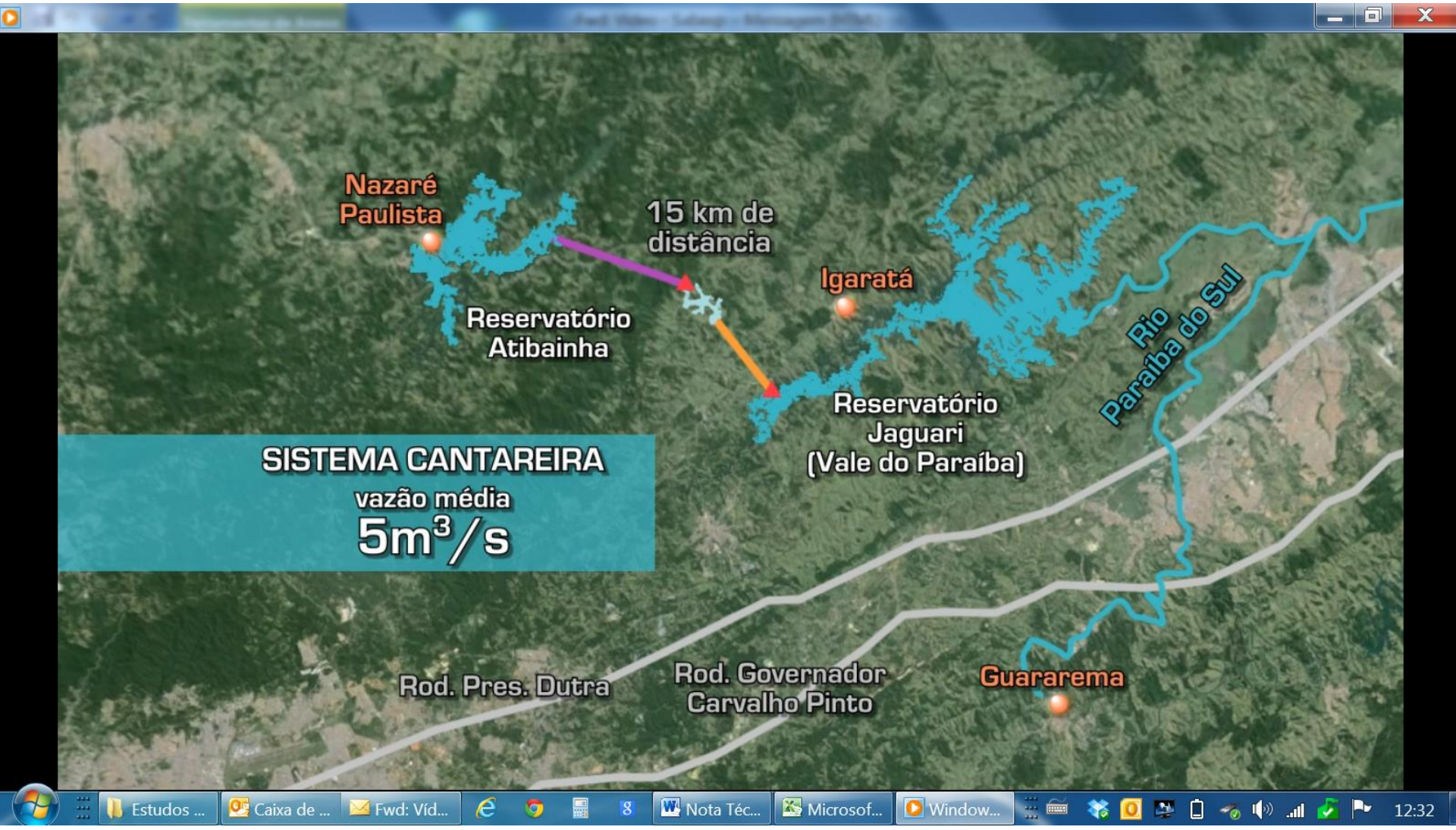
ANA-DAEE renovam outorga do Cantareira (2004)

(a) o máximo volume que pode ser retirado varia diretamente com o estoque de água no início do mês

(b) a região doadora tem direito a x% do volume afluente mensal e a receptora a (100 – x)%

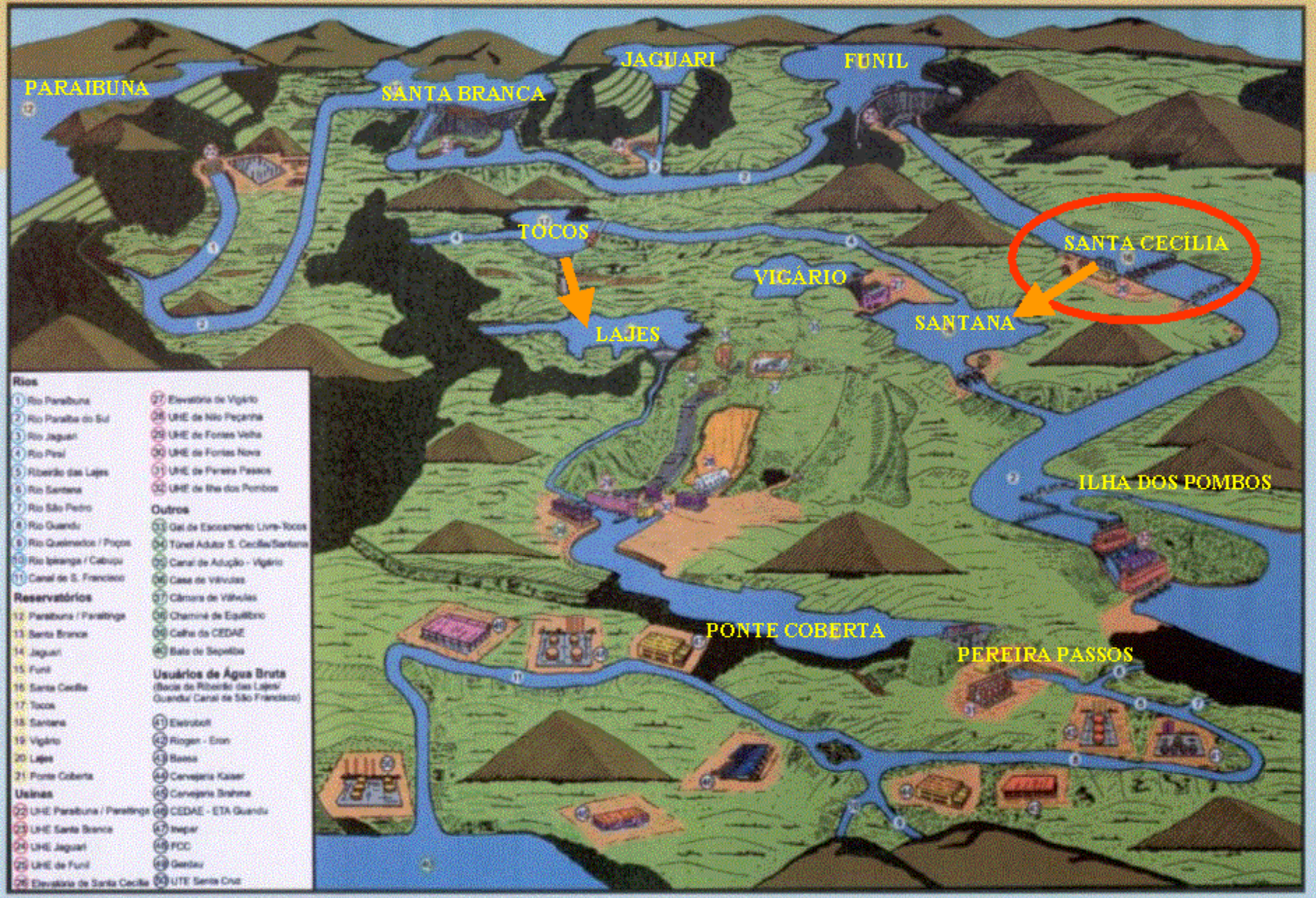
(c) qualquer uma das regiões pode utilizar imediatamente sua cota mensal ou guardá-la nos reservatórios para uso futuro (“banco da água”)

(d) a ANA e o DAEE contabilizam os volumes economizados e dão publicidade, por meio da Internet


Nazaré Paulista
15 km de distância
Igaratá
Reservatório Atibainha
Reservatório Jaguari (Vale do Paraíba)
Rio Paraíba do Sul
SISTEMA CANTAREIRA
vazão média
5m³/s
Rod. Pres. Dutra
Rod. Governador Carvalho Pinto
Guararema

BACIA DO RIO PARAÍBA DO SUL

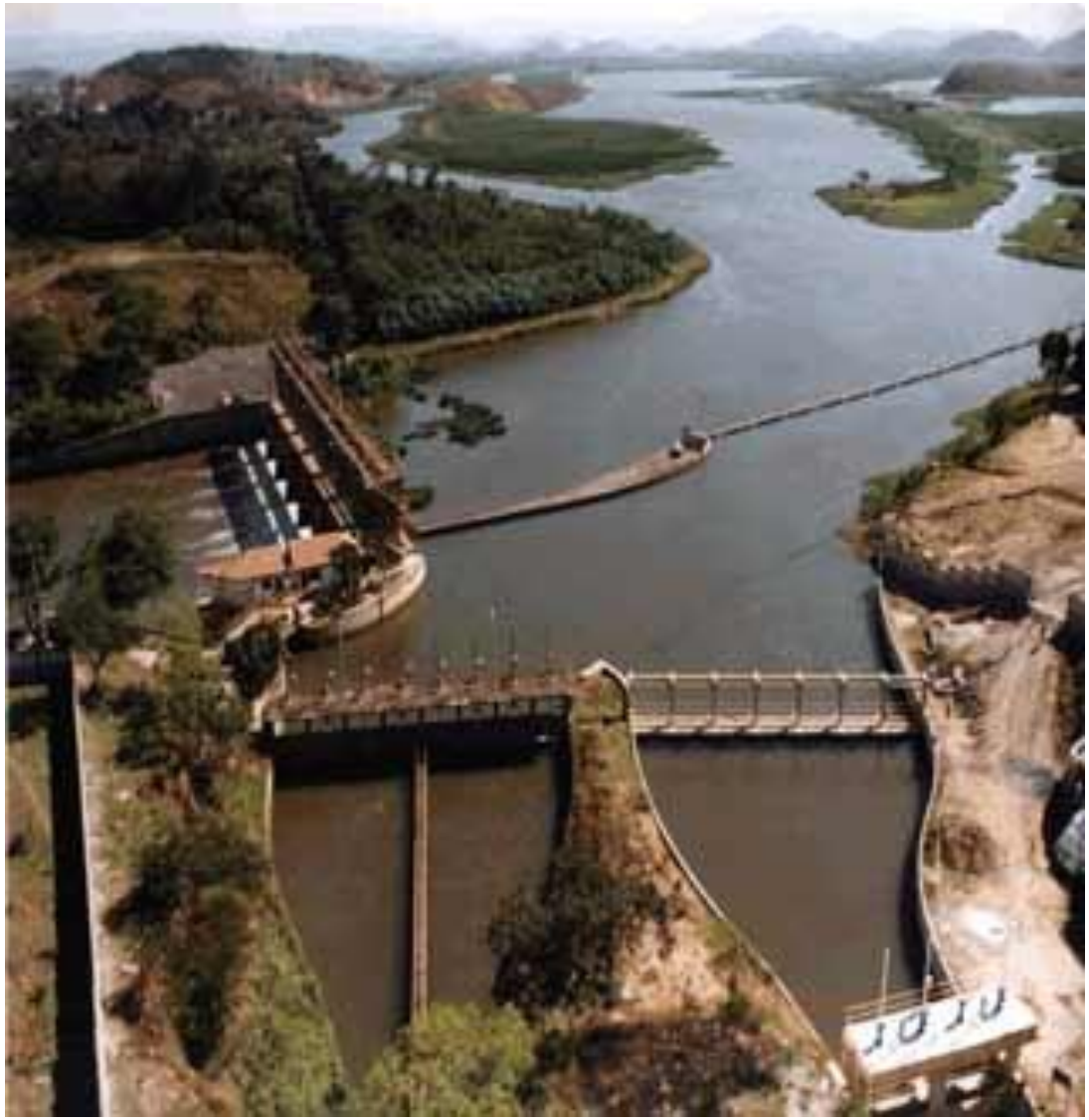
Representação Esquemática do Complexo Hidrelétrico do Paraíba do Sul/Lajes

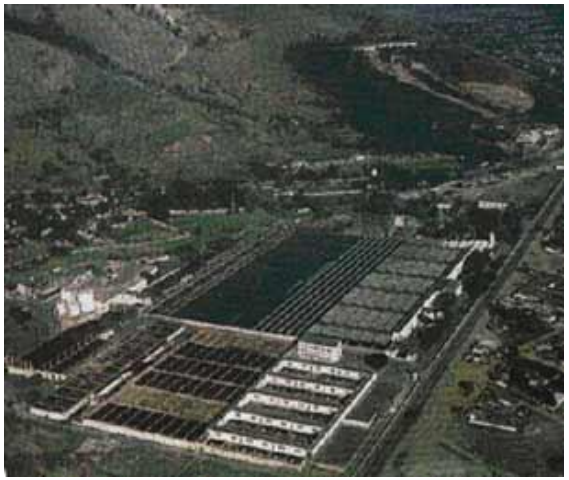


Fonte: LABHID da COPPE / UFRJ - Criação: Nelson Nascimento e Celso Peluzzi


160 m3/s
250 m3/s
90 m3/s
Elevatória de S. Cecília

Estação de Tratamento de Água do Guandu





Inaugurada em 1955, a Estação de Tratamento de Água do Guandu produz hoje cerca de 48 mil litros por segundo

Case 3

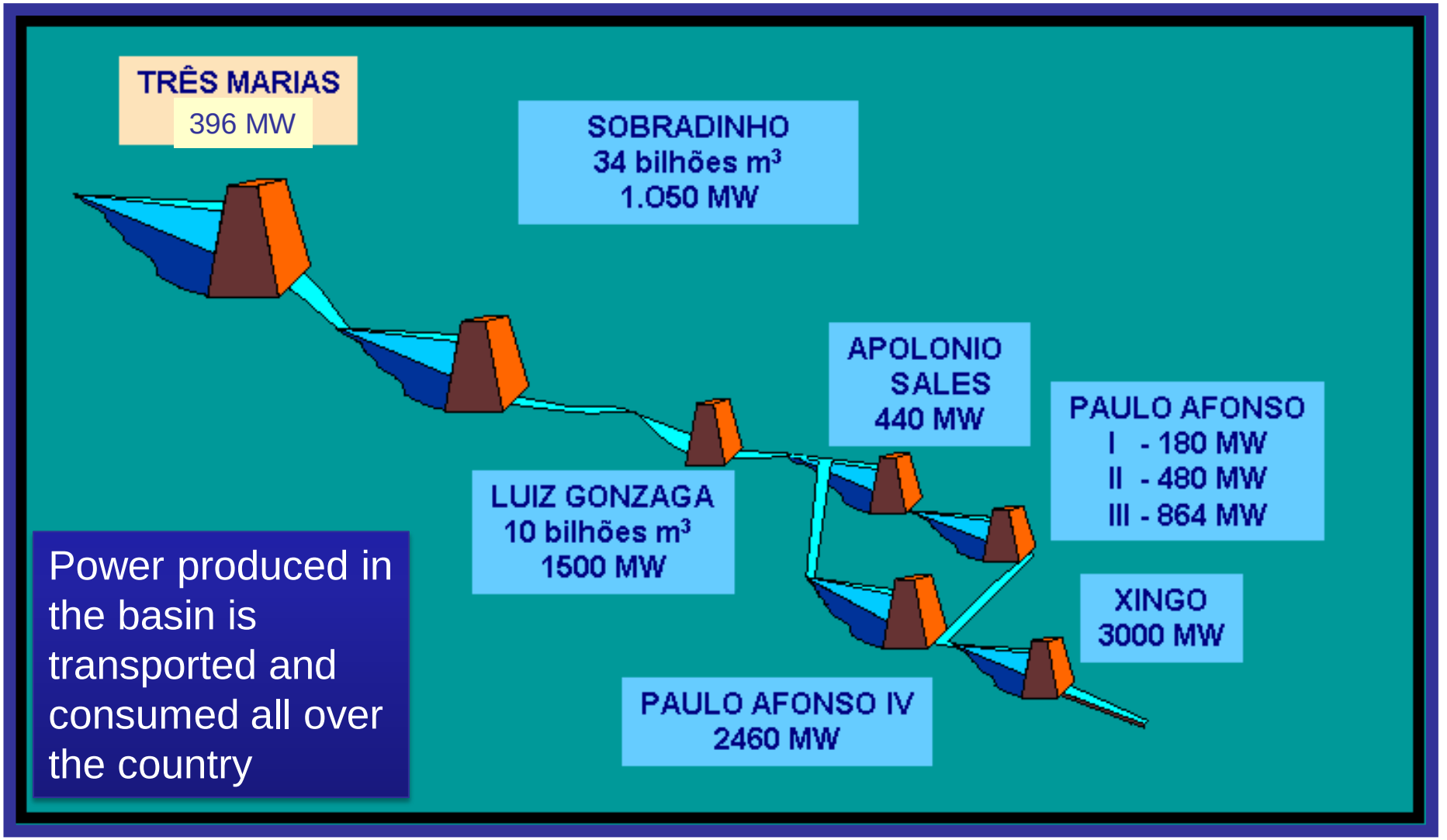
Water transfer from the São Francisco River

About 5% of the Brazilian population lives in the Northeast corner of the country. They share the same language, culture, institutions, education and political system of the other 95%. Yet, they have by far the lowest per capita income.

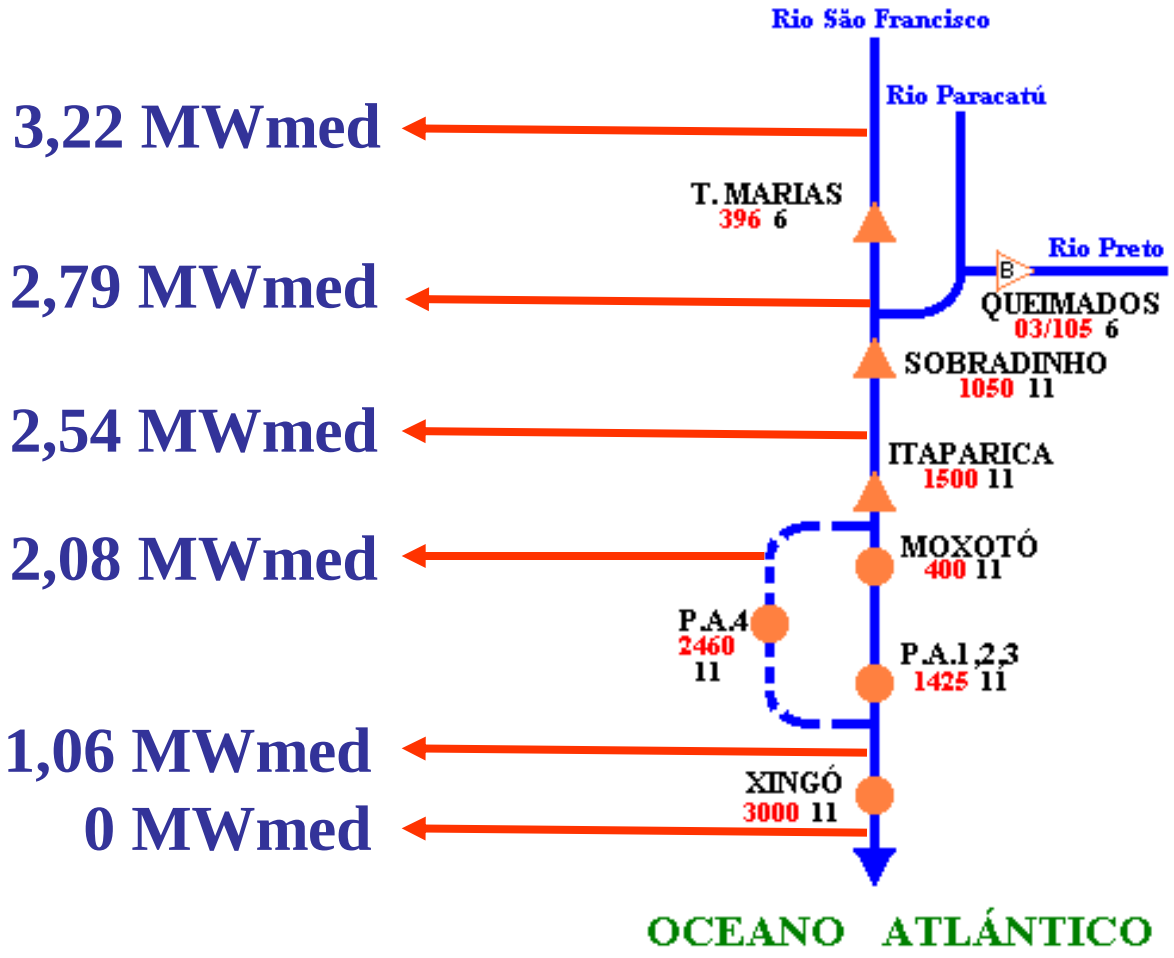
What really differentiates this region from the rest of the country is hydrological variability. How to mitigate this problem?


Sobradinho
Reservoir
34 billion m3
Sao Francisco
River Basin
2800 m3/s
640,000 km2
Length 2600 km
Brazil

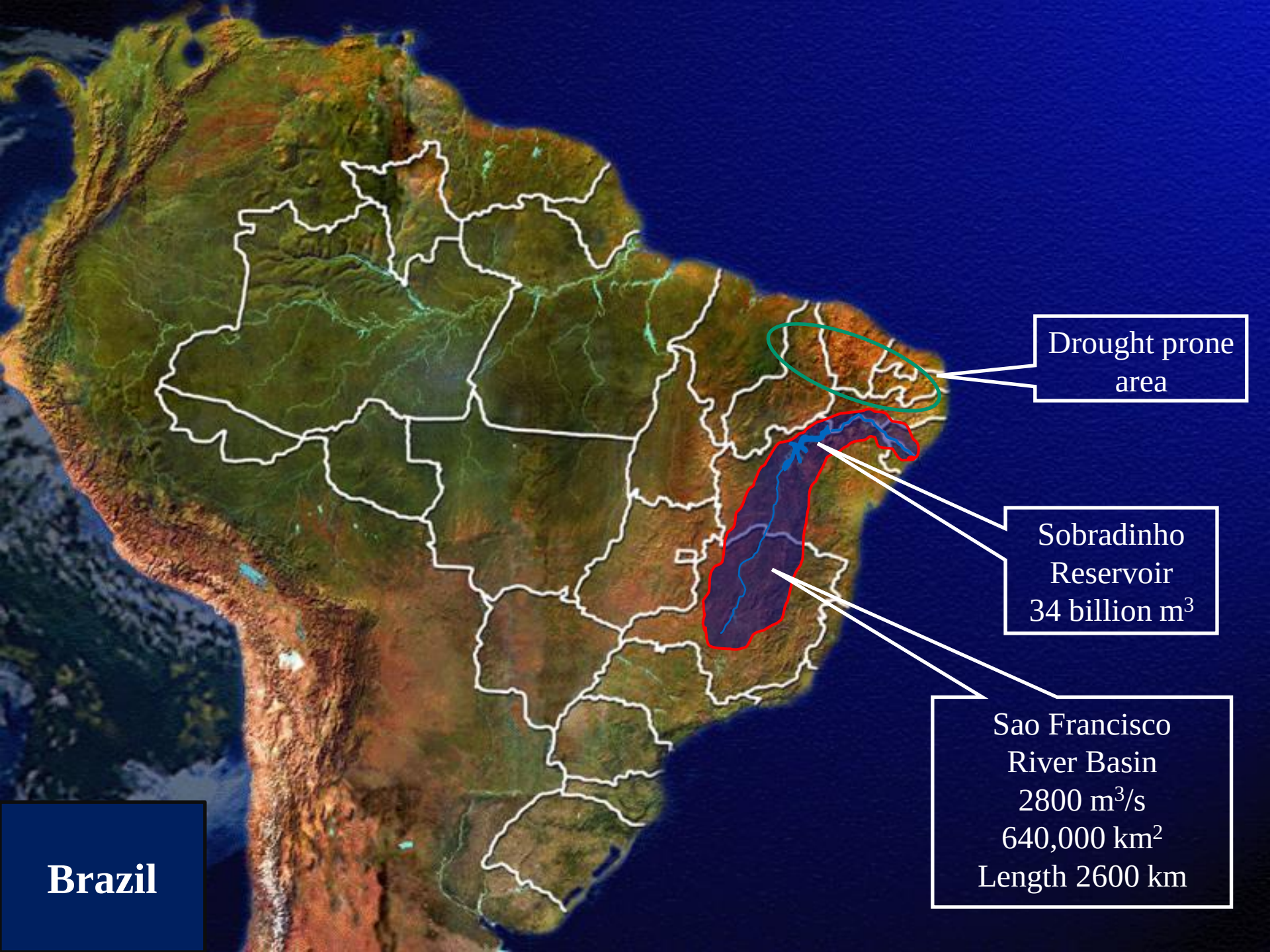
Hydropower in the San Francisco River



Irrigation X Hydropower



Estimated decrease of firm power for each 1m³/s used in irrigation

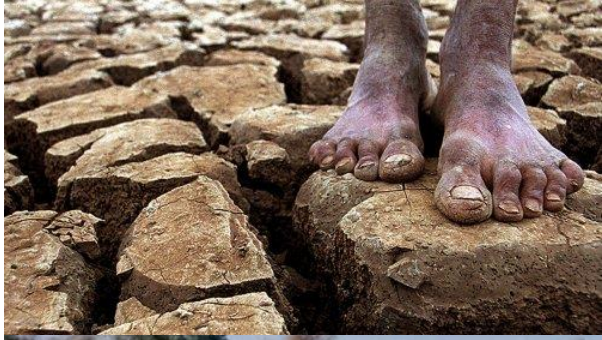

Drought prone area
Sobradinho Reservoir 34 billion m3
Sao Francisco River Basin 2800 m3/s 640,000 km2 Length 2600 km
Brazil

Brazilian Semi-Arid

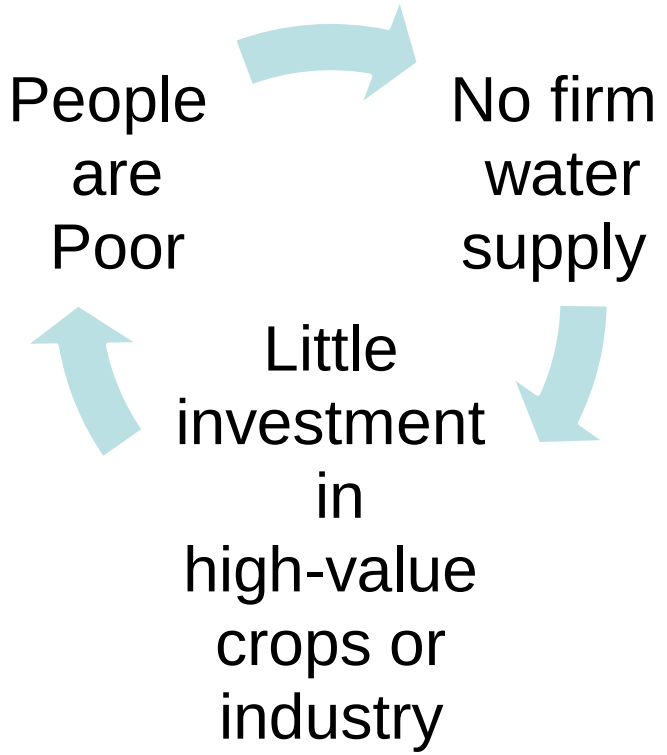
Intermittent rivers
Many small reservoirs that dry out during droughts

10 million people without reliable water supply

3 km average distance to water sources



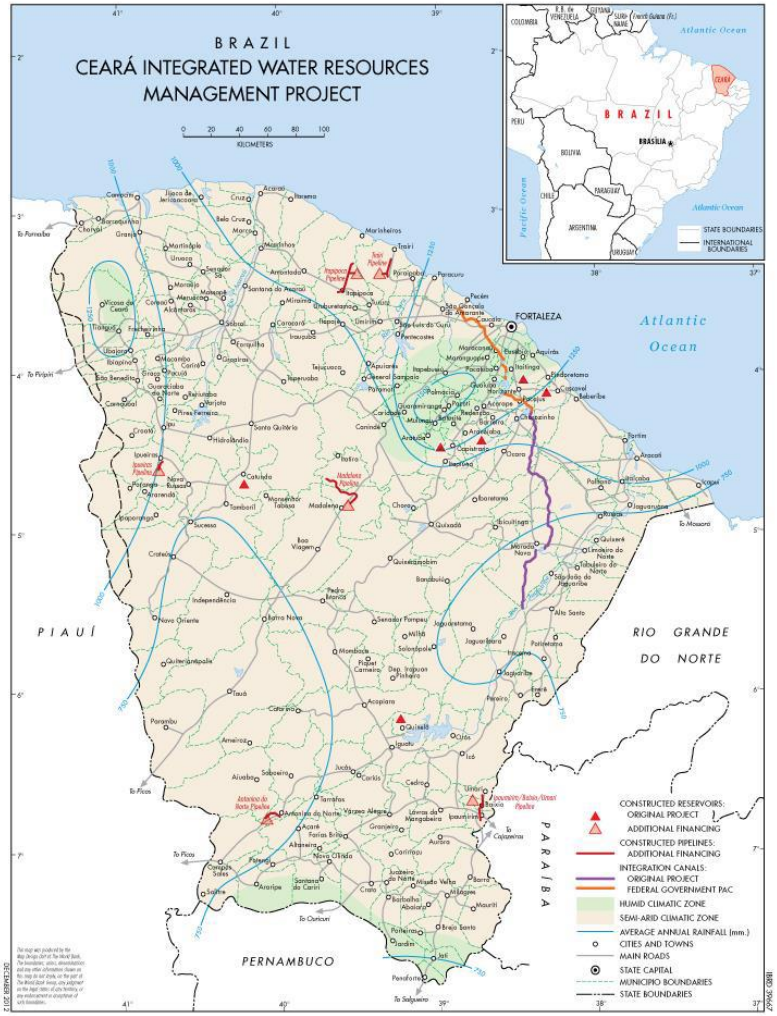
HYDROLOGICAL VICIOUS CYCLE



It is necessary an initial stock of investments on water infrastructure before reaching the "inflexion point… and then real progress starts

(David Grey and Claudia Sadoff, "Sink or Swim? Water security for growth and development")

Success Story – Ceará
Infrastructure + Institutions



The State of Ceará in Northeast Brazil - from recurrent, devastating droughts to water security in 20 years:

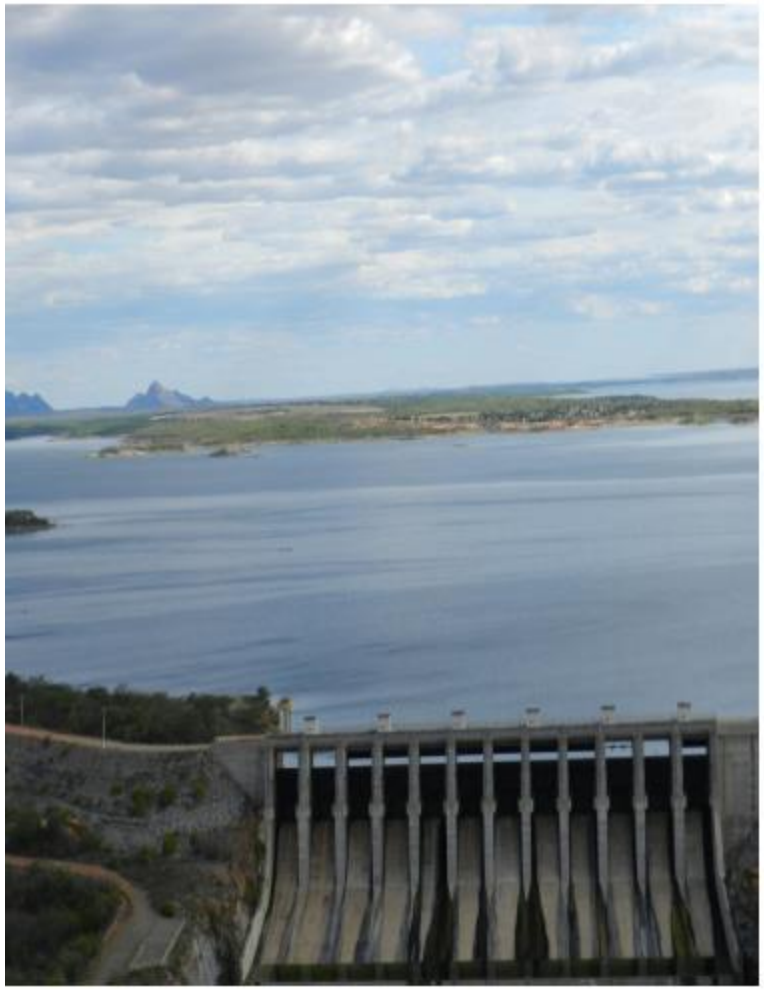
- functioning institutions and legal framework for water resources management

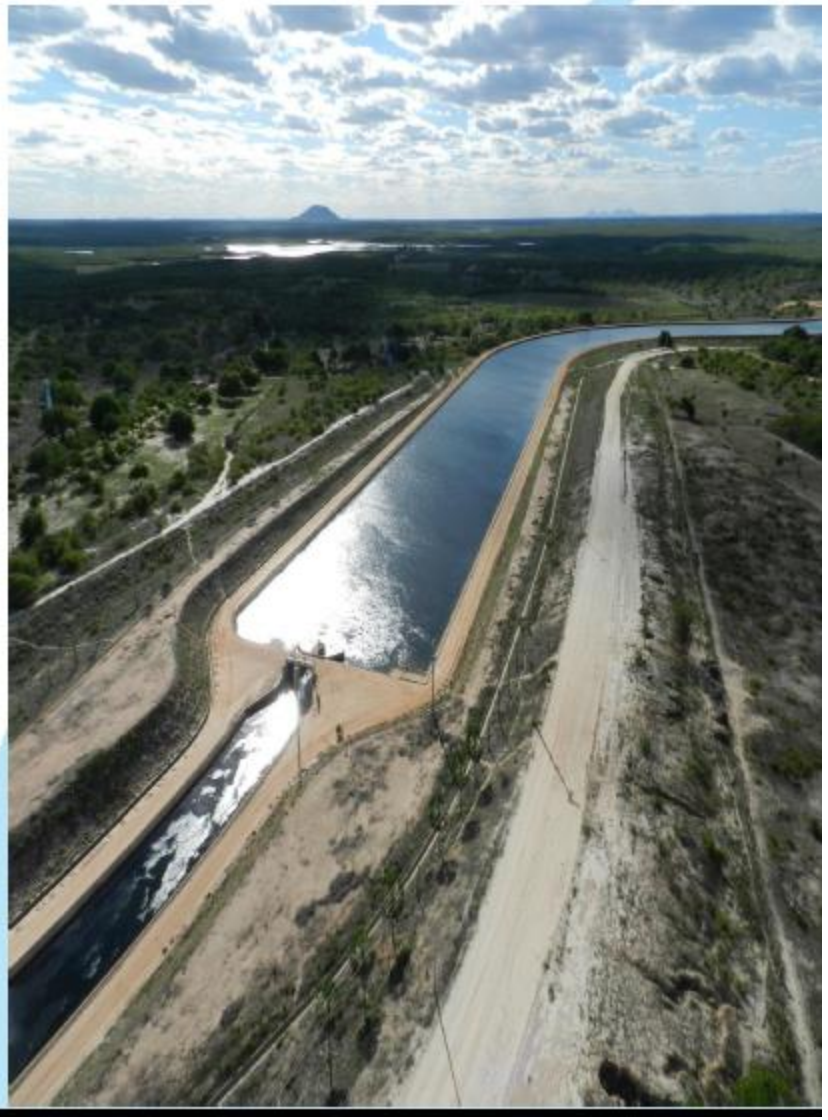
- bulk water pricing

- large and medium storage structures

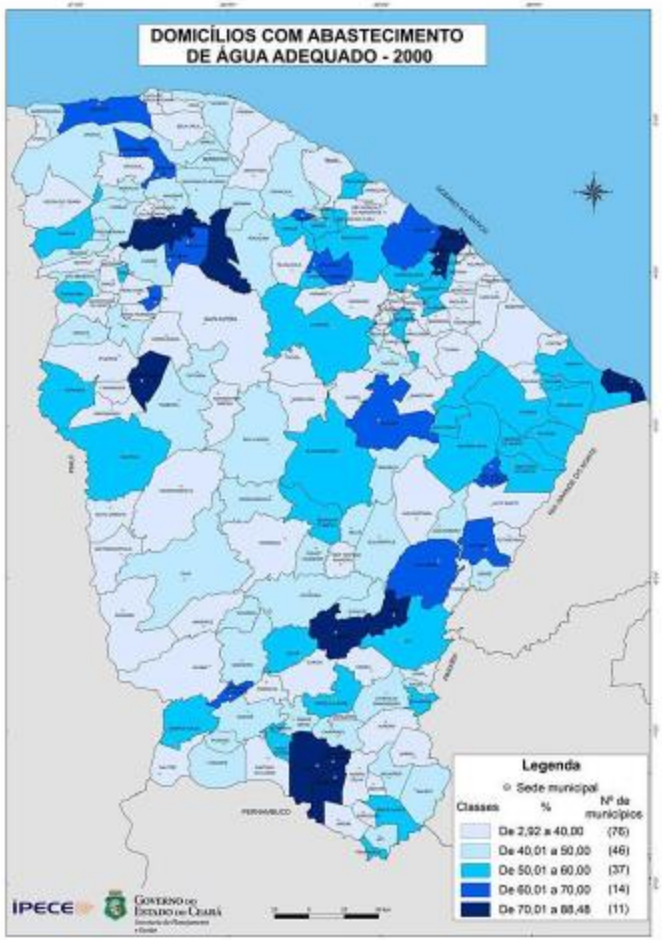
- interbasin transfers

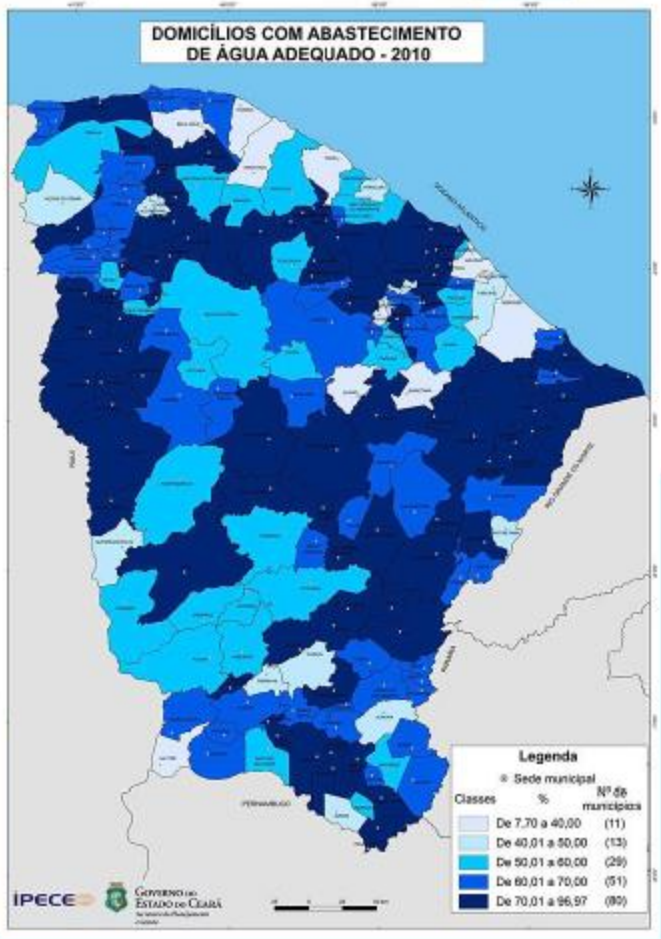
Water Storage and Basin Transfer Infrastructure





Households with Adequate Water Supply in Ceará
2000 vs 2010



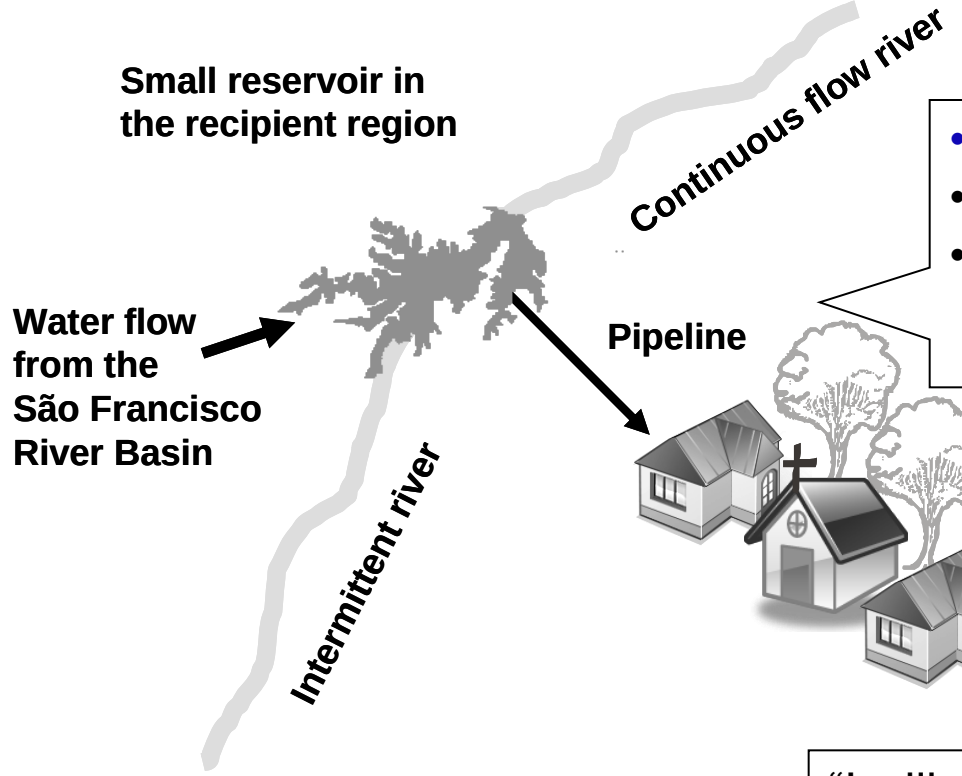


Failure Story – irrigation districts
Infrastructure yes, but no institution and no market

San Francisco River Water Diversion Project

EIXO NORTE

494 m – 325 m = 169 m



- **Interbasin Diversion Project**
- Build local reservoirs
- Build pipes and channels

Water for production

X

"I will sustain a hunger strike until Government cancels the Project" (Bishop Dom Cappio)

- **No Interbasin Diversion Project**
- Build individual water tanks
- Store rain falling on the roofs

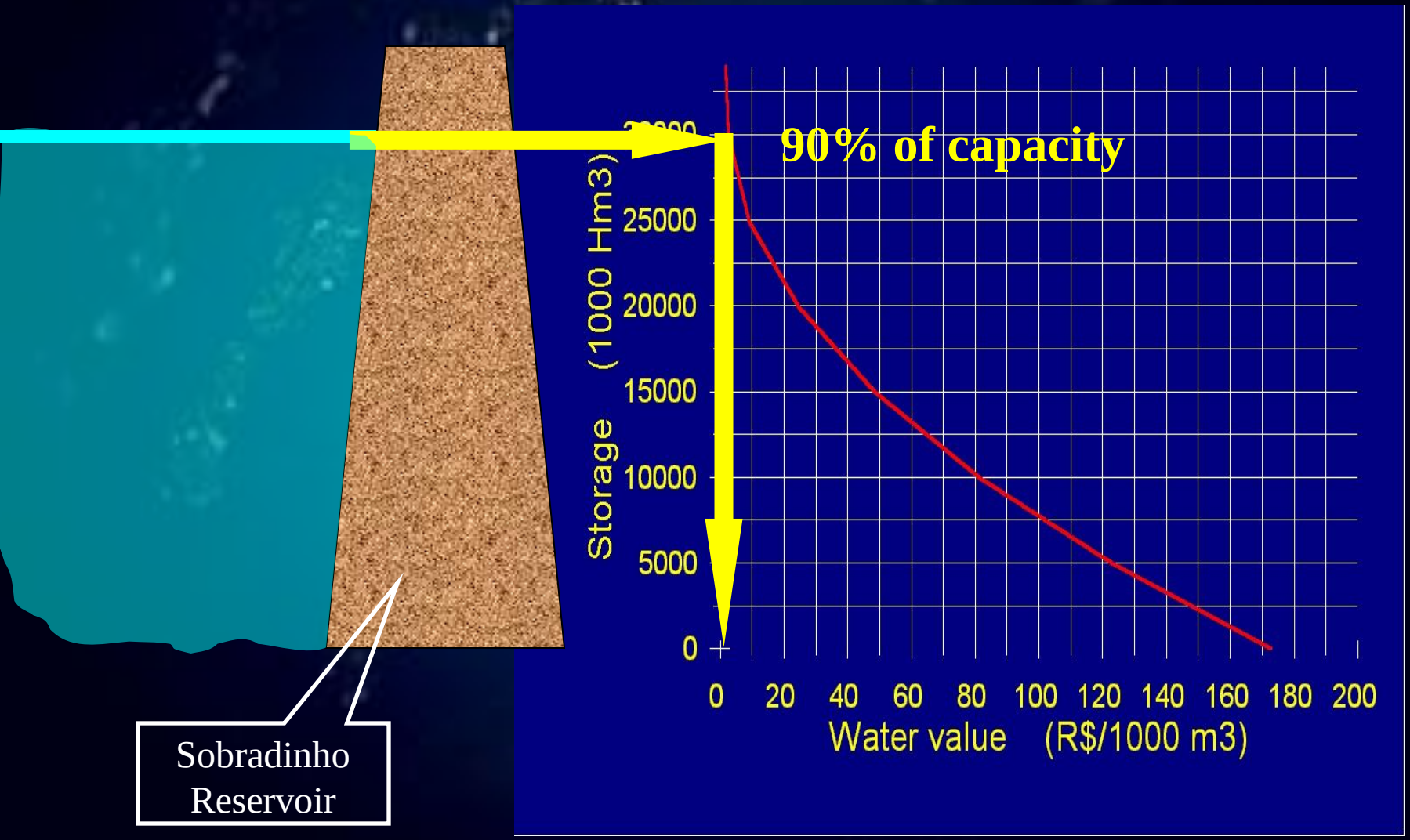
Water for survival

Q_{mean} São Francisco River = 2600 m^3 /s

26 m^3 /s ≤ $Q_{diversion}$ ≤ 127 m^3 /s
1% of Q_{mean} ≤ $Q_{diversion}$ ≤ 5% of Q_{mean}

600 Km of channels

Opportunity cost of water in the Sobradinho Reservoir



Case 4

Water infrastructure in Amazonian rivers

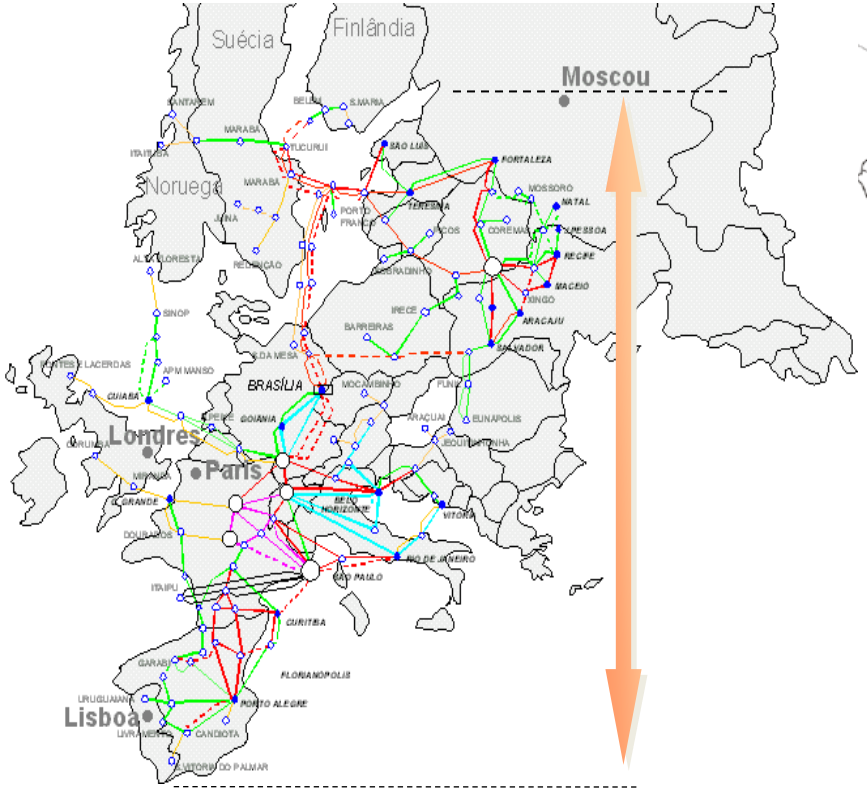
New power plants are being built in the Amazon River Basin.

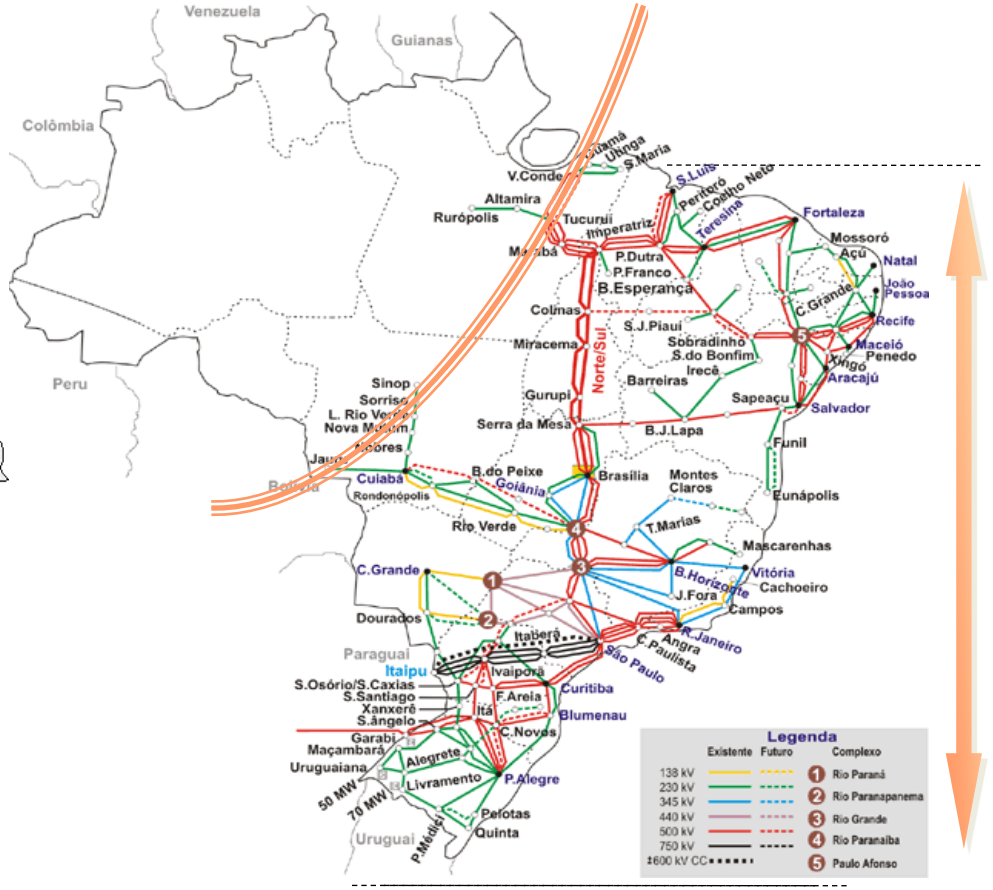
What is the trade-off between the energy benefits and the environmental and socio impacts that affect local people, including indigenous populations?

Background: The Brazilian Amazon covers 520 million hectares, in nine states

RFU
LCSSD

Transmission System
120.000 km 230 -800 kV





Europe — 4 000 km

Brazil — 4 000 km

Brazilian power sector at glance 2012

Installed capacity ~ 121 GW

Hydro installed capacity 70%

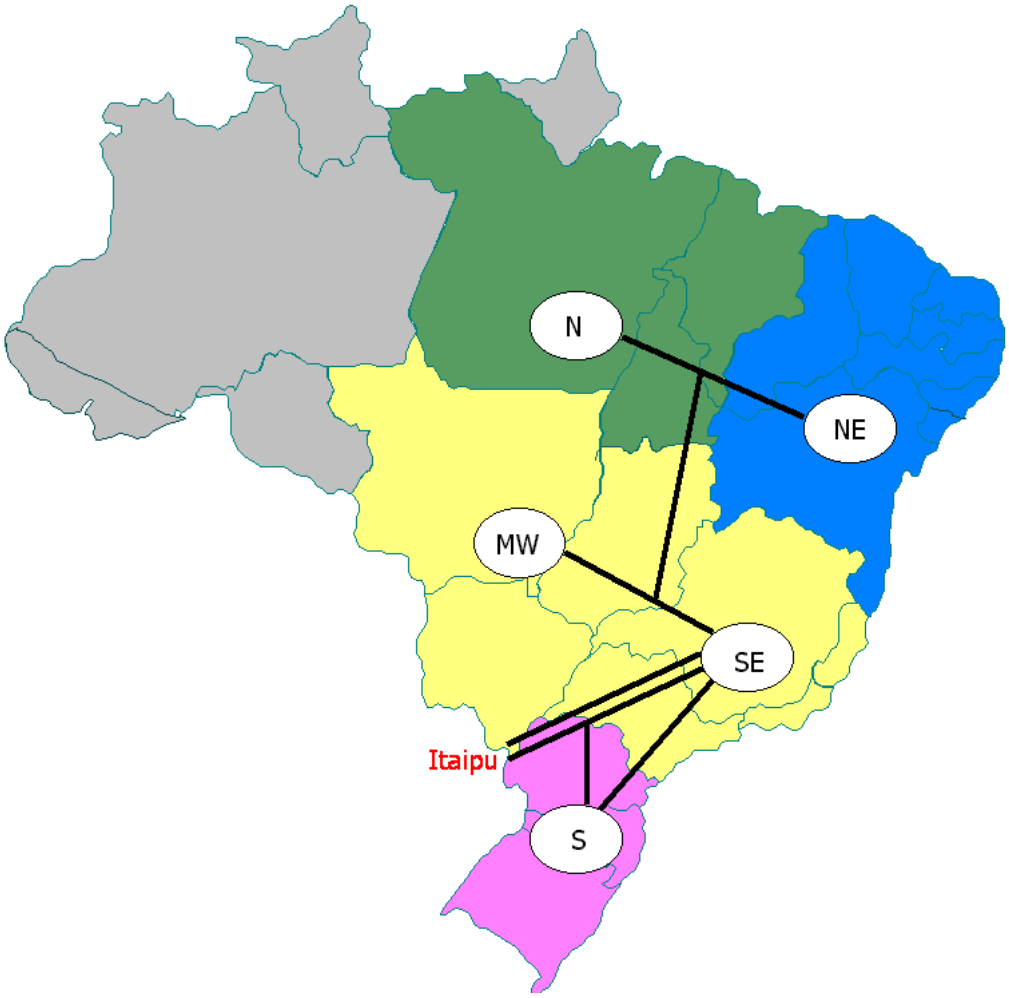
Consumption 500,000 GWh

Losses 15%

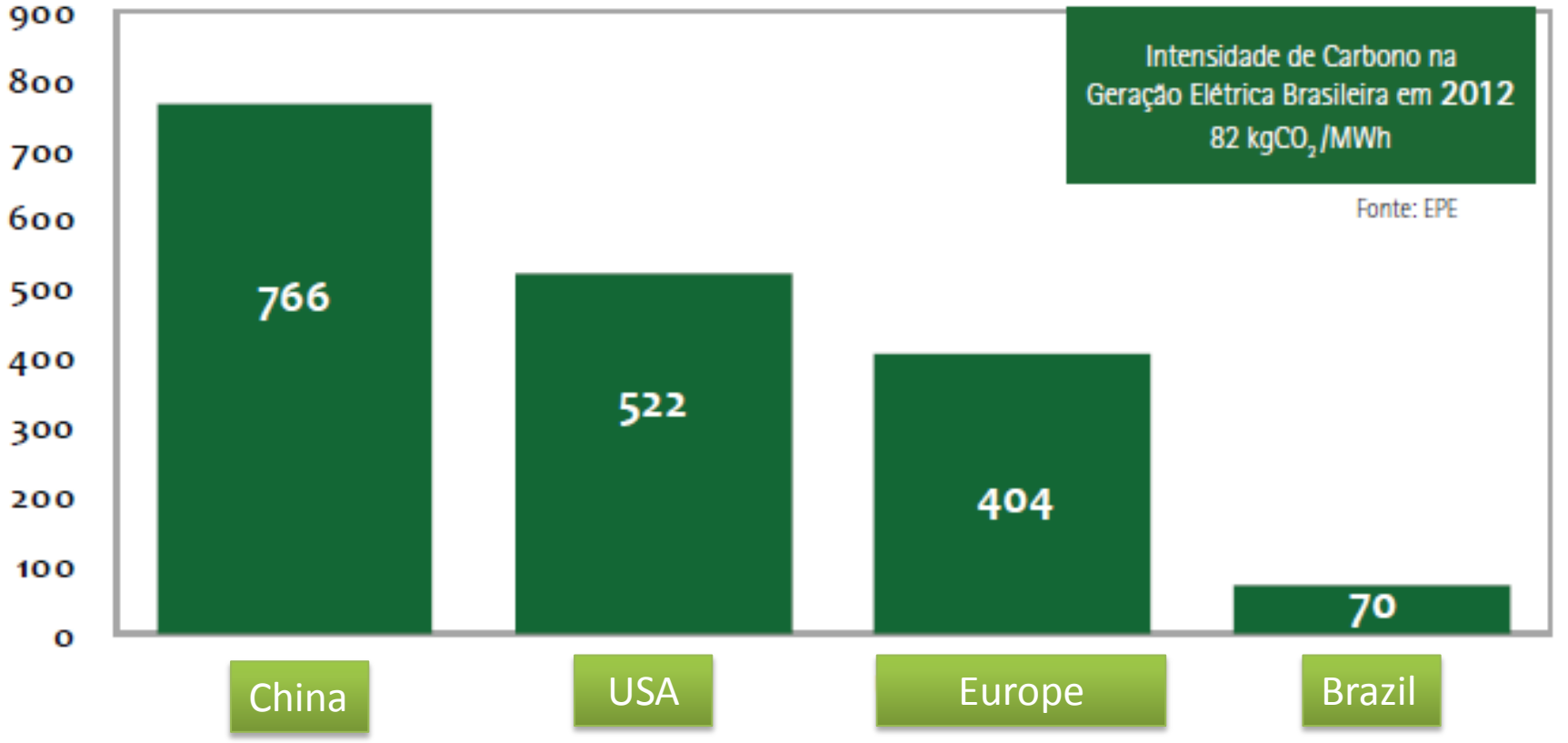
Hydroelectric energy 77%
(few years ago, it was 90%!)

Brazil renewables
(hydroelectric + wind power + sugar cane bagasse) 85%

World renewables 20%



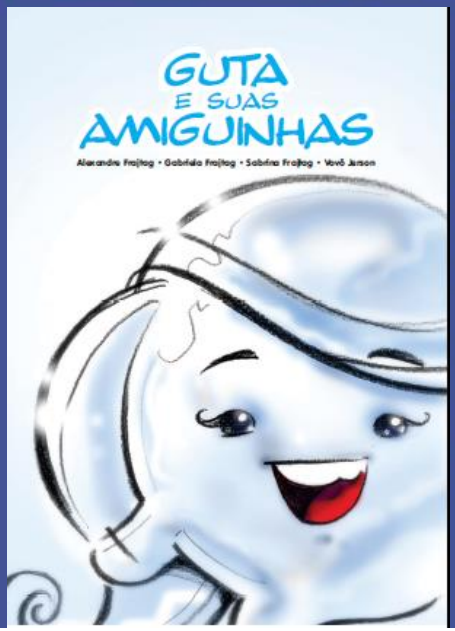
Kg CO2 / MWh (2010)



*Fonte: Agência Internacional de Energia. (*Fonte: EPE)*

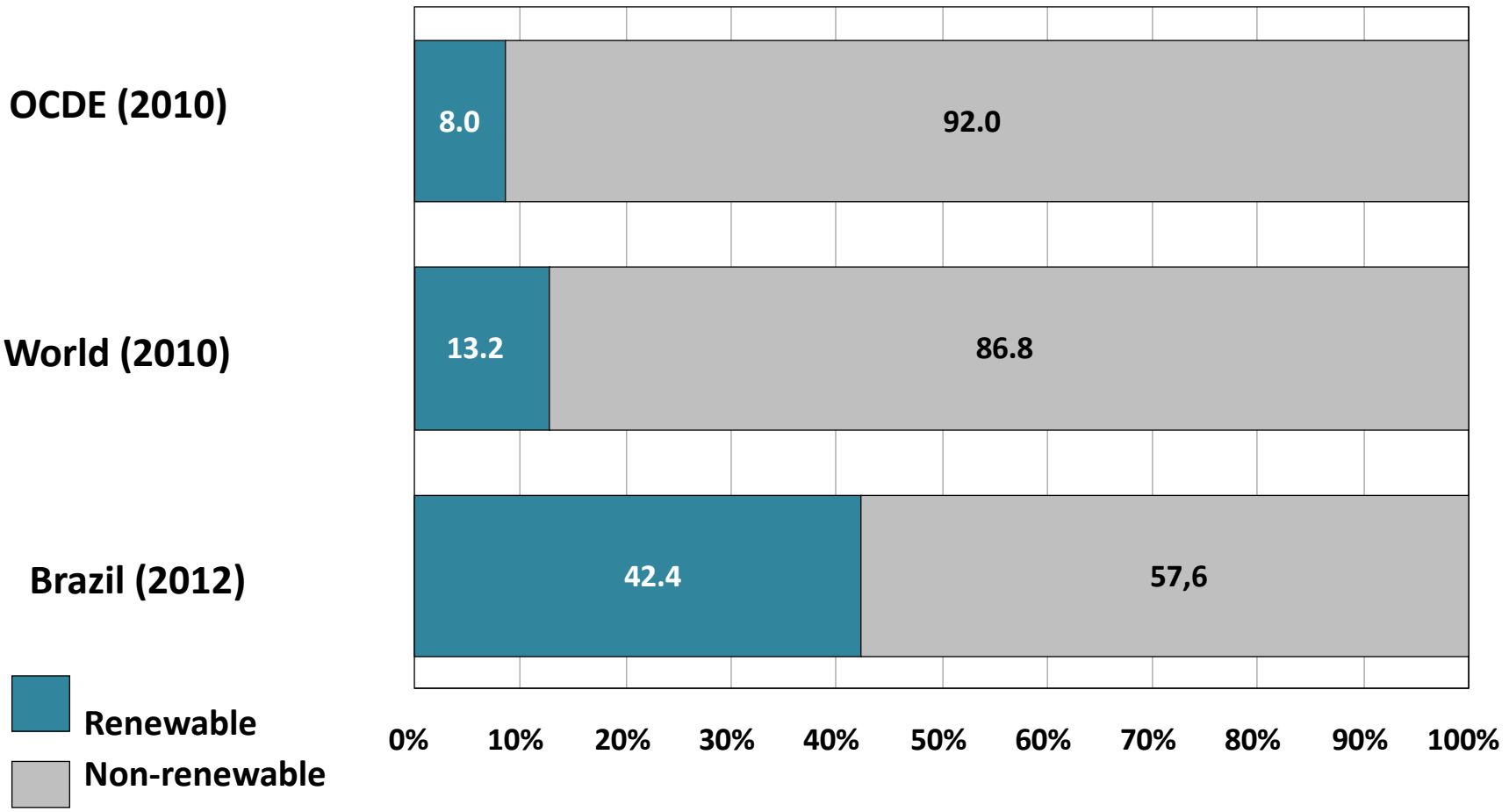
Light
ESCO

WE HAVE BEEN PRODUCING ELECTRICITY FROM SOLAR ENERGY FOR MORE THAN A CENTURY



www.lightesco.com.br

Overall use of Energy

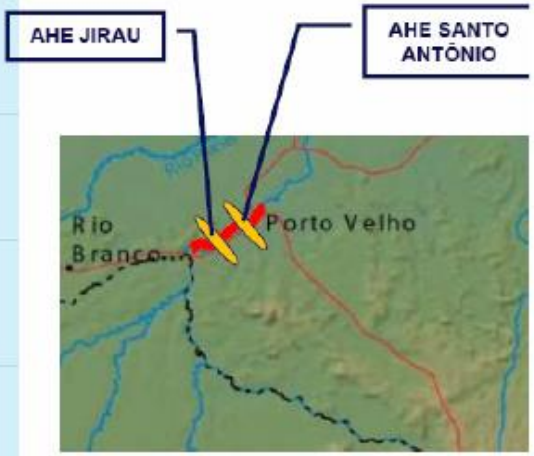


In Brazil:

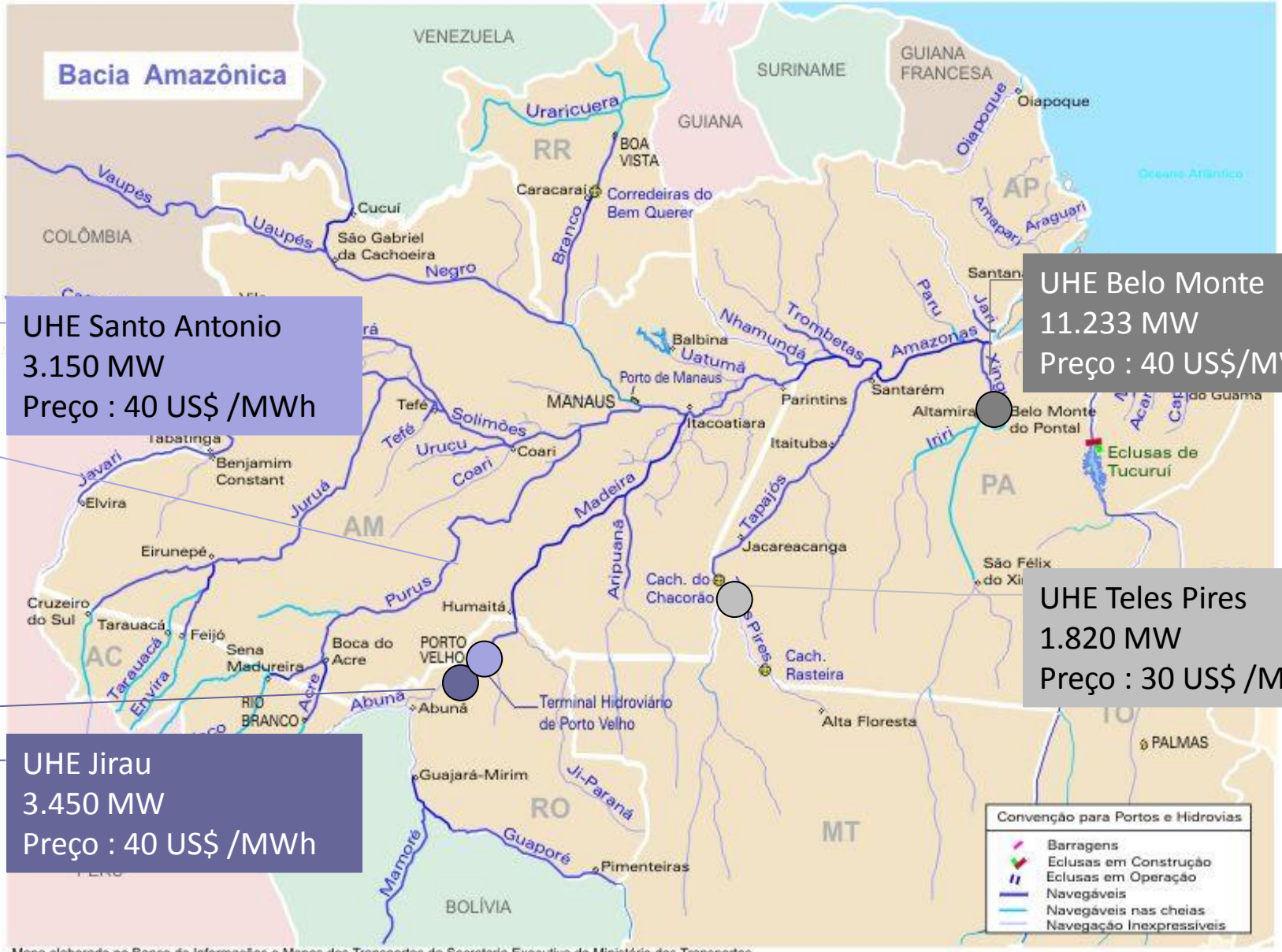
- electricity is mostly produced by water
- vehicles can use any blend of gas + ethanol (flex fuel)

Does it make sense to build new hydro plants and water ways in the Amazon?

THE MADEIRA RIVER PROJECT



What would be the alternatives?



UHE Santo Antonio
3.150 MW
Preço : 40 US$ /MWh

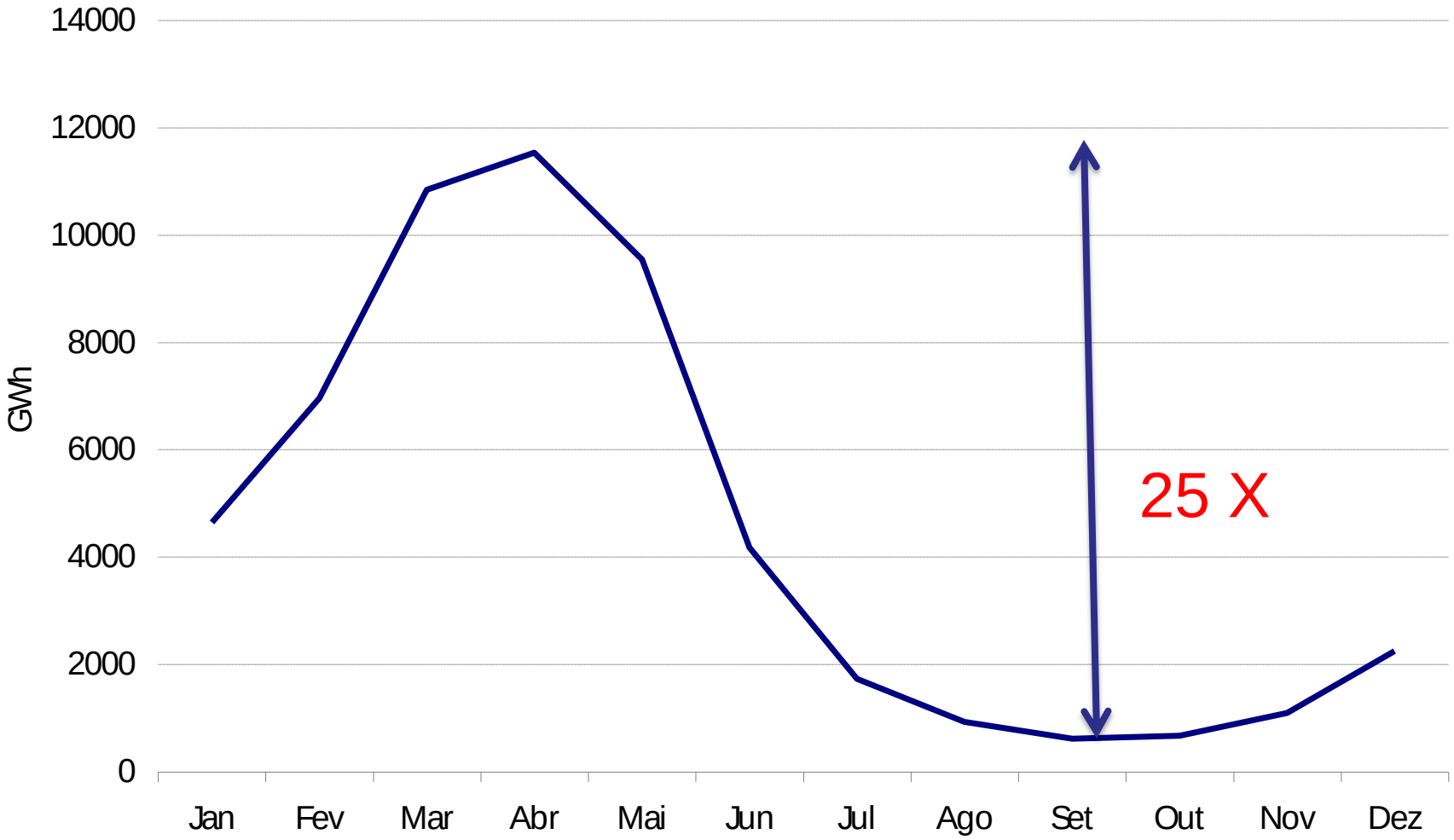
UHE Belo Monte
11.233 MW
Preço : 40 US$/MWh

UHE Teles Pires
1.820 MW
Preço : 30 US$ /MWh

UHE Jirau
3.450 MW
Preço : 40 US$ /MWh

Mapa elaborado no Banco de Informações e Mapas dos Transportes da Secretaria Executiva do Ministério dos Transportes

Streamflow variability of the future Belo Monte power plant

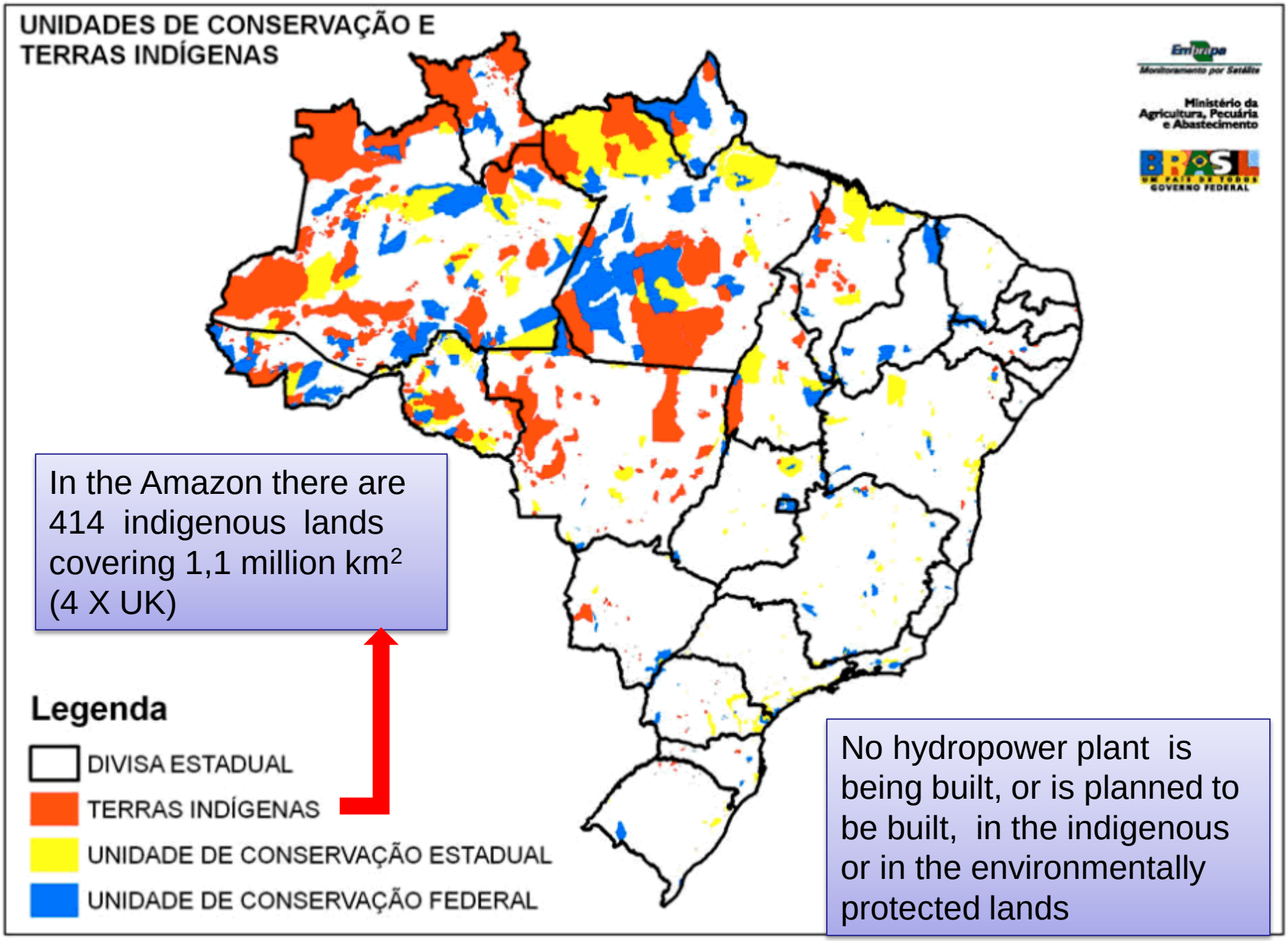


Relationship between storage and monthly consumption

FONTE: EPE.

The new power plants are run of the river because there aren´t good topographic conditions for the creation of reservoirs or the engineers are afraid of the environmental resistance and prefer to inflict themselves the self censorship?

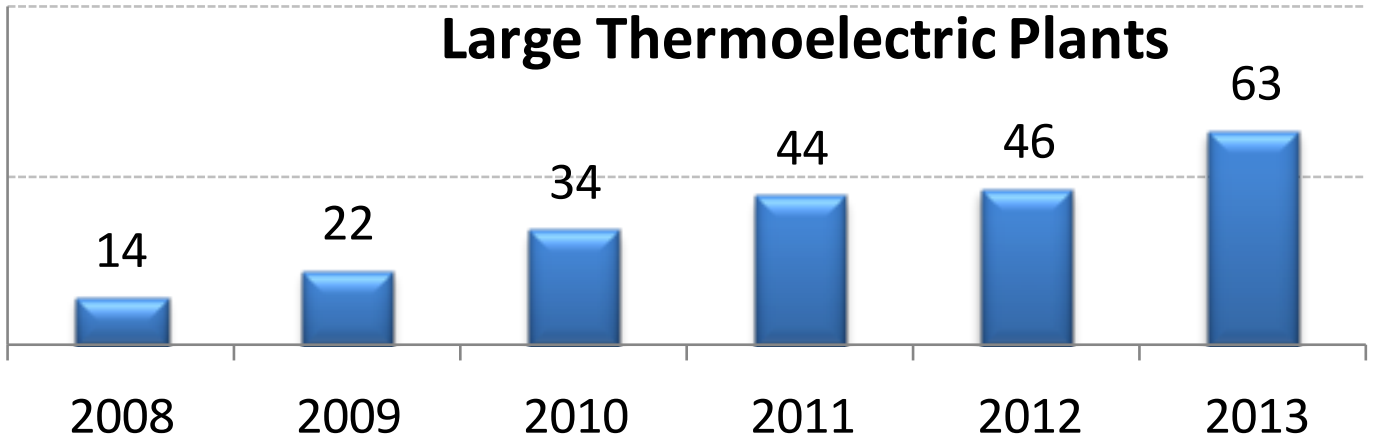
Out of the 20 million Brazilians that live in the Amazon, 200 thousand (1%) live in reserved areas.


UNIDADES DE CONSERVAÇÃO E TERRAS INDÍGENAS
Embrapa
Monitoramento por Satélite
Ministério da Agricultura, Pecuária e Abastecimento
BRASIL
UM PAÍS DE TODOS
GOVERNO FEDERAL
In the Amazon there are 414 indigenous lands covering 1,1 million km2 (4 X UK)
Legenda
DIVISA ESTADUAL
TERRAS INDÍGENAS
UNIDADE DE CONSERVAÇÃO ESTADUAL
UNIDADE DE CONSERVAÇÃO FEDERAL
No hydropower plant is being built, or is planned to be built, in the indigenous or in the environmentally protected lands

The Constitution prohibits the compulsory removal of indigenous groups from their lands (art. 231, § 5).

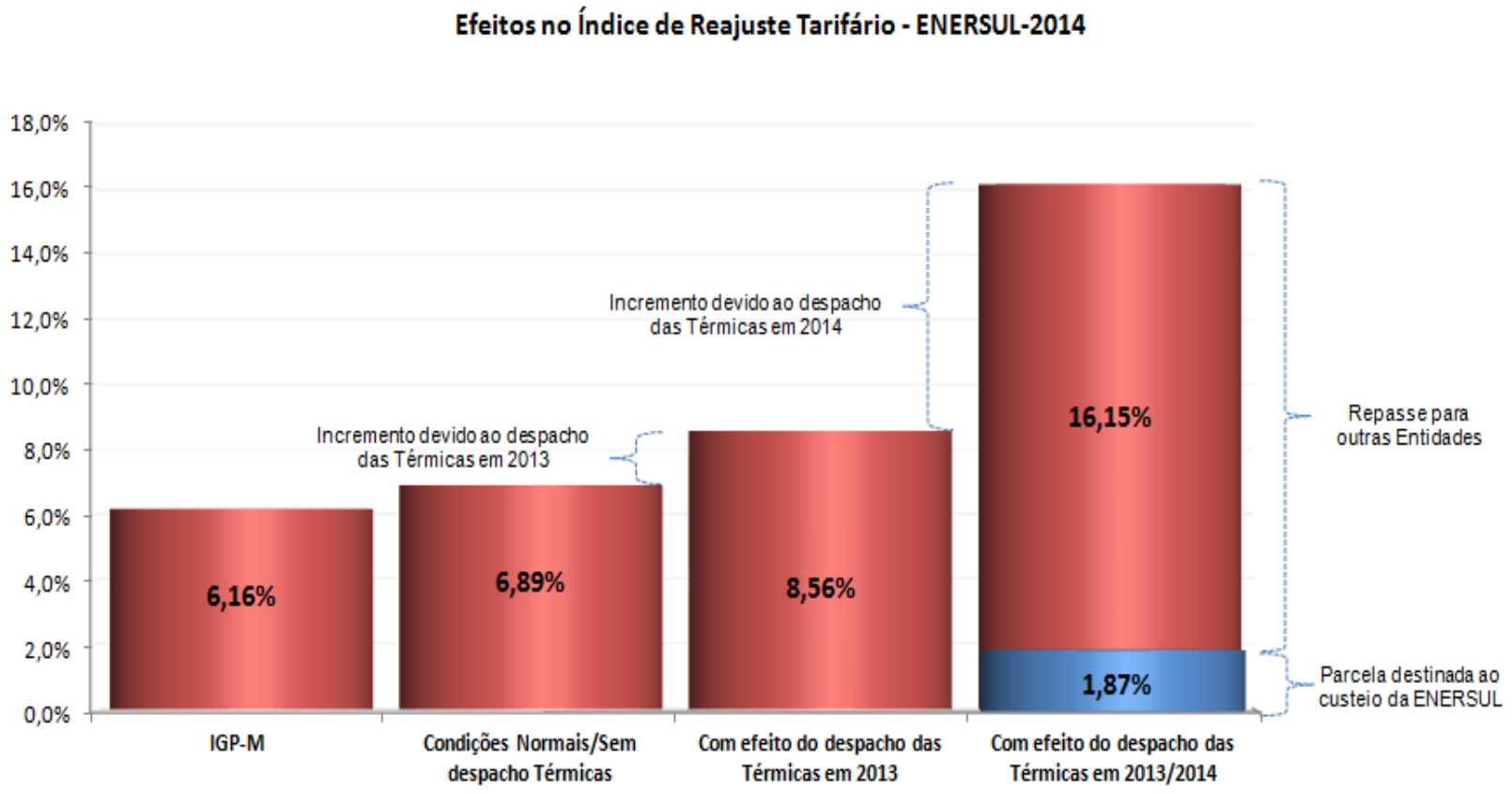
If there is no resettlement, infrastructure could be implemented, but only after consultation with the indigenous community. How?

What happened in Brazil when environmental licenses for hydropower projects were denied or disputed in court?



Estimated cost of firing the thermo plants in 2014: U$ 10 billion

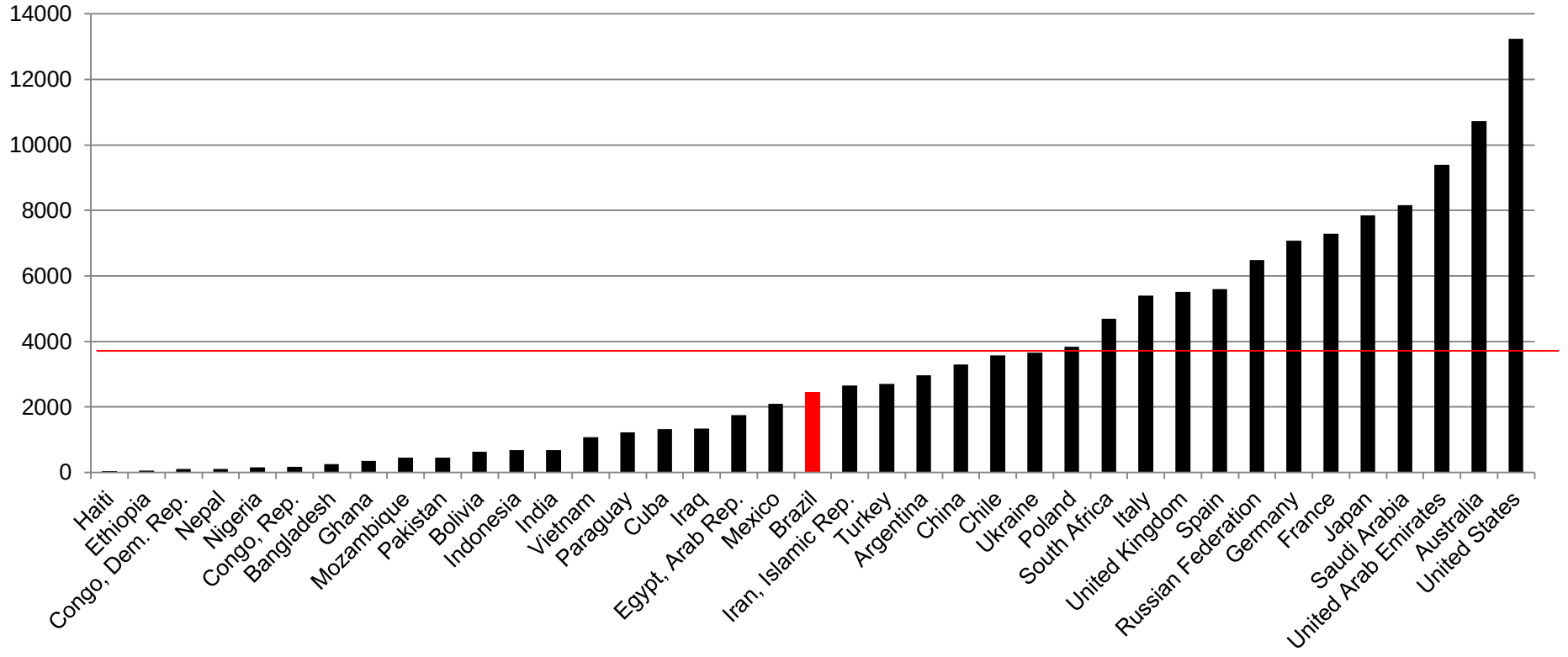
Explaining to the consumer the rise of electric energy tariff



Condições Normais: Reajuste econômico sem variações de preços da energia no período;
Efeito despacho das Térmicas 2013: Reajuste considerando os efeitos financeiros da variação de preços da energia em 2013;
Efeito despacho das Térmicas 2013/2014: Reajuste considerando os efeitos financeiros da variação de preços da energia em 2013 e a projeção de preços de energia para 2014 (PLD);

Per capita consumption of electricity (kWh/year) 2011

Source: The World Bank



When deciding about a new infrastructure project…

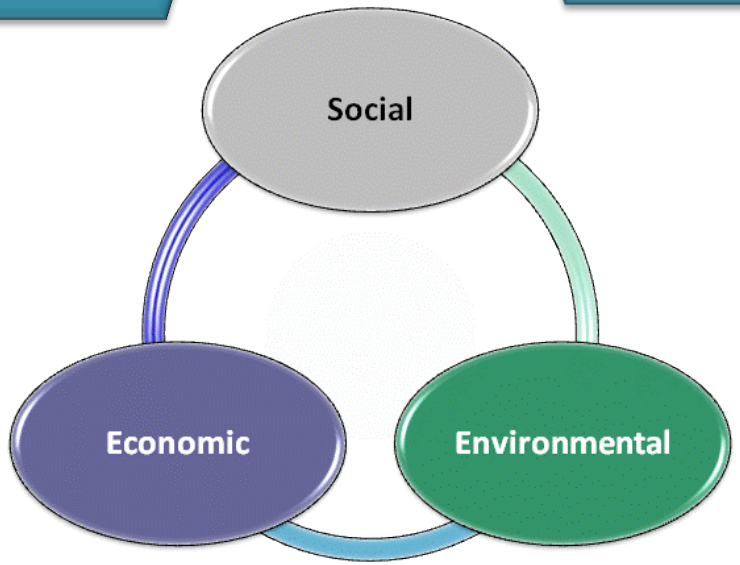
What happens if the plant is built?

What happens if the plant isn´t built

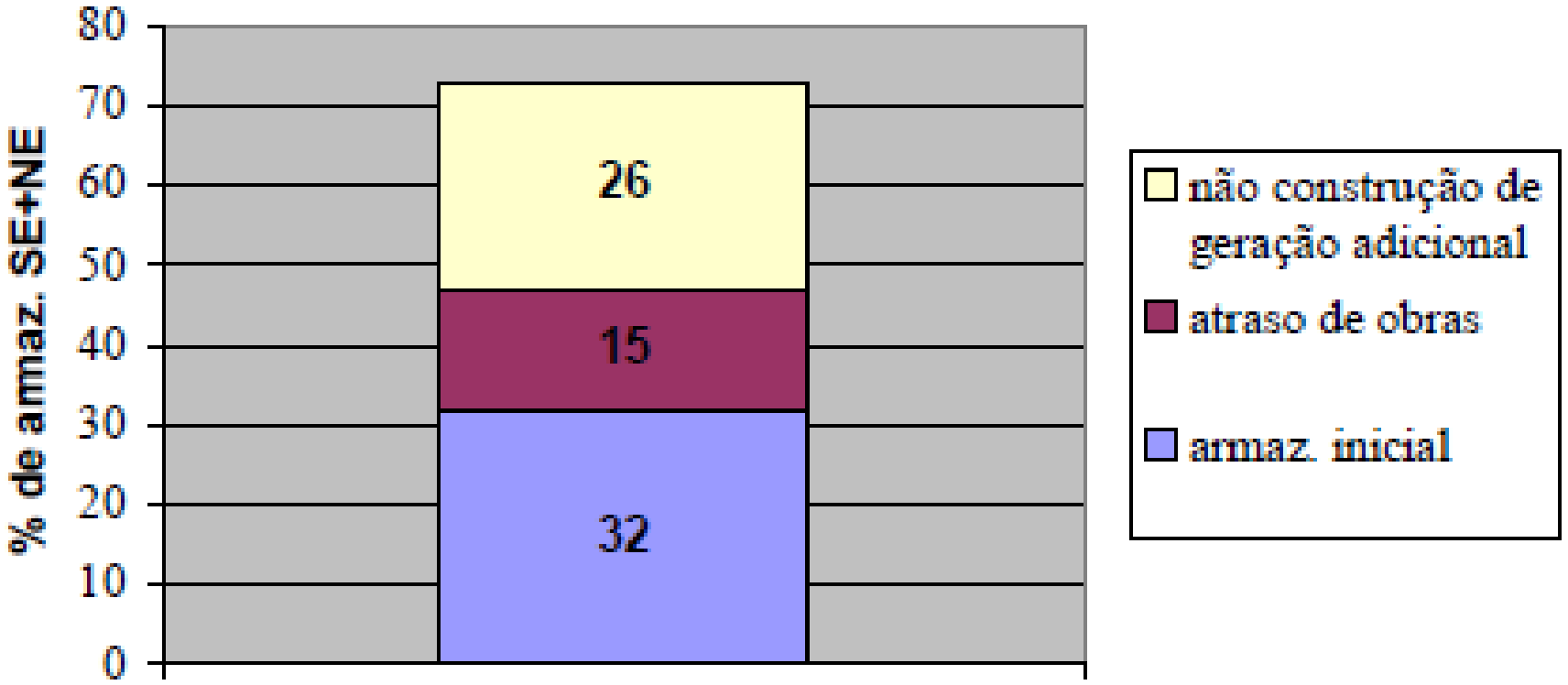
Local impacts

X

Global impacts



Armazenamento do reservatório equivalente em maio de 2001



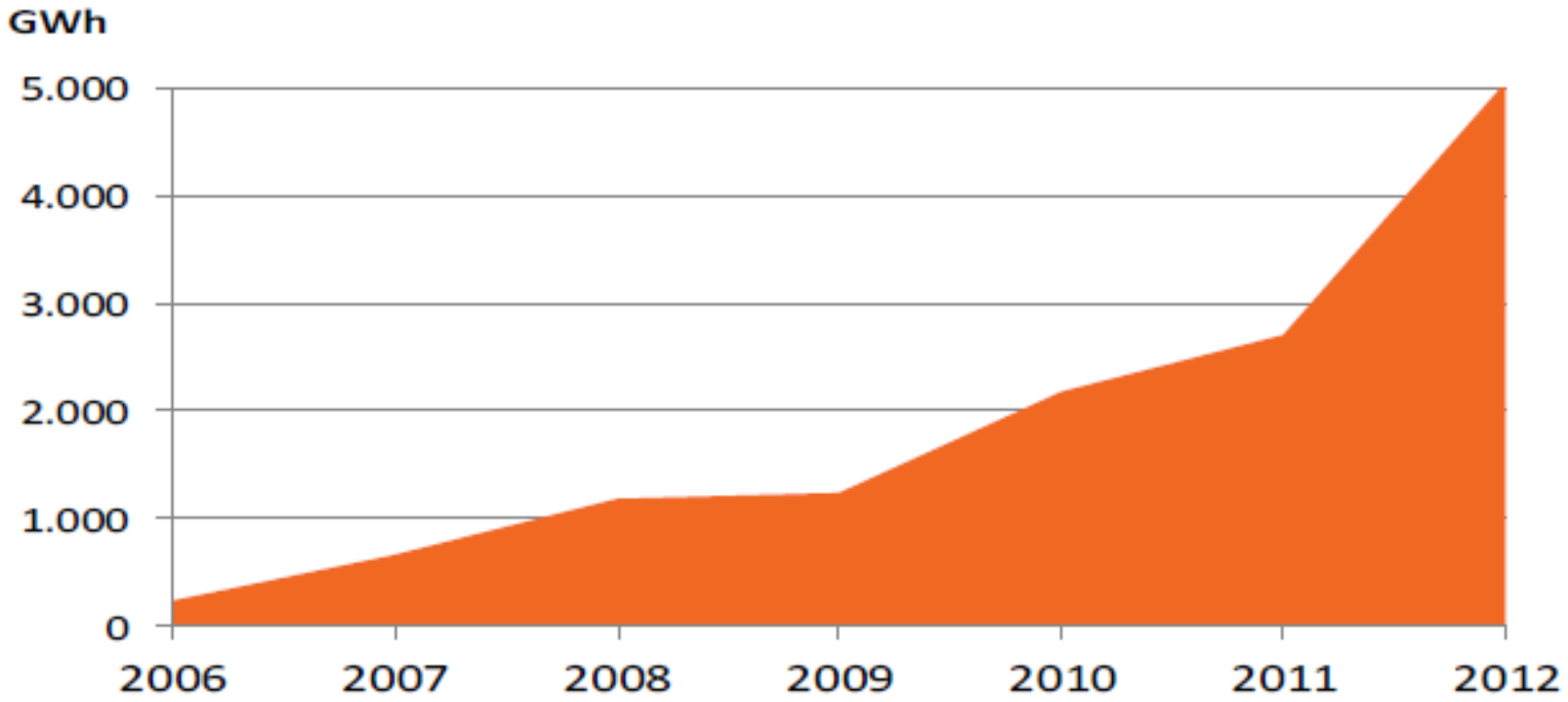
Relatório da Comissão de Análise do Sistema Hidrotérmico de Energia Elétrica - 2001

Proposta

Lei que deixe claro que, no licenciamento de obras de estratégicas, o interesse nacional deveria ser mensurado em pelo menos quatro dimensões – econômica, energética, ambiental e social.

Os dirigentes do MME, MMA, IBAMA, ANA, ANEEL, EPE, ONS, MPO, FUNAI, e representantes do Ministério Público, deveriam ser forçados a chegar a um acordo sobre a quantidade de energia que o país necessita e quais usinas podem ser construídas.

Why wind power is economically competitive inn Brazil?



EMPRESA DE PESQUISA ENERGÉTICA - EPE | MINISTÉRIO DE MINAS E ENERGIA – MME