

**SEVILLA (SPAIN)**  
**17-20 OCTOBER 2018**

## Efficiency and multiple benefits: the interest of combining hydraulic infrastructure and nature-based solutions to face the issue of climate change

**18 OCTOBER 2018**

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## Director of ANA – Brazil's National Water Agency



## BRAZIL IN NUMBERS



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**5<sup>th</sup>** largest country in the world (area of 8,514,876 km<sup>2</sup> - 3,287,594 sq mi)

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**208** million inhabitants (IBGE, July 2017)

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**5** Geopolitical Regions

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**5,565** cities located in **26** States and **1** Federal District

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**8<sup>th</sup>** largest economy in the World and 1<sup>st</sup> in Latin America

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**12%** Planet's fresh water is in Brazil

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**83** boundary and transboundary rivers

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# INTEGRATED WATER RESOURCES MANAGEMENT IN BRAZIL

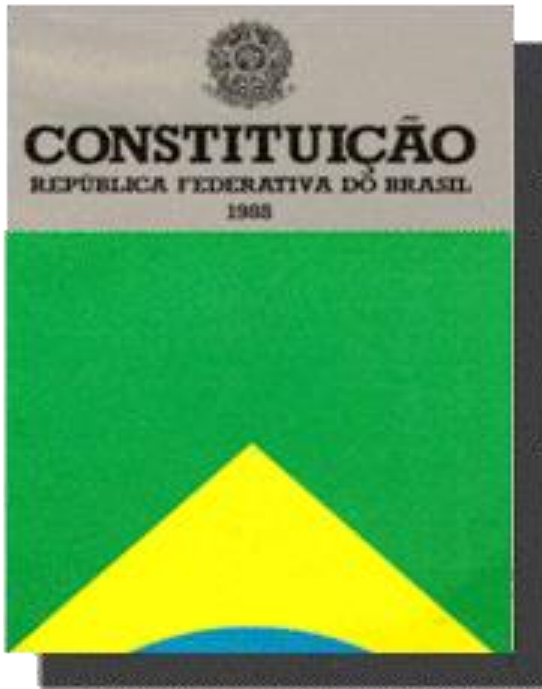




## BRAZIL: IWRM

*“Art. 21. The Union is responsible for establishing a **national water resources management system** and defining criteria for water permits” - 1988*

Brazil has legal, technical and institutional mechanisms for managing water resources



1988



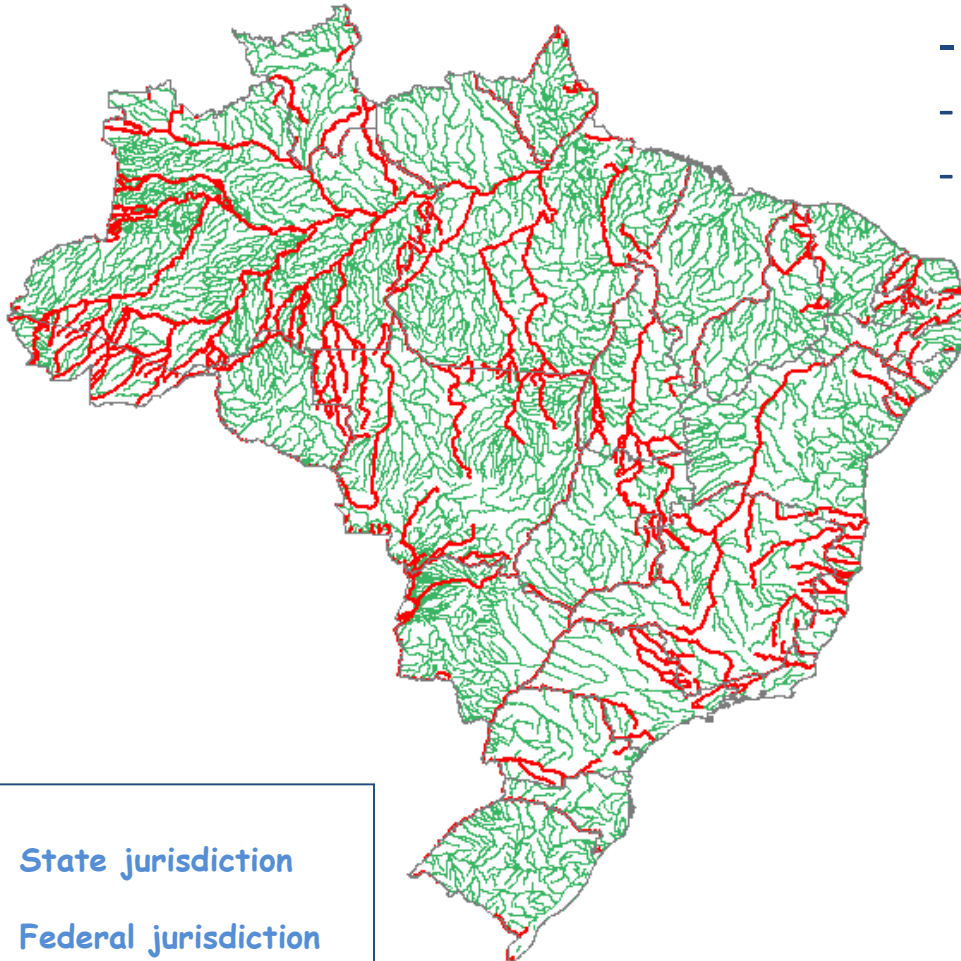
1997



2000

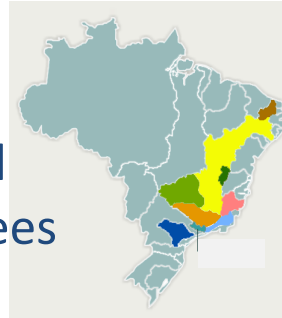
## Double Domain

Established by Federal Constitution



## Federal Rivers

- ANA
- National Water Council
- 9 River Basin Committees



## State Rivers

- 27 State Agencies
- 27 State Water Councils
- More than 160 River Basin Committees created



# NATIONAL & STATES POLICIES

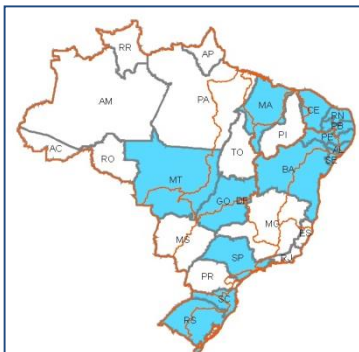
1991



1994



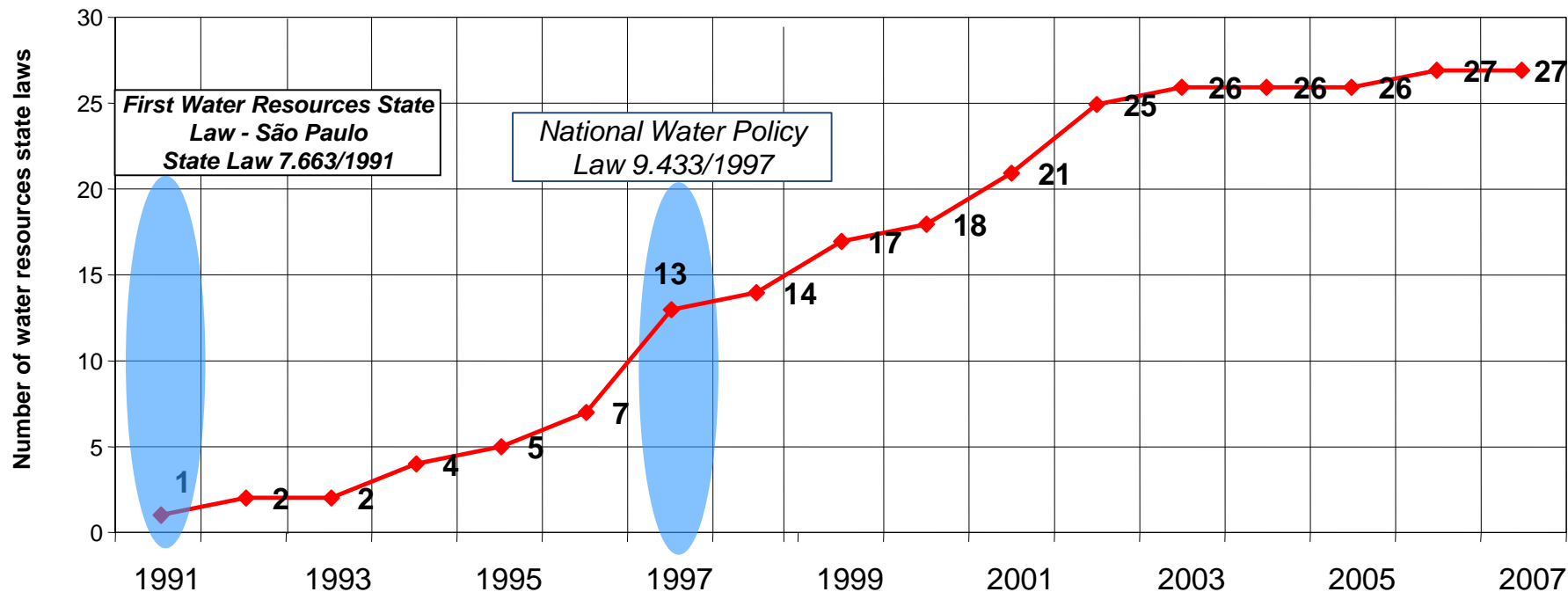
1997



2003



2007



# National Water Resources Policy - Basic Principles

- **Water is a public good;**
- **A limited natural resource**, which has **economic value**;
- **Human consumption and watering of animals** have priority;
- The **river basin** is the territorial unit for the IWRM implementation;
- IWRM should always allow **multiple uses**;
- IWRM shall be **decentralized** and involve **participation** of the Government, water users, local communities and organized civil society.



# WATER BALANCE



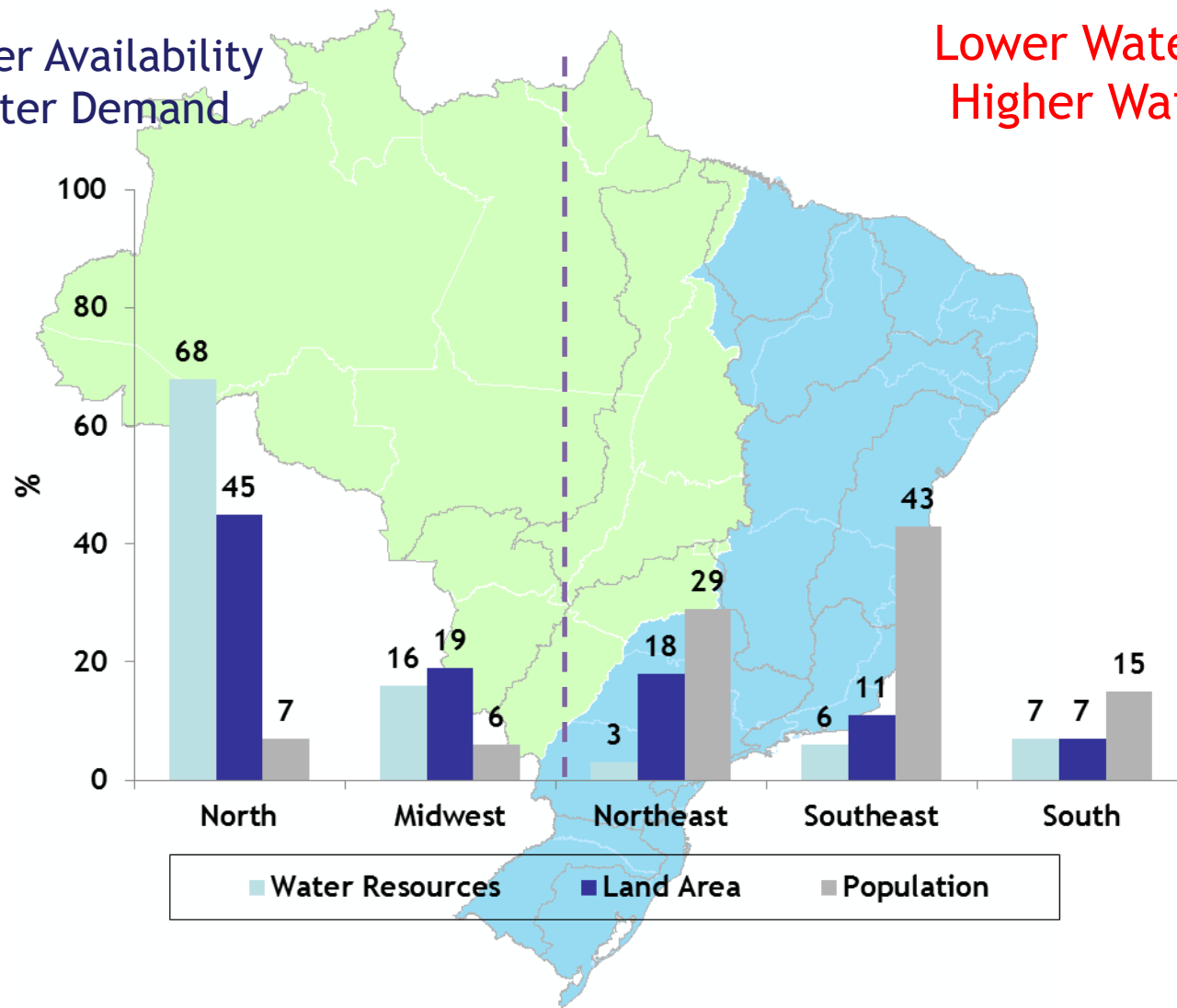


# BRAZIL: WATER BALANCE

## Unequal Distribution of Water and Population

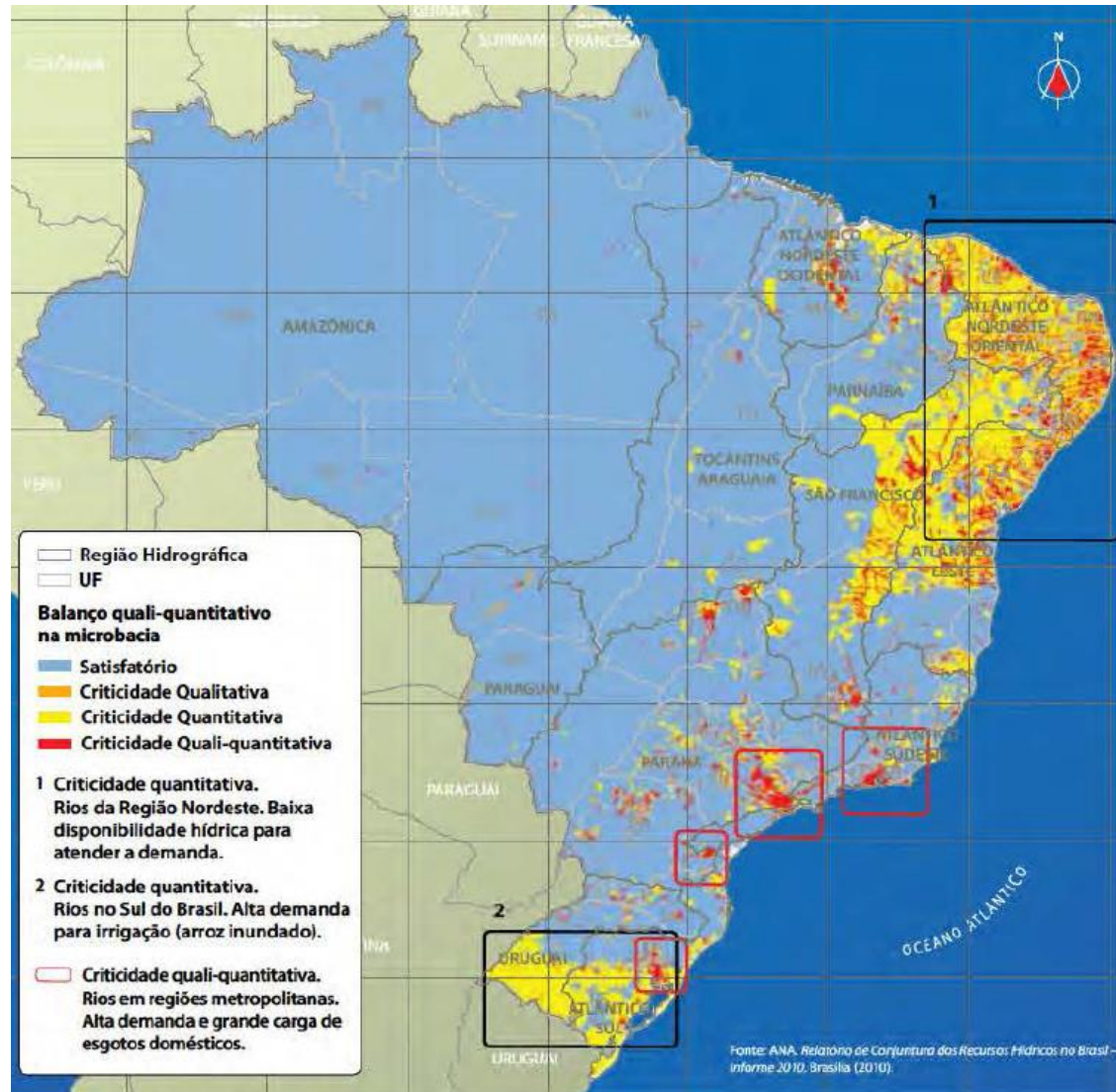
Higher Water Availability  
Lower Water Demand

Lower Water Availability  
Higher Water Demand



# BRAZIL: WATER BALANCE

Critical areas according to water balance qualitative and quantitative



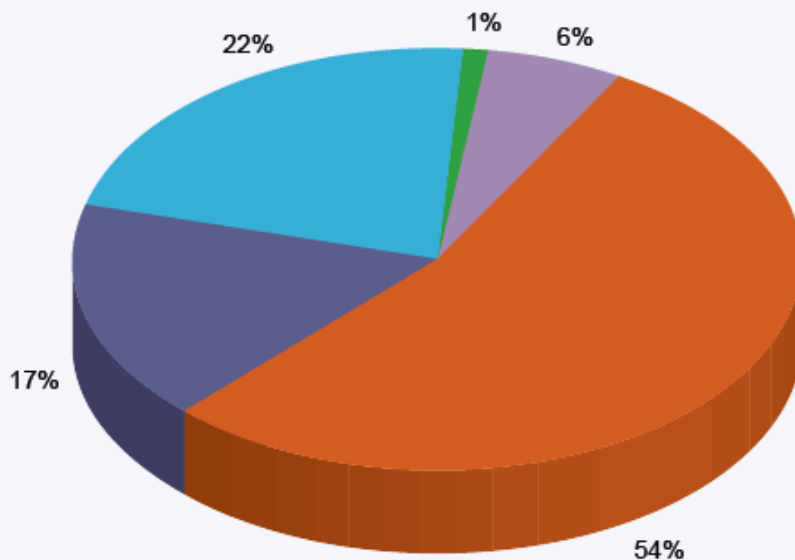
# WATER USES



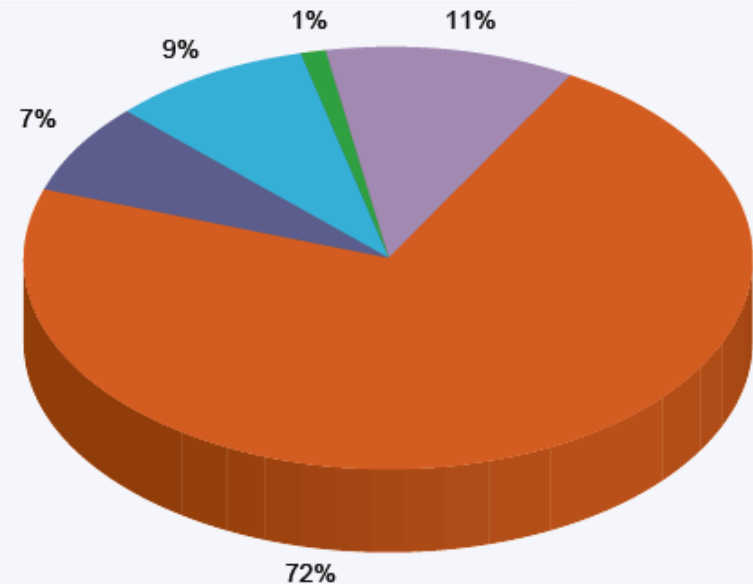
# BRAZIL: WATER USES






## Consumptive Use of Water

Total Water Withdrawal: **2,373 m<sup>3</sup>/s (83,804 cfs)**



Total Water Consumption: **1,212 m<sup>3</sup>/s (42,802 cfs)**



 Livestock     Drinking Water (Rural)     Irrigated Crops  
 Industrial     Drinking Water (Urban)



## BRAZIL: WATER USES

### Irrigation



*Coffee trees cultivated under irrigation in Brazil's Cerrado farms.  
Photo: Anderson Galvão*

- Largest water user (70%)
- Irrigation potential estimated at 29 million hectares
- Total irrigated area of **4,6 million hectares** - 5.8% of total cultivated area
- **94%** of irrigated area developed by the **private sector**

## BRAZIL: WATER USES

### Water Supply and Sanitation

- Access to piped drinking water in urban areas is 85 %. <sup>(1)</sup>
- High deficit in wastewater collection and treatment:
  - 53% of the domestic sewage is collected <sup>(1)</sup>
  - 32% of the domestic sewage is treated <sup>(2)</sup>

(1) In terms of household connections. PNAD 2009 (IBGE, 2010)

(2) In terms of population served. SNIS 2007 (PMSS, 2009)



## BRAZIL: WATER USES

### Hydropower

- 70% of total energy generation
- Installed capacity: 84,000 MW
- Potential capacity: 270,000 MW



Source	Brazil		World	
	1973	2012	1973	2012
Petroleum	7,2	2,7	24,7	4,4
Gas	0,0	7,9	12,1	22,4
Mineral Coal	1,7	1,4	38,3	41,7
Nuclear	0,0	2,7	3,3	10,7
Hydraulic	89,4	76,9	21,0	15,8
Biomass/Wind/Others	1,7	8,4	0,6	5,0
<b>TOTAL (%)</b>	<b>100,0</b>	<b>100,0</b>	<b>100,0</b>	<b>100,0</b>



## BRAZIL: WATER USES

### Navigation Sector

#### Waterways Extention (2013)

- Total: 20,956 km – 13,021 mi
- 8,500 km – 5,282 mi (29.5%) uninterrupted all year long

#### Cargo shipment (2013)

- Total: 80 million tons/year
  - Ore Minerals: 28,8 million tons/year
  - Fuels and mineral oils: 7,4 million tons/year
  - Grains: 6,7 million tons/year
  - Containers: 6,4 million tons/year



Water conflict between hidroelectric sector and transport sector related to locks.



## A map of the African continent where each country's shape is filled with a different photograph. The images include lush green rainforests, a wide brown river, a sunset over a body of water, a herd of elephants, a sandy dune, a large stone mask sculpture, a waterfall with a rainbow, and a tropical beach with palm trees.

# BRAZIL: WATER CHALLENGES

## Complex IWRM governance

Federative  
Republic

1 Federal Constitution  
1 Federal Water Law

27 States

27 State Constitutions  
27 State Water Laws

5,561  
Municipalities

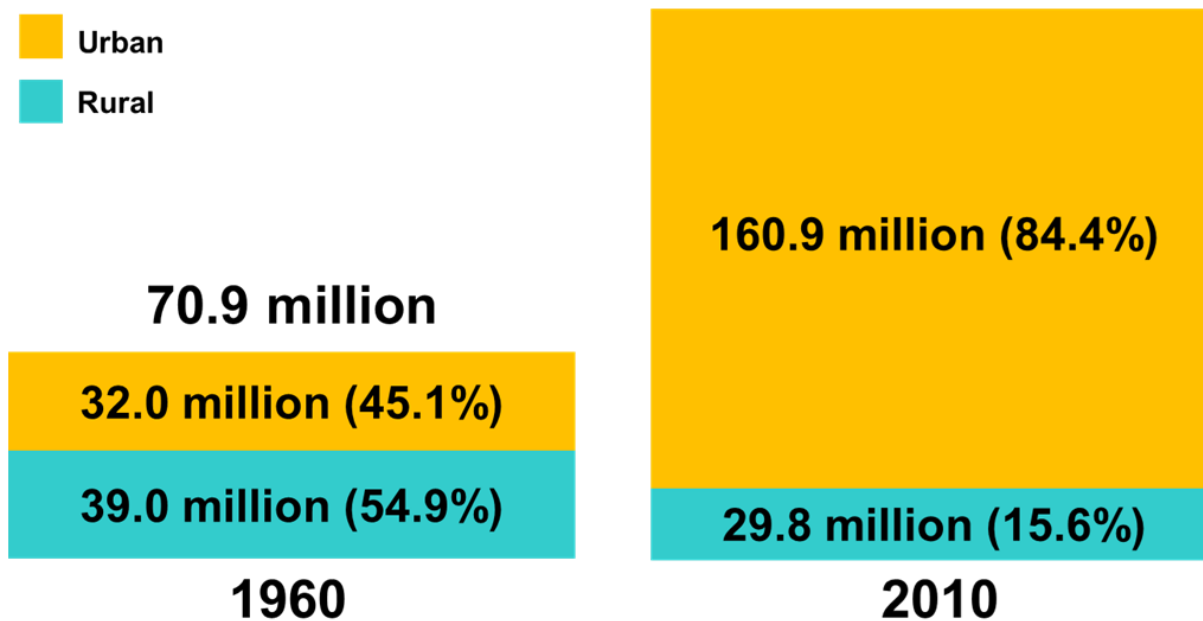
5,561 Land use Laws  
Municipalities are responsible  
for concessions of water supply  
and sanitation services



# BRAZIL: WATER CHALLENGES

## Increasing water demand

- Rapid urbanization
- Water pollution in developed regions
- Conflicts among competitive multiple uses
- Non rational water use and waste of water

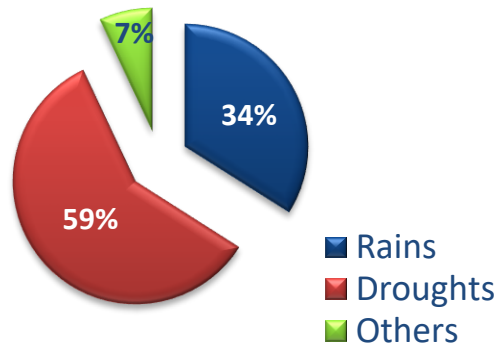


Source: Census 2010 (IBGE).

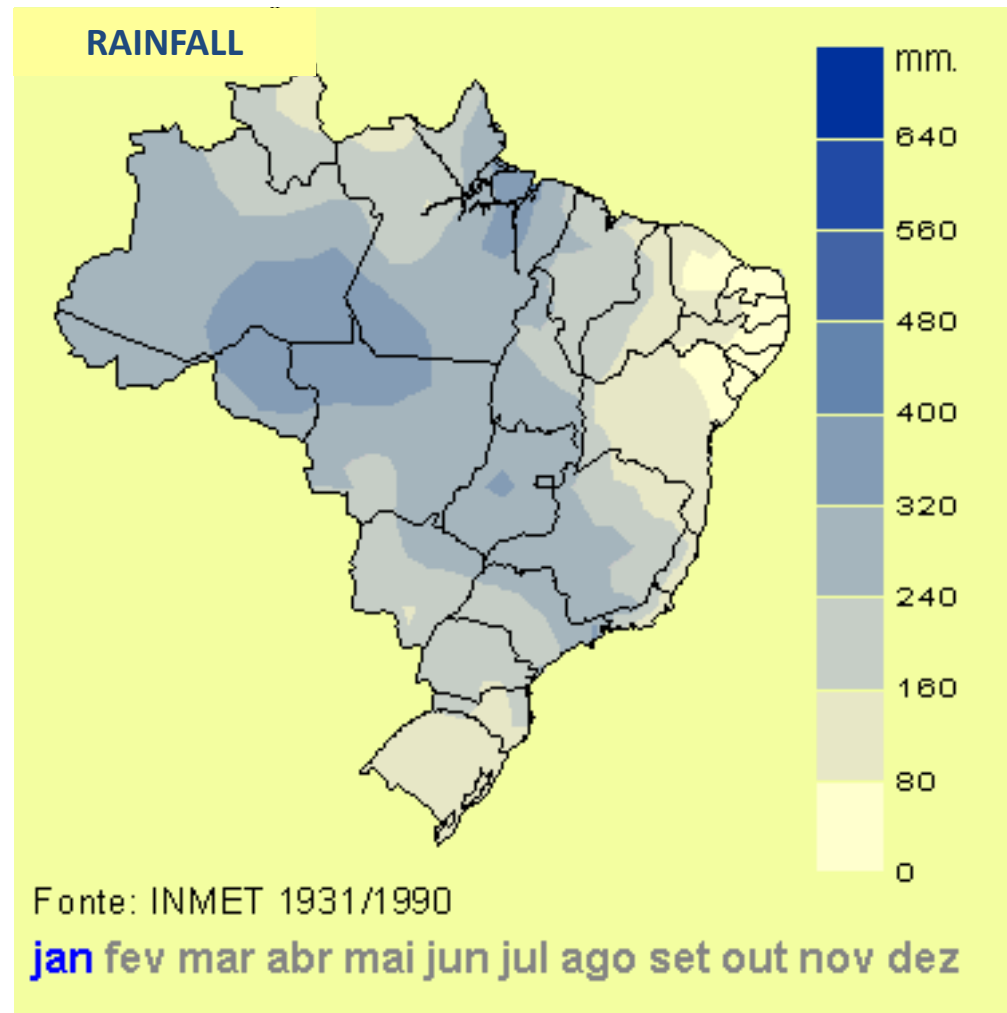
# BRAZIL: WATER CHALLENGES

## Critical events in Brazil

- Rainfall distribution
  - Climate diversity
- It demands continuous monitoring
- Droughts and floods



- Impacts of Climate Change in water





# WATER INITIATIVES



# Water Crisis in Brazil – what to do

## Infrastructure

THERE IS NO “ONE SIZE FITS ALL”

Set of context-appropriate solutions

INFRASTRUCTURE

MANAGEMENT MEASURES

Information

Rules of operation of reservoirs / systems and  
rules of water use

Articulation

ANSWER

Contingency plans / emergency actions

Civil Defense System



Interligação Jaguari - Atibainha

APROXIMADAMENTE  
20 KM  
DE TRANSMISSÃO  
DE ÁGUA BRUTA

RS 555 MILHÕES  
EM INVESTIMENTOS

5,3 MIL  
EMPREGOS GERADOS



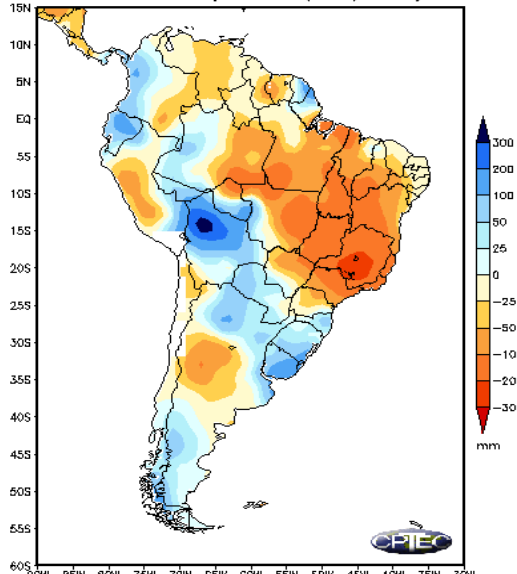
## Management measures

- **Cantareira Water Permit:** it combines infrastructure solution (Cantareira System Reservoirs) with indirect measures (incentive to

rod

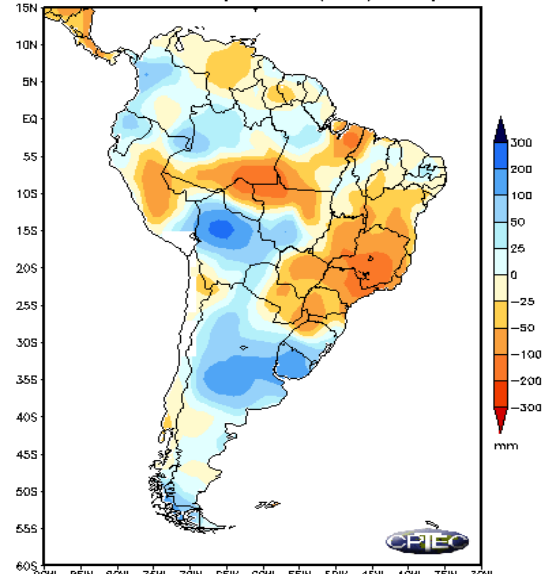


Data da última atualização: 19/02/2014  
**Anomalia de Precipitação (mm)–JAN/2014**



Fonte de Dados: CPTEC-INPE/INMET/FUNCME-CE/SRH-BA/CEMIG/SINGE-MG  
LMRS-PB/EMPARN-RN/DMRH-RS/IAC-SP/ELDER-GO/SIMEPAR-PR/CLIMERH-SC

Data da última atualização: 01/03/2014  
**Anomalia de Precipitação (mm)–FEV/2014**



Fonte de Dados: CPTEC-INPE/INMET/FUNCME-CE/SRH-BA/CEMIG/SINGE-MG  
LMRS-PB/EMPARN-RN/DMRH-RS/IAC-SP/ELDER-GO/SIMEPAR-PR/CLIMERH-SC



## Pipiripau Project



Overview of Vicinal Infiltration Boxes for Accumulating and Infiltrating Water - Pipiripau Project Federal District



Overview of terraces in pasture area and agriculture fulfilling water preservation- Pipiripau DF Project



# Thank you!



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