Source: ANA

Water Resources Management in Brazil: Challenges and New Perspectives

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Water

Summary

1. Water Resources:
   supply, pressure and demand
2. National Water Resources Management System:
   proposition of water laws
3. General overview of national water management practices
4. Integrated Management: Experiences at the local and regional levels
5. Closing Remarks

Water Resources:
supply, pressure, and demand

Water Supply

- ✓ **Surface Water Supply (average flow): ~ 180,000 m3/s**
- ✓ **12% of the planet's water supply Amazon Region = 81%**

- ✓ **Groundwater Availability (extractable quantity): ~11,500 m3/s**
- ✓ **Amazon Region = 62%**

- ✓ **Average Precipitation: 1,761mm (ranging from 500 mm in Semi Arid regions to +3.000 mm in the Amazon Region)**

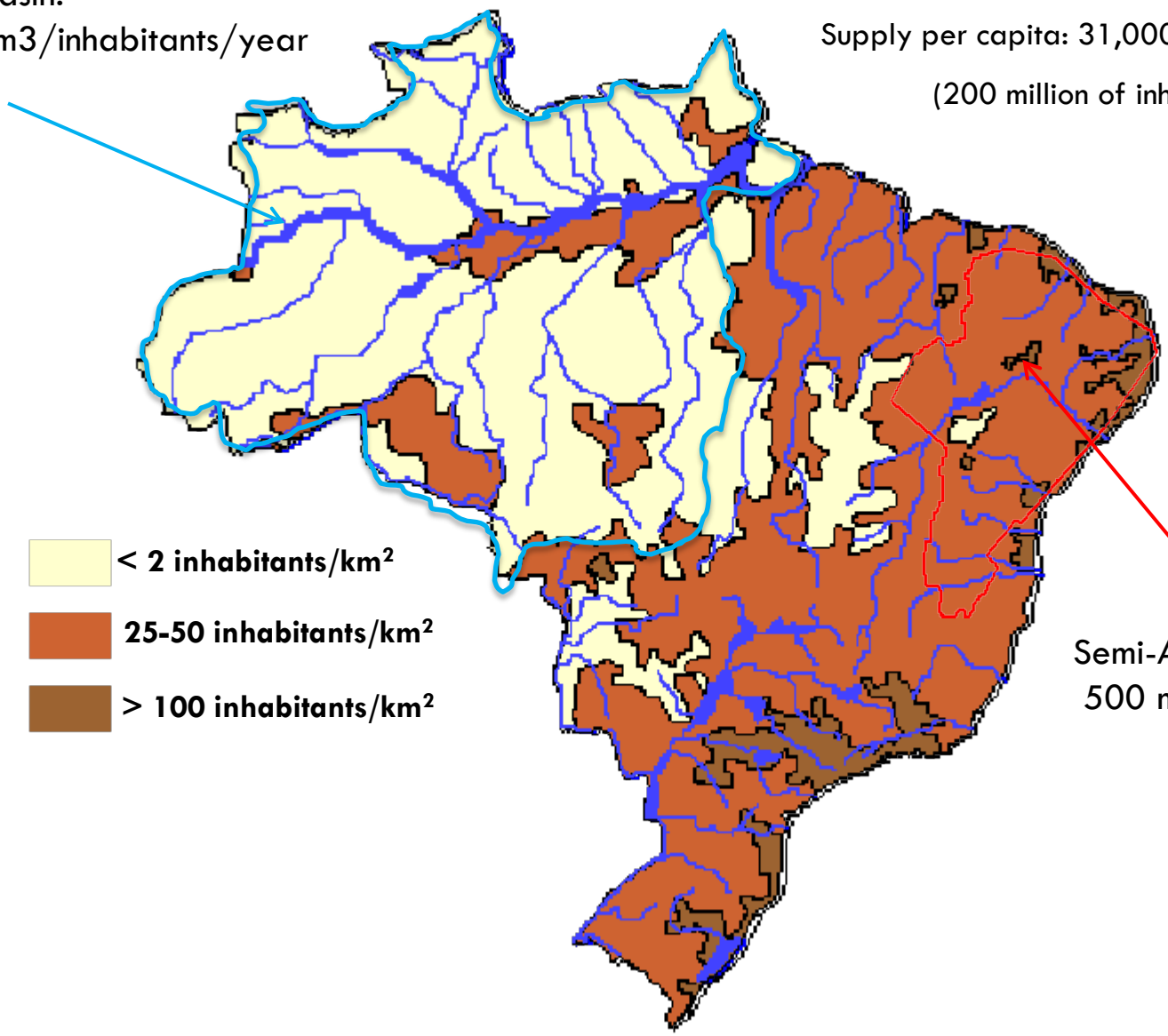
Fonte: Relatório Conjuntura dos Recursos Hídricos (ANA, 2013).

Water Supply & Demographic Density

Amazon Basin:
558.000 m3/inhabitants/year

Supply per capita: 31,000 m3/inhabitant/year

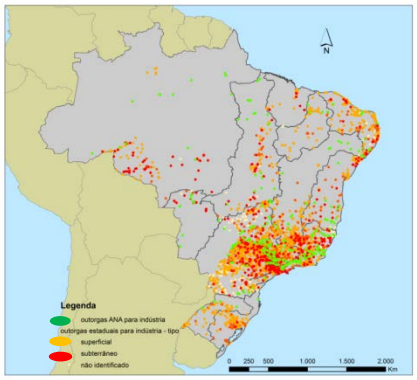
(200 million of inhabitants, 84% urban)



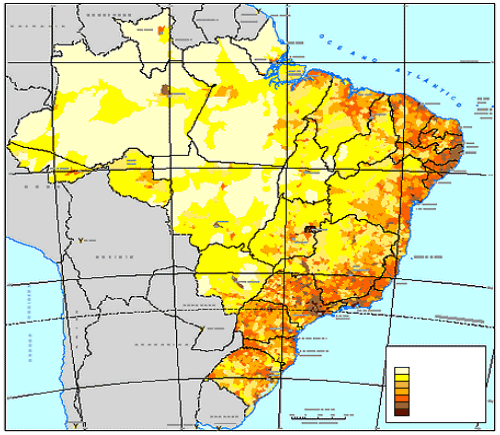
Semi-Arid Basins:
500 m3/inhabitants/year

Principle Consumptive uses in Brazil

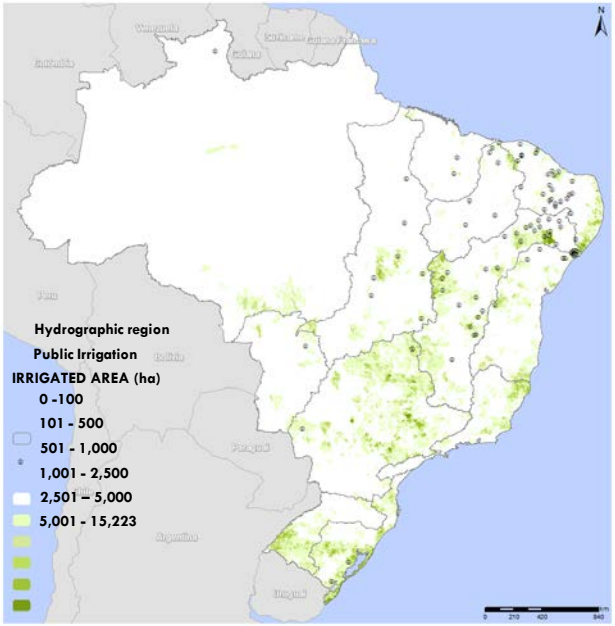
Water demand for industrial use (grants, outorgas)



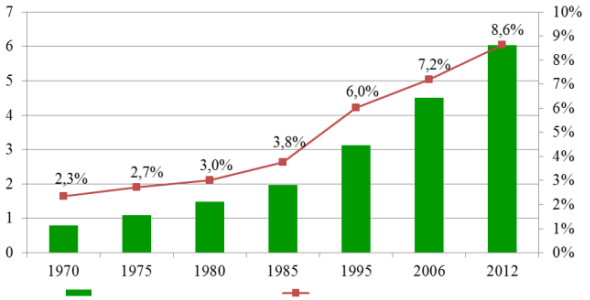
Urban Water Demand



Source: IBGE, 2011.



Irrigated areas in Brazil by micro-basins

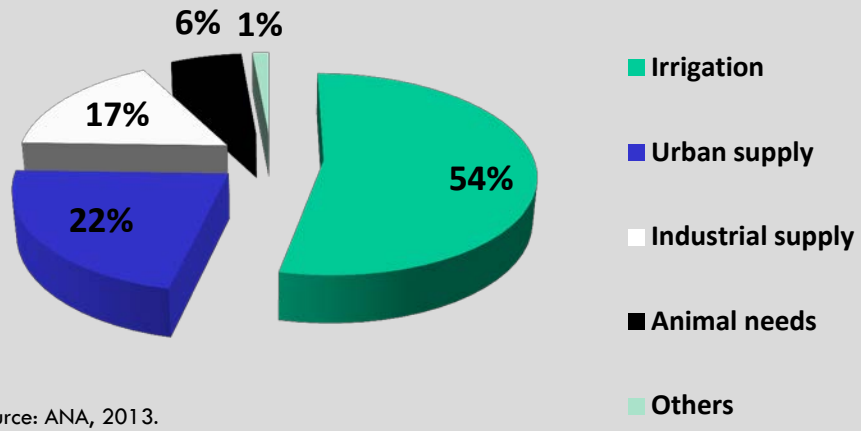


Evolution of irrigated land in Brazil 1970 – 2012

Source: Relatório Conjuntura dos Recursos Hídricos (ANA, 2013).

Water Demand – 2012 Status

Total water withdrawal in Brazil in 2010: 2.373m³/s

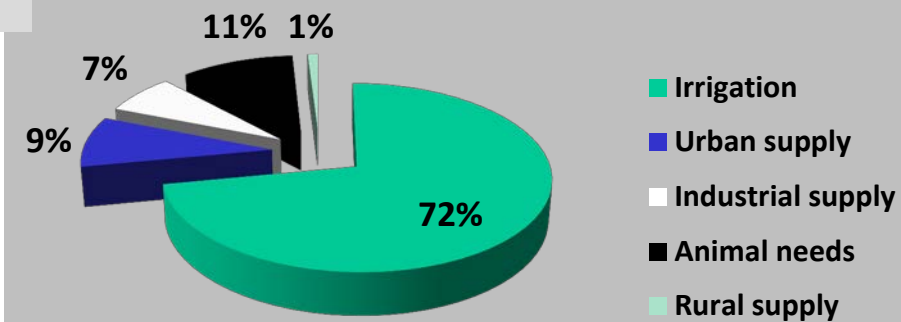


Source: ANA, 2013.

Hydropower:

- ✓ **Installed Capacity: 81 GW**
- ✓ **Potential Capacity: 260 GW**

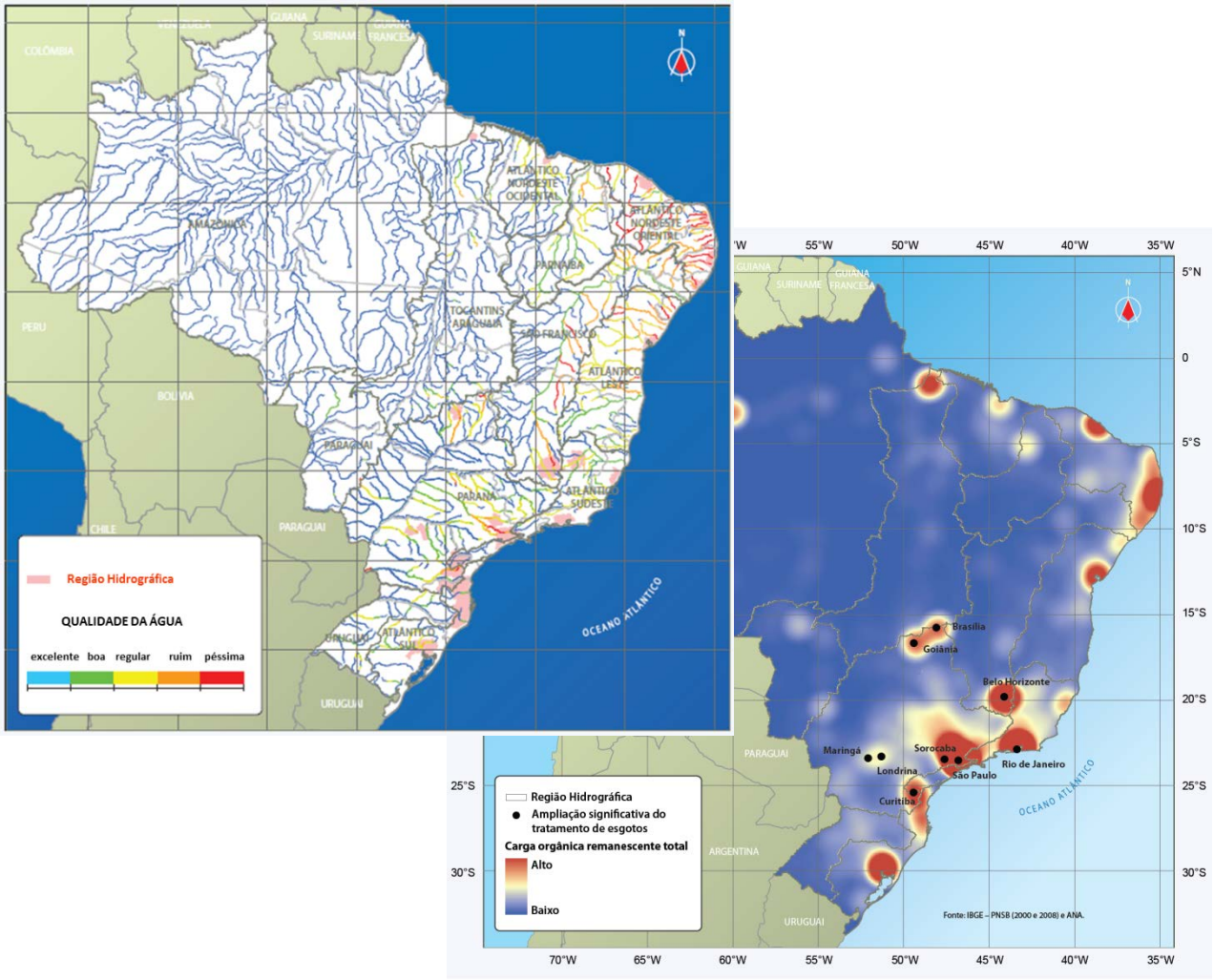
Total water consumption in 2010: 1.161 m3/s



Source: ANA, 2013.

Navigation, tourisms, recreational purposes, and protection of aquatic ecosystems are still competing for their share on Brazil's water agenda

Water Quality: Organic Pollution



Principles sources of pollution:

- ✓ Urban pollution
- ✓ Industrial pollution
- ✓ Agricultural pollution

<u>Sanitation (IBGE, 2011):</u>

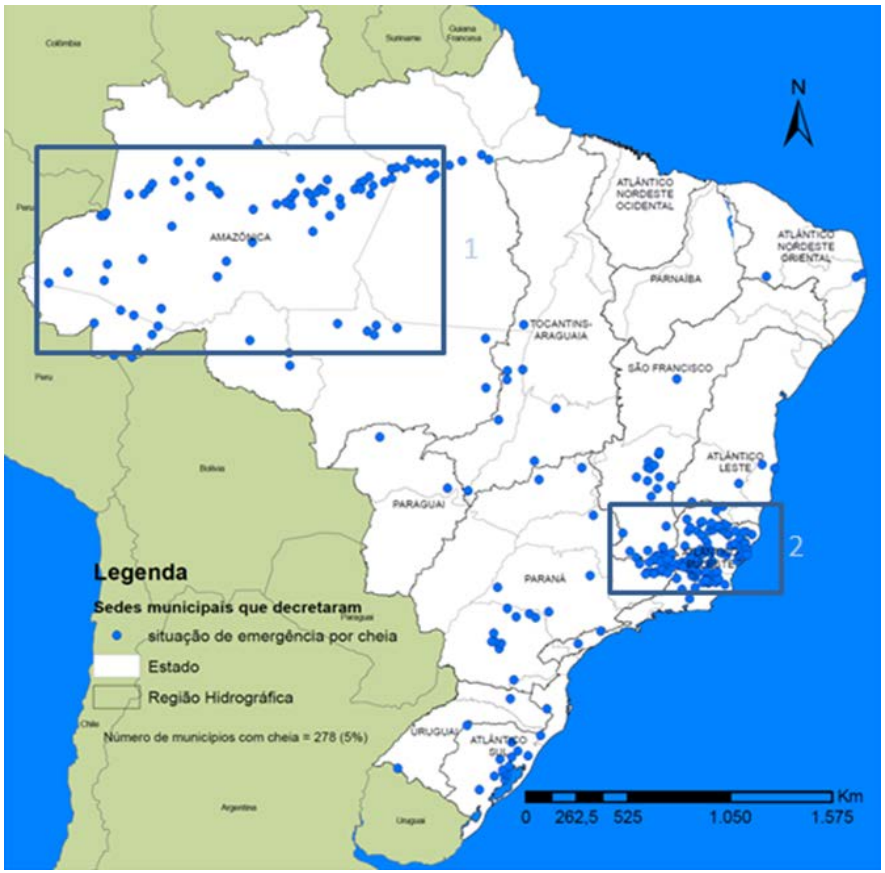
- ✓ Sewage: 52,5% of urban sewage is collected
- ✓ Treatment: only 34% of collected sewage is treated

Metropolitan Regions have a higher concentration of organic pollution remaining in Brazil

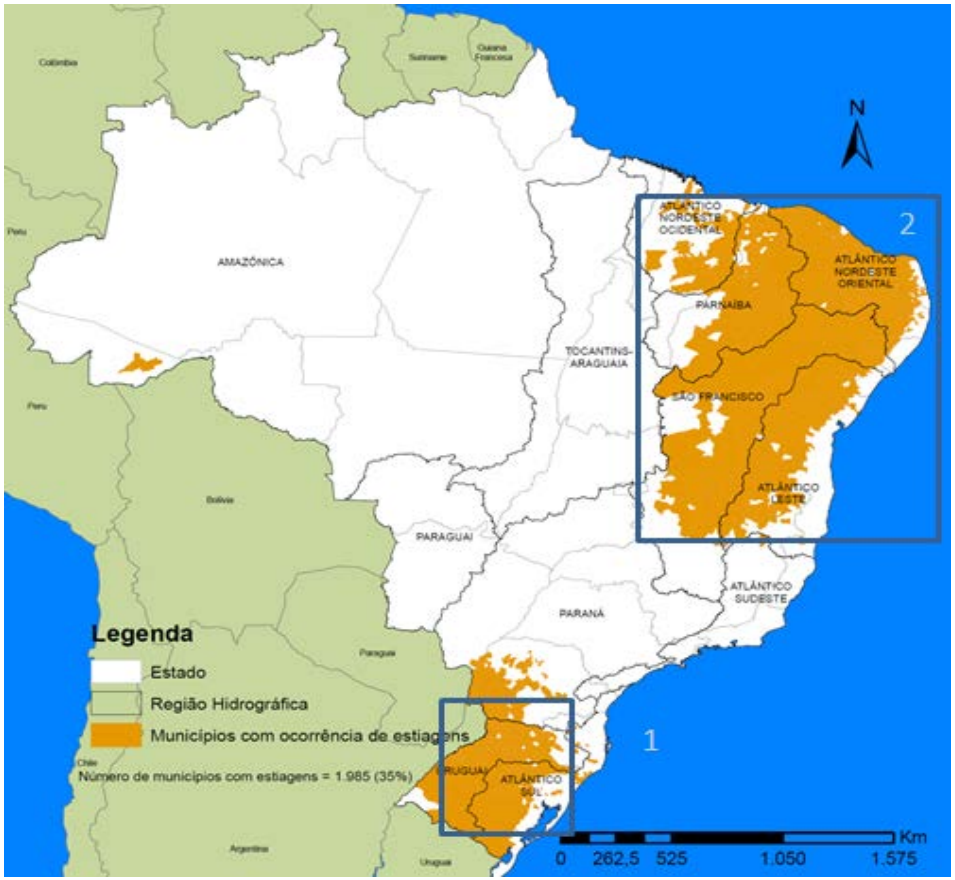
Source: Relatório Conjuntura dos Recursos Hídricos (ANA, 2013).

Critical events in 2012

Floods: 754 municipalities (14%)

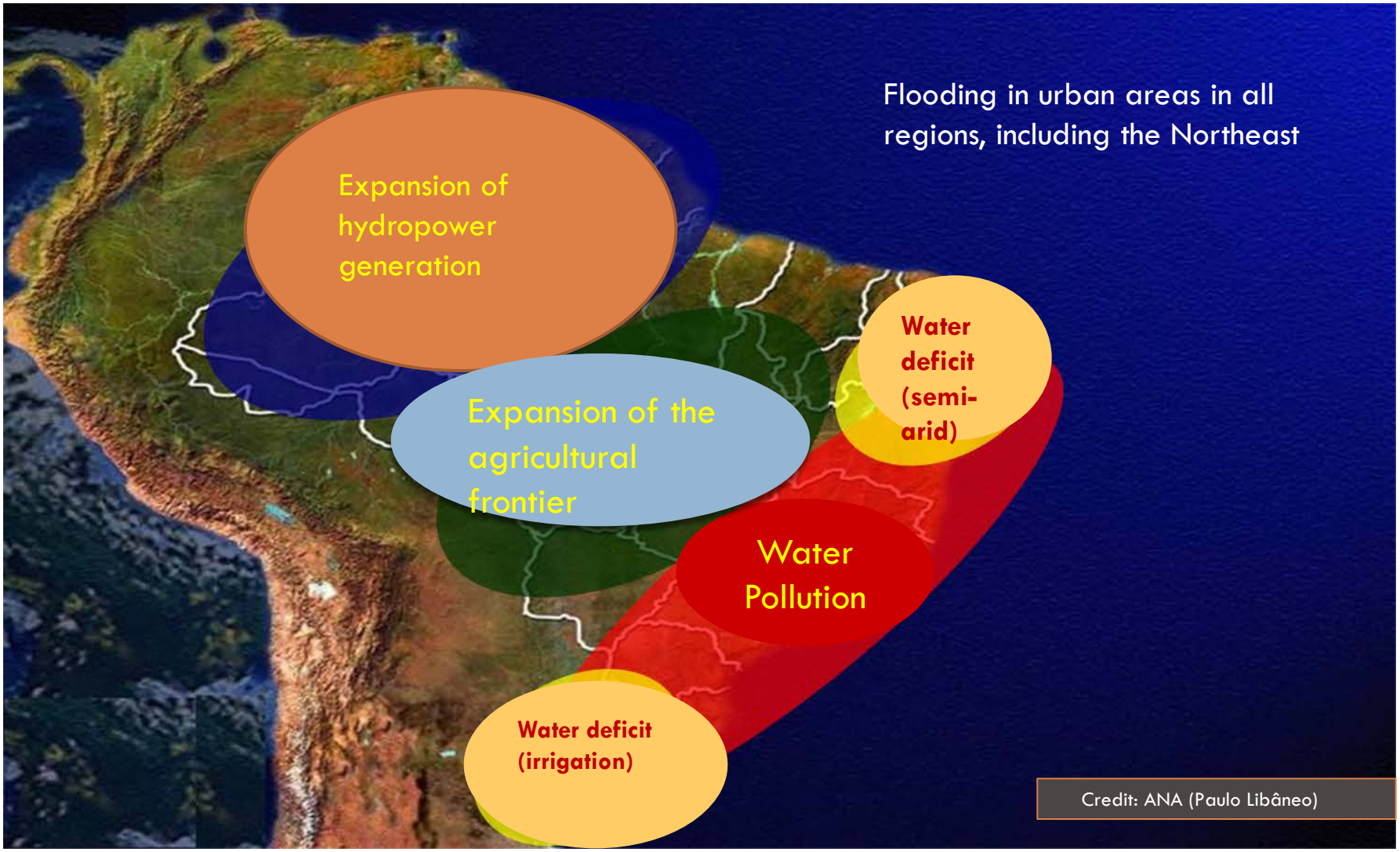


Drought: 1,985 municipalities (36%)

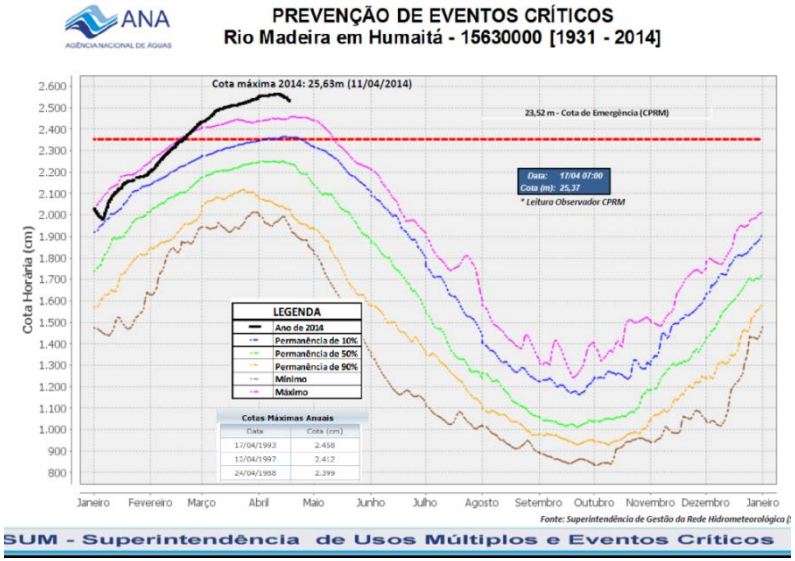


Source: Relatório Conjuntura dos Recursos Hídricos (ANA, 2013).

Main regional water issues in Brazil at a glance



Water crisis in 2014

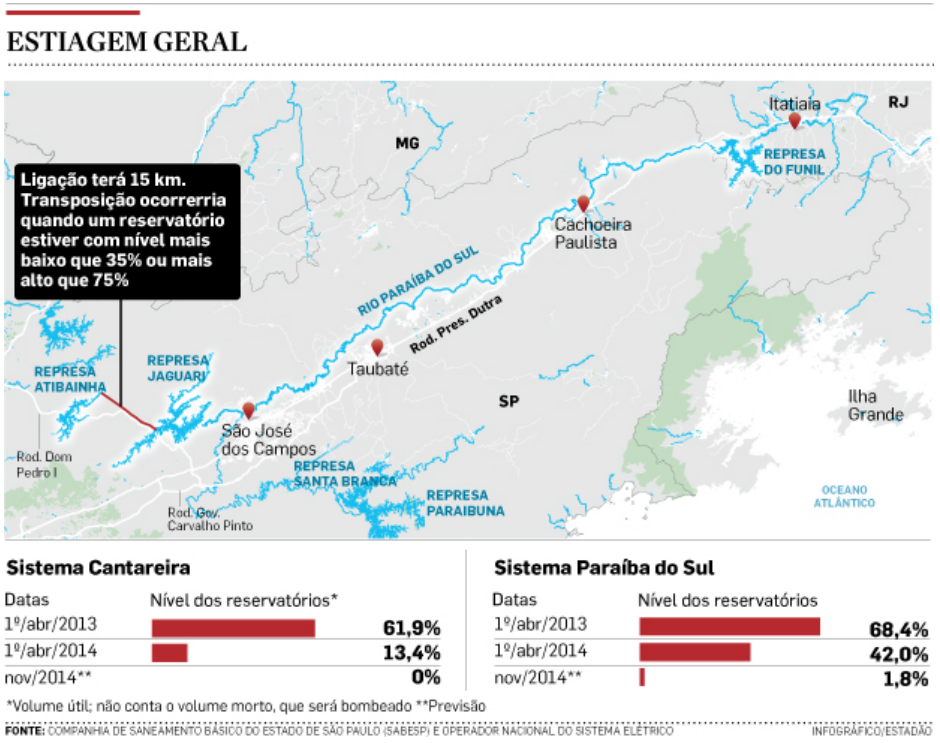


Full history of the Madeira River

Water shortage in the Northeast , again

Severe drought in the Cantareira System

Strong hydric stress in the hídrico in the River Basin of Paraiba do Sul



National System for Water Resources Management: The Water Act proposal

The water sector in Brazil

All waters are public domain

Federal waters:

rivers that cross through more state boundaries or into the territory of other countries

State waters:

Groundwater and rivers located entirely within the territory of a single State, except when reserved in the Federal Government's works

Two levels of management = two levels of reform for integrated water resources management!

(5,565 municipalities manage land uses)

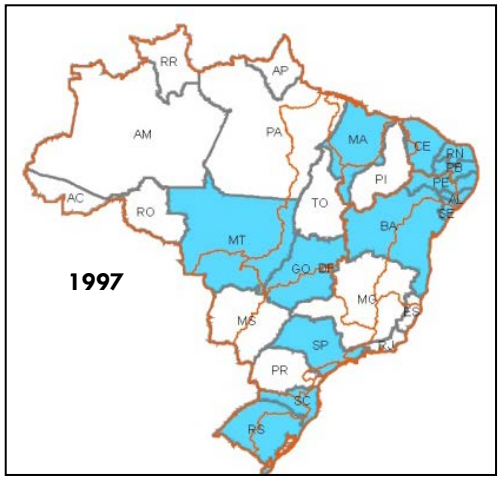
Historical Context

- ✓ Until the emergence of the reforms in the years 1990 and 2000, water management in Brazil was a sub-sector of energy (hydroelectric)
- ✓ In Northeastern semi-arid, the emphasis of the 'Large Hydraulic' was the fight against droughts
- ✓ Grants issued previously – in some states – were documents of little legal value
- ✓ The laws of water propose profound changes in management practices, on the basis of the principles and standards of Integrated Water Resources Management (IWRM)

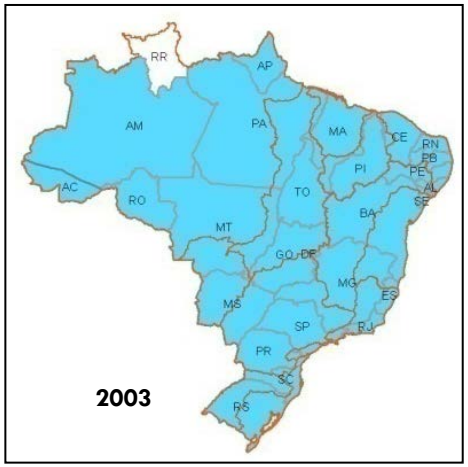
Dynamics in the approval of Water Laws

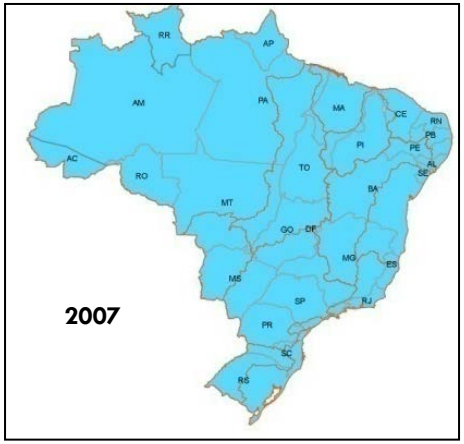
Sao Paulo: pioneer state

Federal Water Laws (1997)



São Paulo inspired management models across the country, such as the Rio de Janeiro, Minas Gerais, Rio Grande do Sul, Santa Catarina, etc.. and the National System of Waters itself.





States with water resources laws

Source:
Relatório Conjuntura (ANA, 2013).

Water Laws: Federal and State

Objectives of National Policies and State Policies:

- ✓ Ensure the availability of water for the current and future generations, in adequate quality for each of its uses
- ✓ The rational and integrated use of the water resources
- ✓ The prevention and protection against critical hydrological events

Water Laws: Federal and State (cont'd.)

The foundations/principles:

- ✓ Water, a public good of public domain
- ✓ Recognition of water as a finite and vulnerable public good that has a big economic value
- ✓ In situations of scarcity, the primary use is human and animal consumption
- ✓ Multiple Uses of water
- ✓ River Basin is the unit of planning and management
- ✓ Integrated Management, decentralized and participatory

Water Laws: Federal and State (cont'd.)

Management Tools:

- ✓ Plans for Water Resources;
- ✓ Granting of rights of use of water resources
- ✓ Instituted a fee for the use of water resources;
- ✓ Inclusion of water bodies under classes, according to the predominant uses of water;
- ✓ Water Resources Information System

Water Laws: Federal & Estate (cont.)

Institutions :

- ✓ Water Resources National and State Councils
- ✓ National Water Agency (ANA) – water management authority at federal level*
- ✓ State Water Management Agencies - water authority at state level*
- ✓ Watershed Committees
- ✓ Water Agencies (almost always)
- ✓ Federal, State and Municipal Bodies related with Water Management

* ANA and some State Water Management organizations where created later under other laws.

Water Laws: Federal & Estate (cont.)

Other key players for the management of water:

- Institutions responsible for the environment and pollution control (eg, state environmental agencies)
- Institutions responsible for water infrastructure to combat drought, irrigation and civil defense (especially the Ministry of National Integration, the secretaries and related institutions)
- Institutions related to the hydropower sector and different user sectors (fishing, navigation, etc.).

Greater complexity of the system: integrated management of interstate basins

In general, the management models have a strong French inspiration, based on the tripod "committee / agency - collection - basin plan." There are exceptions.

- ✓ Extremely complex Management of difficult operation in shared watersheds between the Union (ANA) and the States
- ✓ Easier implementation in entirely State watersheds

National View of

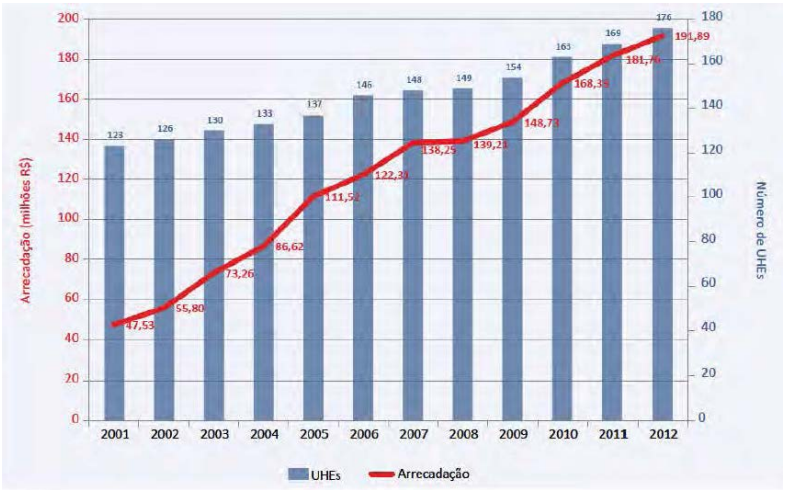
Management Practices

First challenge: institutions to implement integrated management

- Few states had an authorizing organization of water resources, like São Paulo and Rio de Janeiro.
- Some have created a state institution, but few are robust and have financial independence, such as Ceará.
- **COGERH** (Ceará) was created in 1994 (Law of 1992), with different characteristics:
  - Water resource manager and responsible for O&M for water infrastructure (114 own employees + 538 outsourced)
  - Pricing of raw water = Own resources (R$268 thousand in1996 and R$68 million in 2013 => personnel costs and O&M)
  - Technical and administrative support to watershed committees (functions of basin agency)

First challenge: institutions to implement integrated management (cont.)

- At the federal level, there was only a structure of direct administration (SRH / MMA). ANA was established in 2000.
- It is a special financial agency, with administrative and financial autonomy, linked to MMA. Skills in water management.
- Its executive board is comprised of the CEO and 4 more directors for a term of four years.
- ANA has a highly specialized technical team standing: ~ 230 technicians, ~ 500 employees (~ $ 75 million / year, Union Budget)
- Main revenue for expenses and investments: Charging for water use in the electric sector (R$ 191 million in 2012, R$ 220 million in 2013)
- Problem: contingency (until 2011)



Diversity of rhythms and management practices

Profound difference between states:

- ✓ Few States are in an advanced stage of implementation of their Management Systems
  (Ceará, Rio de Janeiro, São Paulo, Minas Gerais, etc.)
- ✓ Some have not even started an effective implementation
- ✓ Several are in a Mid-way stage
- ✓ A large majority of State management bodies lack an administrative structure, human resources and financial to execute their functions

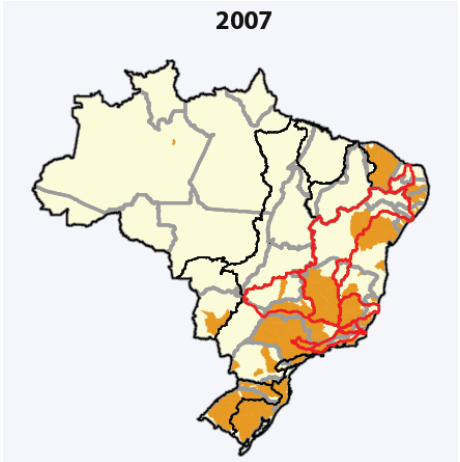
At the federal level, ANA has been selectively implementing management on interstate basins.

Watershed Committees (State and Interstate)

Lei das Águas (1997)

Criação da ANA (2000)

Região Hidrográfica
UF
Comitês Interestaduais - 10
Comitês estaduais instalados em 2011
Comitês estaduais - 174

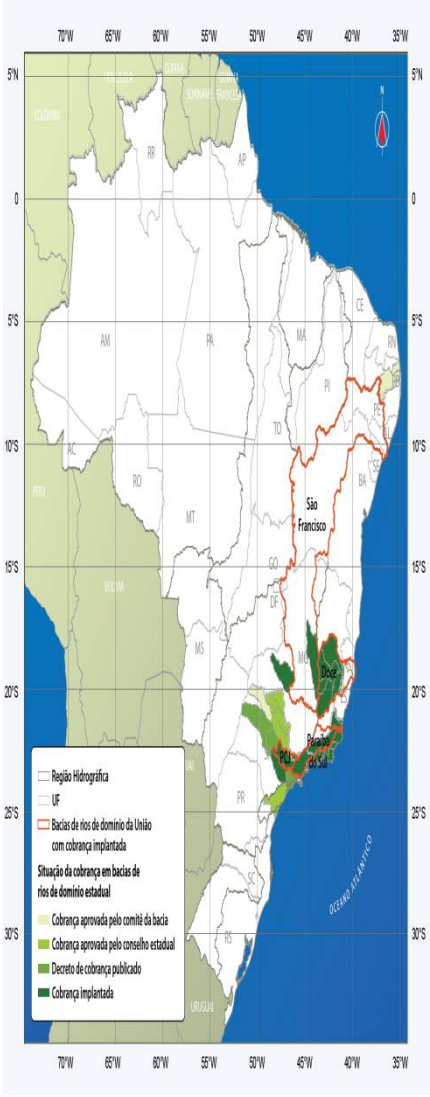


ONLY 17 committees with "delegational" water agencies !!

In 2011, only 1 State (Acre) did not have a State Council on Water Resources

National Council functions regularly since 1998

Collection for water use



- ✓ Collection on federal rivers (by interstate committees):
  - ✓ Paraíba do Sul (RJ/SP/MG) - 2003
  - ✓ Piracicaba, Capivari e Jundiaí – PCJ (SP/MG) – 2006
  - ✓ São Francisco (PE/AL/SE/BA/MG/DF/GO) - 2010
  - ✓ Doce (MG/ES) – 2011

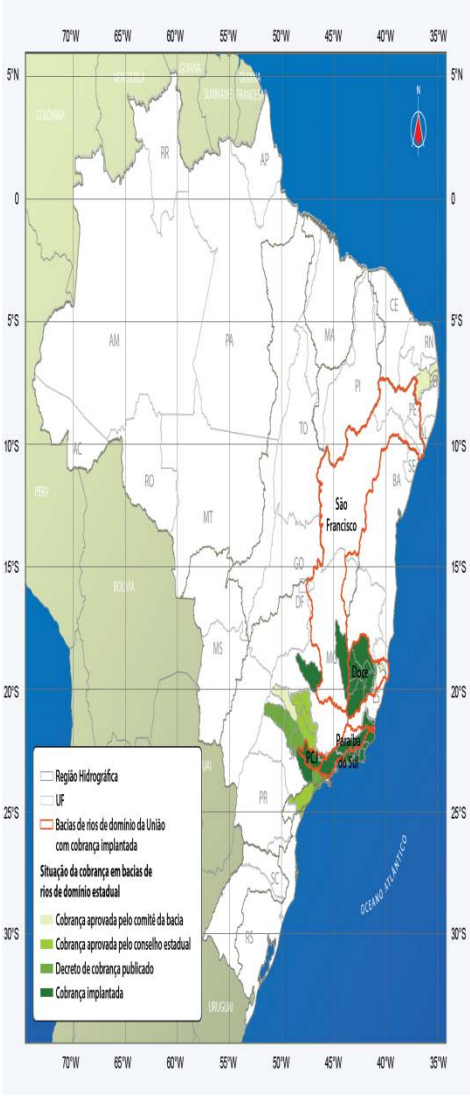
- ✓ Collection on State waters (by State committees):
  - ✓ Rio de Janeiro: all the State 9 hydrographic regions - 2003
  - ✓ São Paulo: watersheds PCJ, Paraíba do Sul and watersheds of rivers Sorocaba and Médio Tiête.
  - ✓ Minas Gerais: watersheds Piracicaba-Jaguari, of the rivers Velhas and Araguari

Methodology and variable criteria
(recollection, consumption and DBO).

Paying-Users:
Water treatment, industries, mining and sometimes irrigation related.

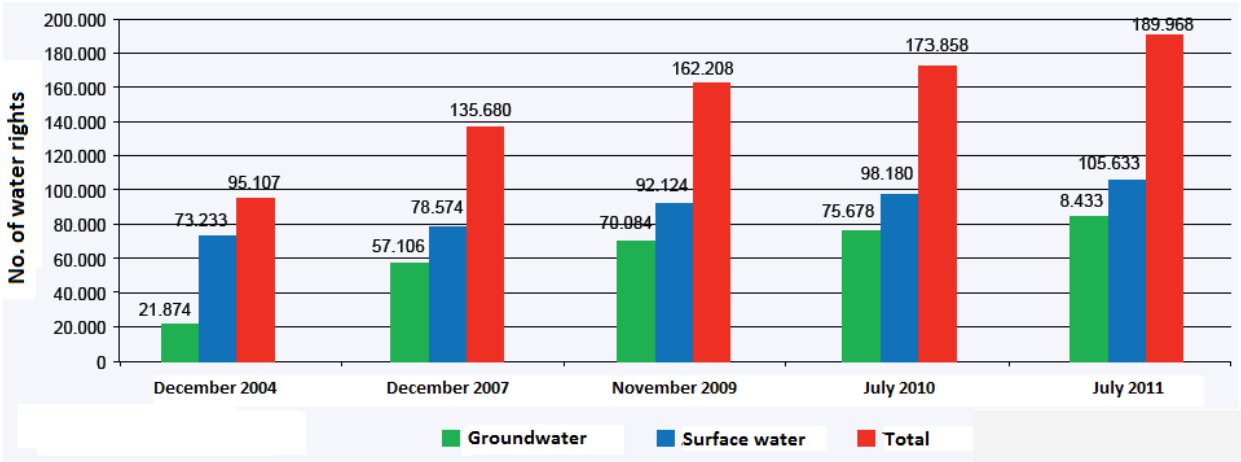
Practical Values are very low.

Collection for water use (cont.)



- Total as of December 2012:
  R$ 532 million reals, of which near R$ 170 million from federal waters users (collection of federal and state waters, without do Estado do Ceará revenue and financial compensation).
- Low disbursement level (use of resources), oscillating near 20% to 50% of the total collected for the basin.
- Ceará (gross water tariff): collection grew from R$268 thousand in 1996 to ~R$40 millions in 2010.
- Payment for water use by the energy sector (0,75% of financial compensation) is used by ANA: R$ 189 million in 2012 (not contingency since 2011)
- In general, the annual collection addresses the small part of investments scheduled in the water resources Plan => Watershed Paraíba do Sul is 10%
  (Annual collection of R$ 12,5 million; investments R$ 3 billion in 20 years, or R$ 150 million annual).

Granting of rights of use

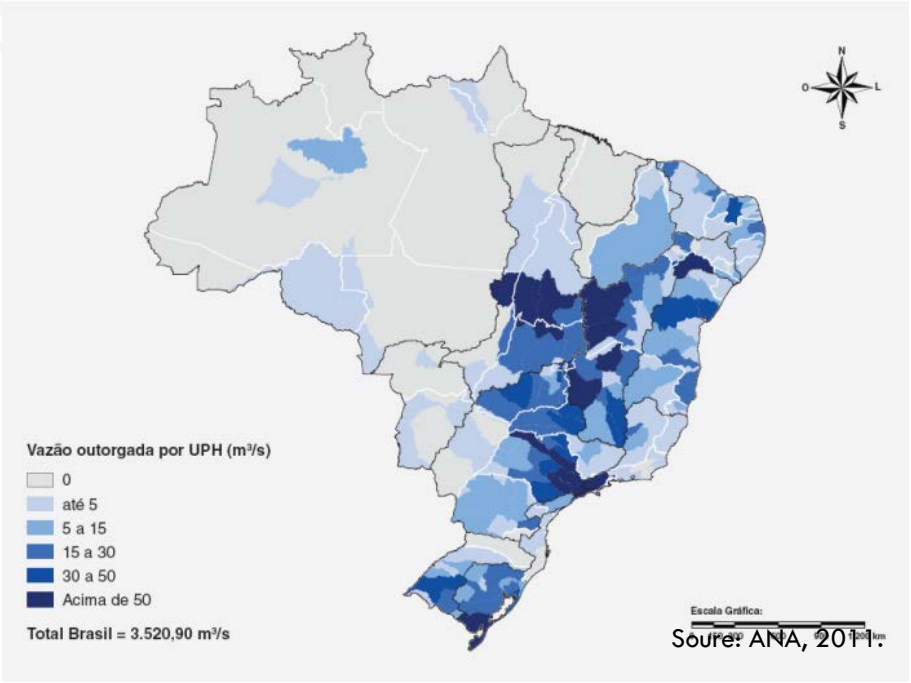


Evolution in the number of permits issued in Brazil (ANA, 2012)

More than 200,000 water permits have been granted (consumptive uses) until July 2012

Over 70% of the granted flow (7,400 m3/s) is allocated to irrigation, followed by urban users and industries

Around 350,000 wells being used



Soure: ANA, 2011.

Granting rights of use (cont.)

In general, water allocation is based on conservative/restrictive criteria :

- ✓ Only a small fraction of the minimum flow reference is grantable;
- ✓ The maximum instantaneous flow rates are granted;
- ✓ There is no seasonal flexibility;
- ✓ Large water security to established and regularized users;
- ✓ New users are admitted if do not compromise pre-existing users.

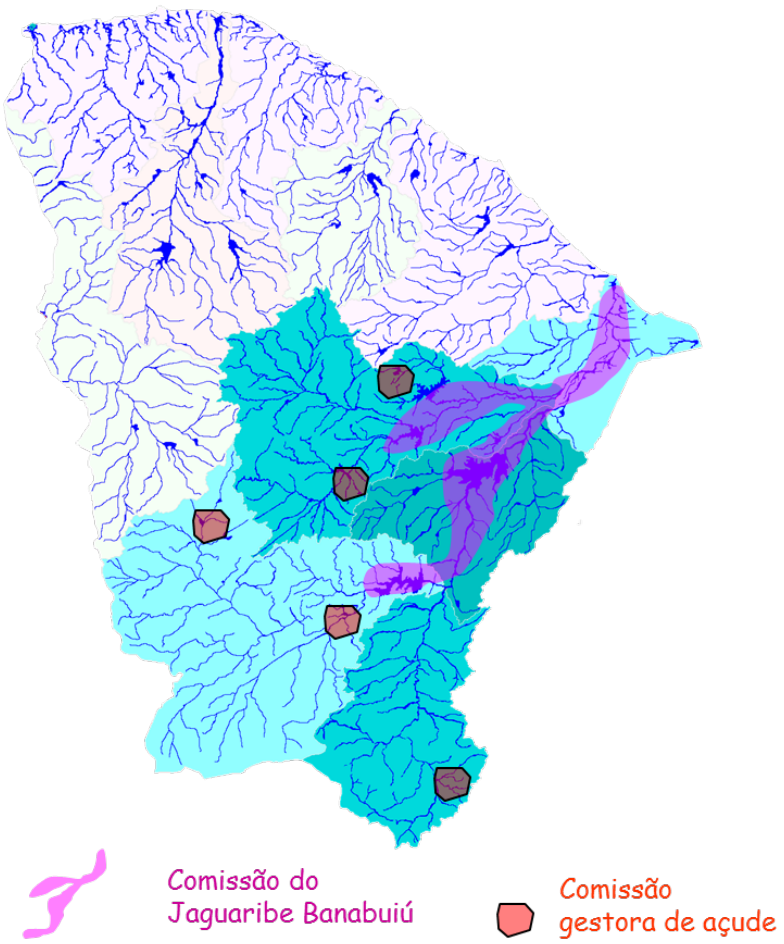
This grant system works well only in basins without quali-quantitative water stress.

Water Resource Plans

- ✓ 8 in elaborate plans and 1 in preparation of interstate basins (rivers under federal domain)
- ✓ Dozens of state watershed plans, elaborated by the States and/or basin committees
- ✓ National Plan (2006, rev. in 2010)
- ✓ 19 State Planos (27 in total)
- ✓ Plans are still assumed to be "state plans," guiding the management or investment actions in the basin.
- ✓ Low commitment levels from state or federal governments in effective plan implementation.

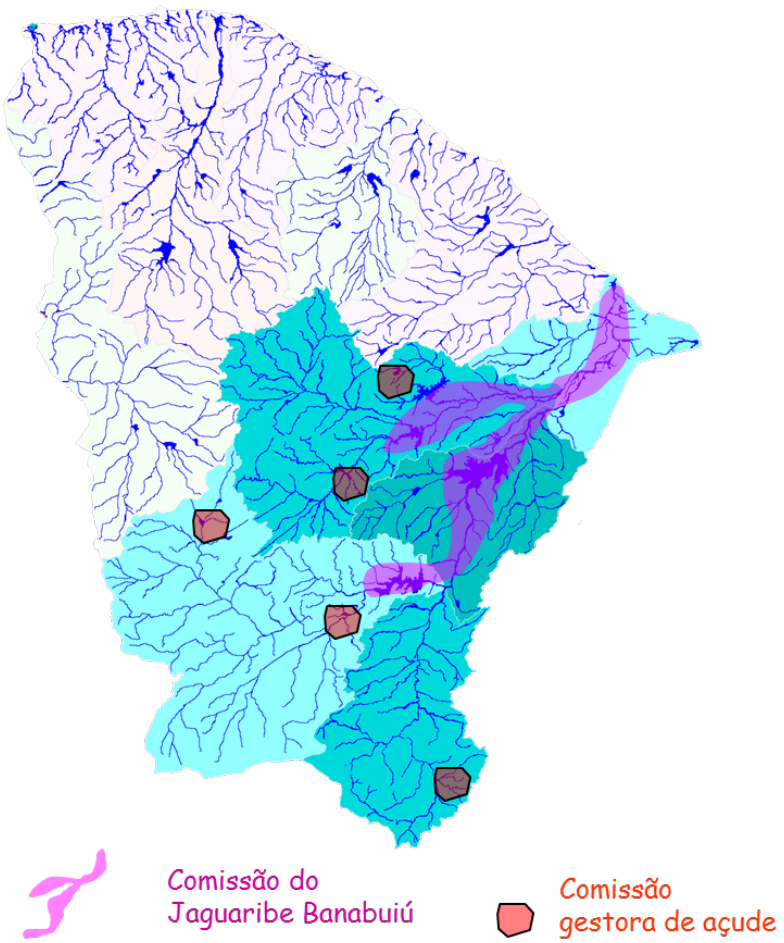
Some experiences in the integrated management at the local/regional levels

Negotiated allocation of water in Ceará



- Ceará "invented" a User Commissions of Perennial Valley and Dam user Associations, local organizations whose creation preceded the formation of CBHs
- Main assignment: negotiated water allocation, every year, with the technical support of Cogerh
- The 144 monitored reservoirs in all the State, 70 are managed through negotiated water allocation (2013)

Negotiated allocation of water in Ceará: Main Results

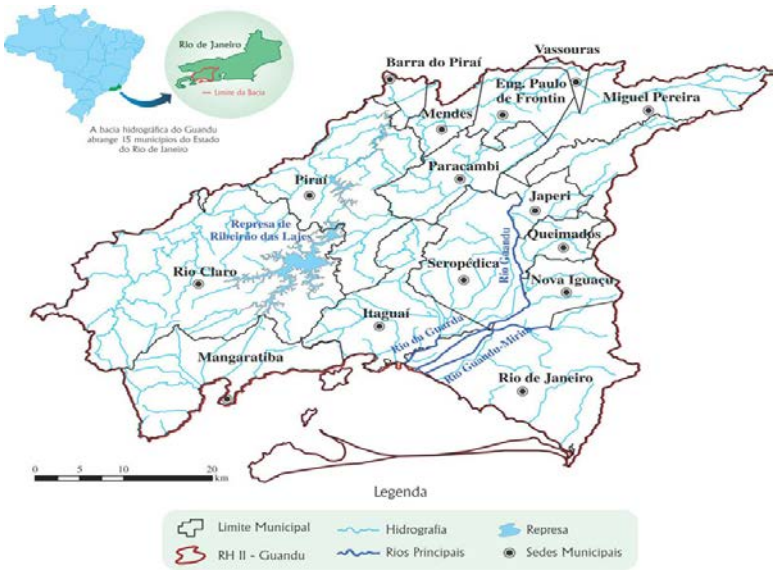


- ✓ Water User involvement and civil society
- ✓ Major flexibility and efficiency of water allocation
- ✓ Greater transparency=> greater water security

BUT...

- ✓ The allocation process has still not translated into regularization of uses
- ✓ There is room for methodological improvement
- ✓ During severe droughts and emergencies, the process is not efficient enough to mitigate loss

State Basin Management



Guandu Committee (RJ):

- Universalization of sanitation projects and municipality sanitation plans for the Basin;
- Protection of streams/water sources/PSA;
- Contingency for environmental accidents.

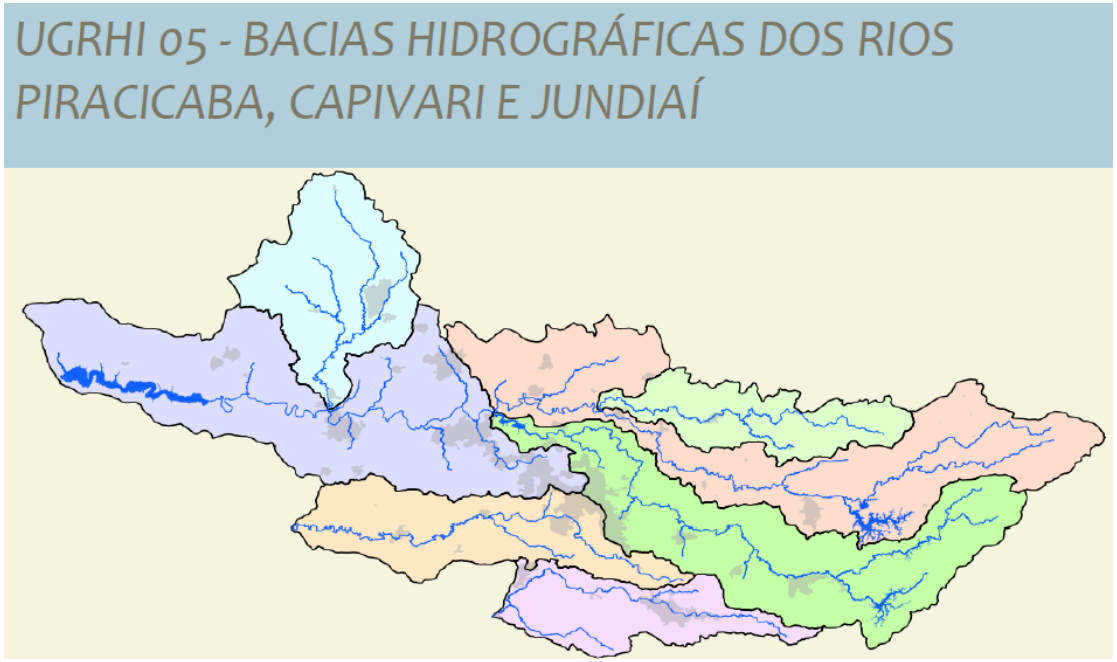
Lagos São João Committee (RJ):

- Main action: recovery of Lagoa (Pond) de Araruama, by management pact involving water and sewage services, users, civil society, ERJ and municipalities (collection for dry weather).

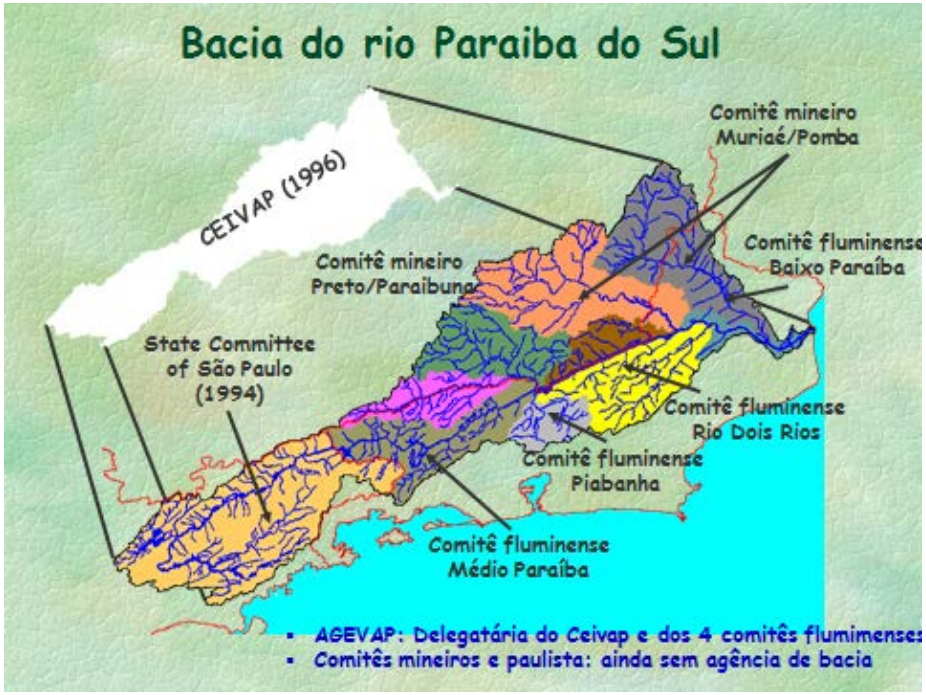
Management of interstate basins

PCJ Committee (SP/MG):

- ✓ Significant regional mobilization
- ✓ Strong performance in macro-regional allocation of water, involving the MRSP
- ✓ Significant sanitary sewage results
- ✓ Interstate basin with greater integration between basin organizations



Management of Interstate Basins



CEIVAP e comitês estaduais (SP/RJ/MG):

- ✓ A pioneer in the country (committee, regularization, grants, basin plans...)
- ✓ High management complexity: 8 committees, the delegate is not the only agency, 5 management agencies (quality - quantity)
- ✓ Integration difficulties
- ✓ Systematic investments but still modest compared to Basin needs

- ✓ Charging: close to 12,5 million per year
  Investments: ~R$ 3 billions in 20 years, or R$ 150 millions annually.
- ✓ The charging corresponds close to 10% of the sum of necessary investments for the protection and recovery of the Basin.
- ✓ Difficulties in the use of resources: average of 30% of the total accumulated value.

Final Considerations

Main Results

Very Positive Results in terms of processes:

- ✓ New management practices,
- ✓ Social mobilization (Basin committees),
- ✓ Institutional strengthening (at the state level but especially federal)
- ✓ Technical bases for management.

Generally, results still modest in terms of protection and recovery of hydric resources, but (very) important in some local experiences/ regional: Ceará (negotiated allocation), São Paulo (PCJ), Rio de Janeiro (Lagos São João), among many others.

Major Advances Made

Greater knowledge about water, its use and strategic orientations, in large part because of ANA's initiative:

- ✓ Significant development of the monitoring of quality and quantity of water.
- ✓ Significant development about knowledge of uses and users of water.
- ✓ Major control over the hydrologic conditions of basins with hydric infrastructure, dam security, among others.
- ✓ Production and dissemination of technical information for management. ANA highlights: Situational Report, urban sewage Atlas, etc.
- ✓ Strategic planning, the example of National Plan of Hydric Security, in preparation (MI and ANA).

“Problems of origin of “Water Laws”(1)

- Managing Institutions:
  => Water Laws did not address this issue (inspiration from São Paulo). ANA and COGERH came to cover this gap. => Problem remains serious in most states. Financial aspects for the IWRM:
  => Too much reliance on charging for the use of raw water. Do I need to ‘brainstorm' other complementary solutions.

- Joint implementation of management tools=> A lack of planning for joint implementation of watershed (basin) committees & management tools. Dozens of committees are unable to fulfill their mission.

- The management system for hydric resources has little or no governance over the flooding problem and floods, one of the water policy objectives.

“Problems of origin of “Water Laws”(2)

- Management models of Brazilian laws, based on the initiatives from Sao Paulo (from French inspiration), Looks less adaptable to an Amazonian basin or the Brazilian semiarid.
- Ceará found a good equilibrium in the adaptation of IWRM to the semiarid regions (centralization & decentralization/participation).
- Amazonian region must find a model that is adaptable to its characteristics.
- The complexity of inter-state basin management, for example Paraíba do Sul and São Francisco.

Challenges (1): perfectioning the management in humid basins

Even in the most humid and richest basins, the pace of implementation of IWRM is slow and faces sizeable challenges:

- ✓ Charging (1): universalize and increase its significance; increase the universe of beneficiaries.
- ✓ Charging (2): more efficient use of collection resources => Delegatee. Delegatee: institutional 'limbo' (neither public nor private).
- ✓ Basin plan: more oriented diagnoses, more robustness in the construction of scenarios, and especially in agreement on action and investment.
- ✓ Information systems: not well developed=> it's necessary to utilize better and give more transparency to the available data.
- ✓ Background: embryonic, of difficult application.

Challenges (2): allocation of water in all Brazil

Water allocation: There is great need and possibility of advancements

- ✓ Grants: still bureaucratic, and not well adapted to the regions with stress or water scarcity.
- ✓ Macro-allocation of water in critical basins or with hydric stress: water pacts involving States and sub-basins (of the 'Regulatory Framework" type) are absolutely fundamental. ANA's role.
- ✓ Importance of mitigation conflict mechanisms in moments of water scarcity, the example of the negotiated allocation of the State of Ceará (or the same experiment 'Water of the Valley' of 2001)

Challenges (3): hydraulic infrastructure

- ✓ With variability regarding climate change and its increasing uncertainty, there is a tendency to increase a reservoir's capacity and the adduction of water
- ✓ Transposition of water amongst basins
- ✓ Interconnection of hydrographic basins
- ✓ Management, O&M of complex infrastructures
- ✓ Multiple uses and hydraulic infrastructure
- ✓ Reservoirs and environmental & social costs

Challenges (4): supply in metropolitan areas, transposition & other issues

The SP-RJ crisis around the Paraíba do Sul Basin has raised very interesting issues for the Federation, in particular:

- ✓ What are the autonomy and the limits of each federal unit in the management of shared basins?
- ✓ What is the role of the Management System (ANA, Committees, CNRH)?
- ✓ Double dominion is a problem? What is the solution?
- ✓ How to plan and agreeing on meeting the demand of water in metropolitan areas?
- ✓ Need of rules for coexistence in macro-regional level: management agreement, or similar regulatory framework.
- ✓ Even when we will manage water resources in these areas without facing the problems of sanitation? Demand Management? Other mechanisms for rational use? Climate changes?

"Water reform requires a complex mixture of impatience and patience.

Impatience is required to make paradigm shifts, but… progress is measured in decades, not years".

MAKING REFORM HAPPEN IN WATER POLICY:

Reflections from a practitioner*

John Briscoe

OECD Conference Centre, Paris, 2011

Thanks!

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