

# Hydrolithology, Hydrogeology, Annual Exploited Volumes and Soils of the Tietê River Basin, São Paulo, Brazil

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DO BRASIL - CPRM

SECRETARIA DE  
GEOLOGIA, MINERAÇÃO  
E TRANSFORMAÇÃO MINERAL

MINISTÉRIO DE  
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# ABSTRACT INFORMATION | POSTER

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# SUMÁRIO

- Map with the location and population density of the Tietê river hydrographic basin (Brazil)
- Altimetry / Hypsometric map
- Biomes map
- Average annual rain map
- Köppen-Geiger climate classification map



# SUMÁRIO

- Soil map
- Soil – Water infiltration capacity map
- Explored annual volume map
- Hydrolytic map of the Joinville
- Hydrogeological map



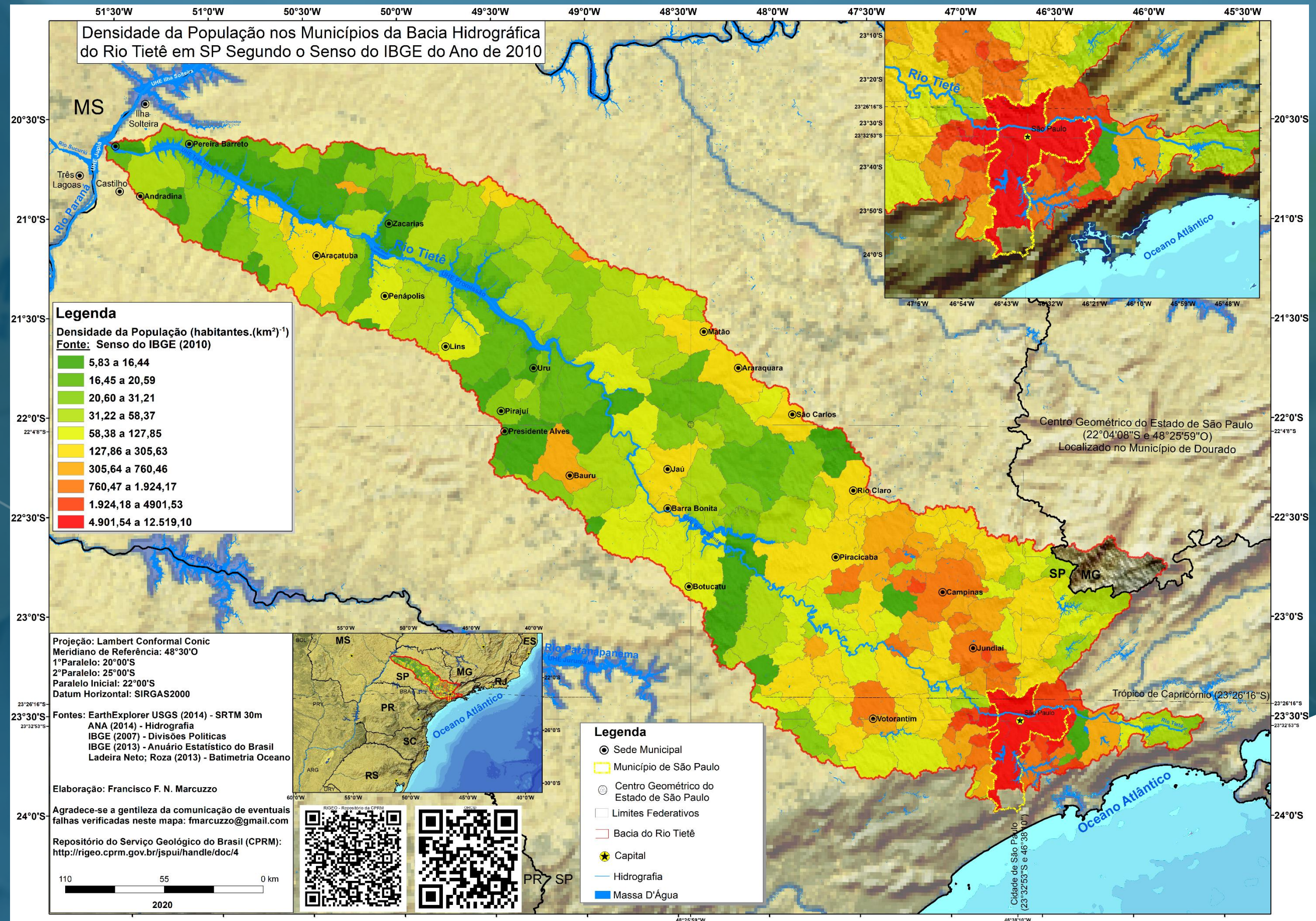
# Hydrolithology, Hydrogeology, Annual Exploited Volumes and Soils of the Tietê River Basin, São Paulo, Brazil

Using clippings from the hydrogeological map of Brazil, from the Geological Survey of Brazil, the objective of this work is to present and discuss the maps of hydrogeology, hydrolytic domains, soils, soil infiltration capacity and explored volumes of the Tietê river hydrographic basin (Brazil).



# Map with the location and population density of the Tietê river hydrographic basin (Brazil)

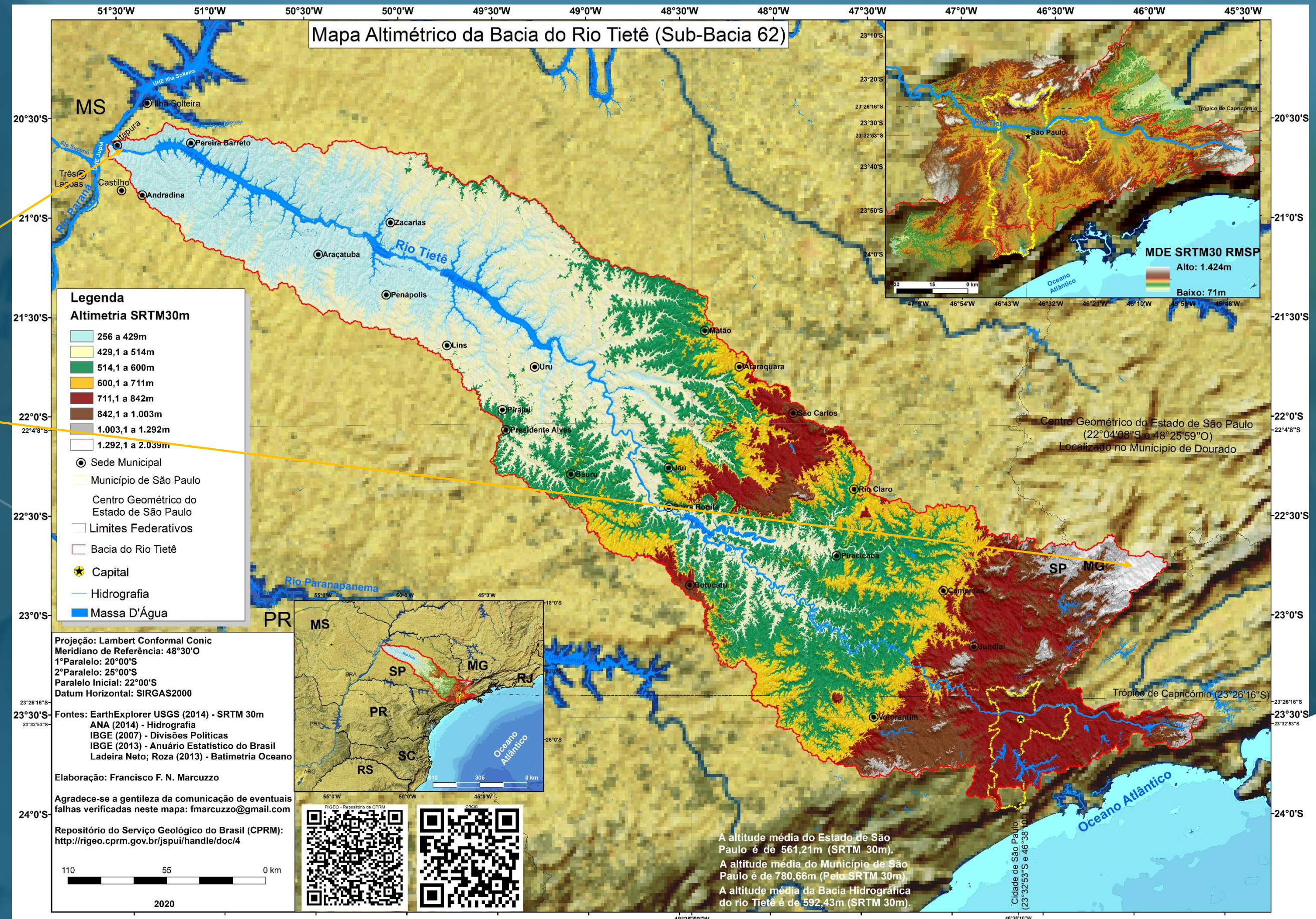
The Tietê River rises in the Serra do Mar in the municipality of Salesópolis/SP, cuts across the entire State of São Paulo from East to West, and is considered its main river, flows into the left bank of the Paraná River on the border between the State of São Paulo and Mato Grosso do Sul, helping making up the Paraná basin, which is the second largest hydrographic basin in South America to its confluence in the Atlantic Ocean. The Tietê River basin, whose area is approximately 72,000 km<sup>2</sup>, has most of its territory in the State of São Paulo and a small portion in the extreme south of Minas Gerais.





# Altimetry / Hypsometric map of the Tietê river hydrographic basin (Brazil)

The altimetry variation of the basin is 1,783m, ranging from 256m in its confluence in the municipality of Itapura/SP to 2,039m in its small part in the State of Minas Gerais, with an average altitude of 592m.

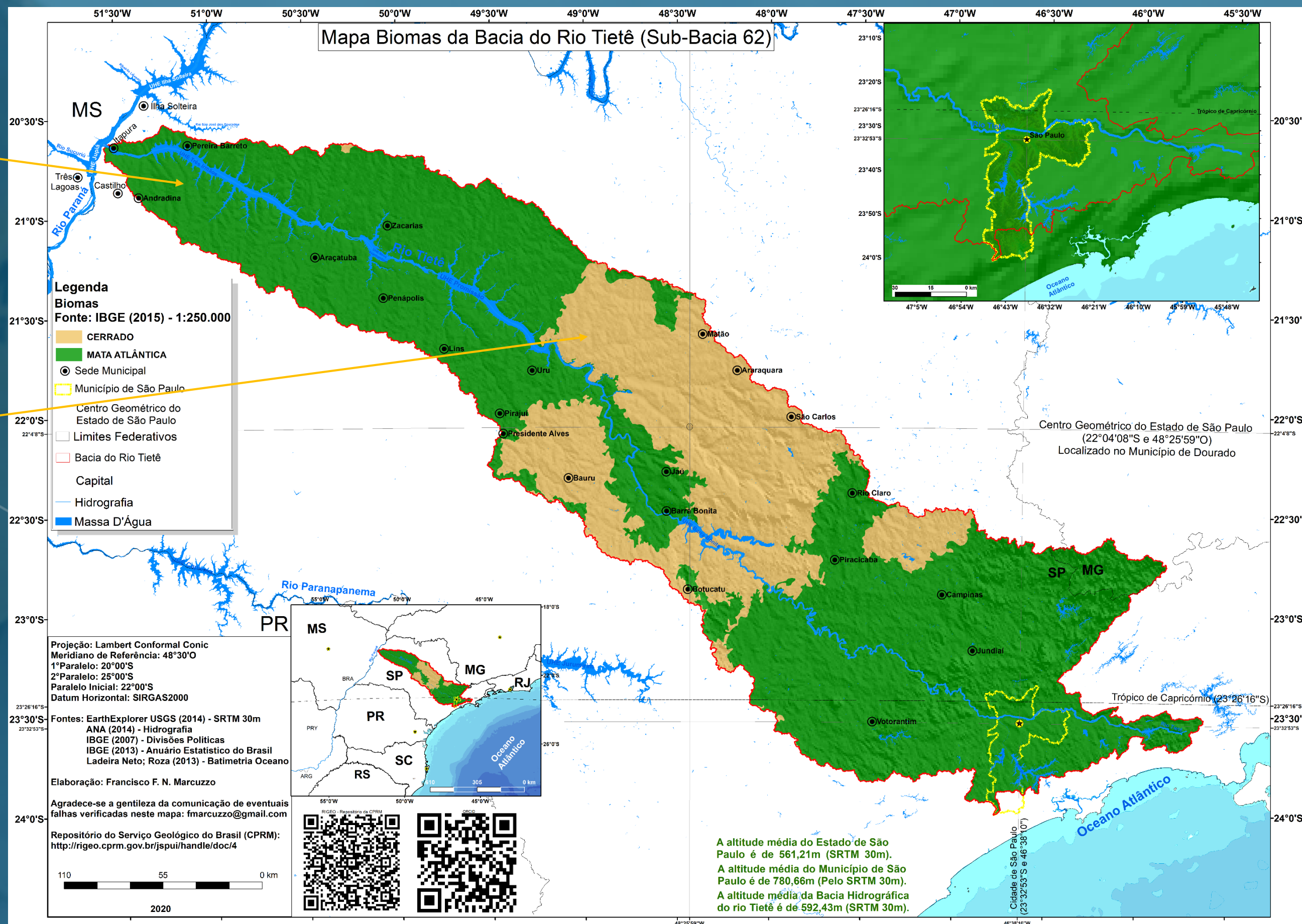




# Biomes map of the Tietê river hydrographic basin (Brazil)

The Atlantic Forest is composed of a series of ecosystems with very different structures and composition of flowers, as well as the climatic characteristics of the region where it occurs, having as a common element the exposure to the humid winds that blow from the ocean.

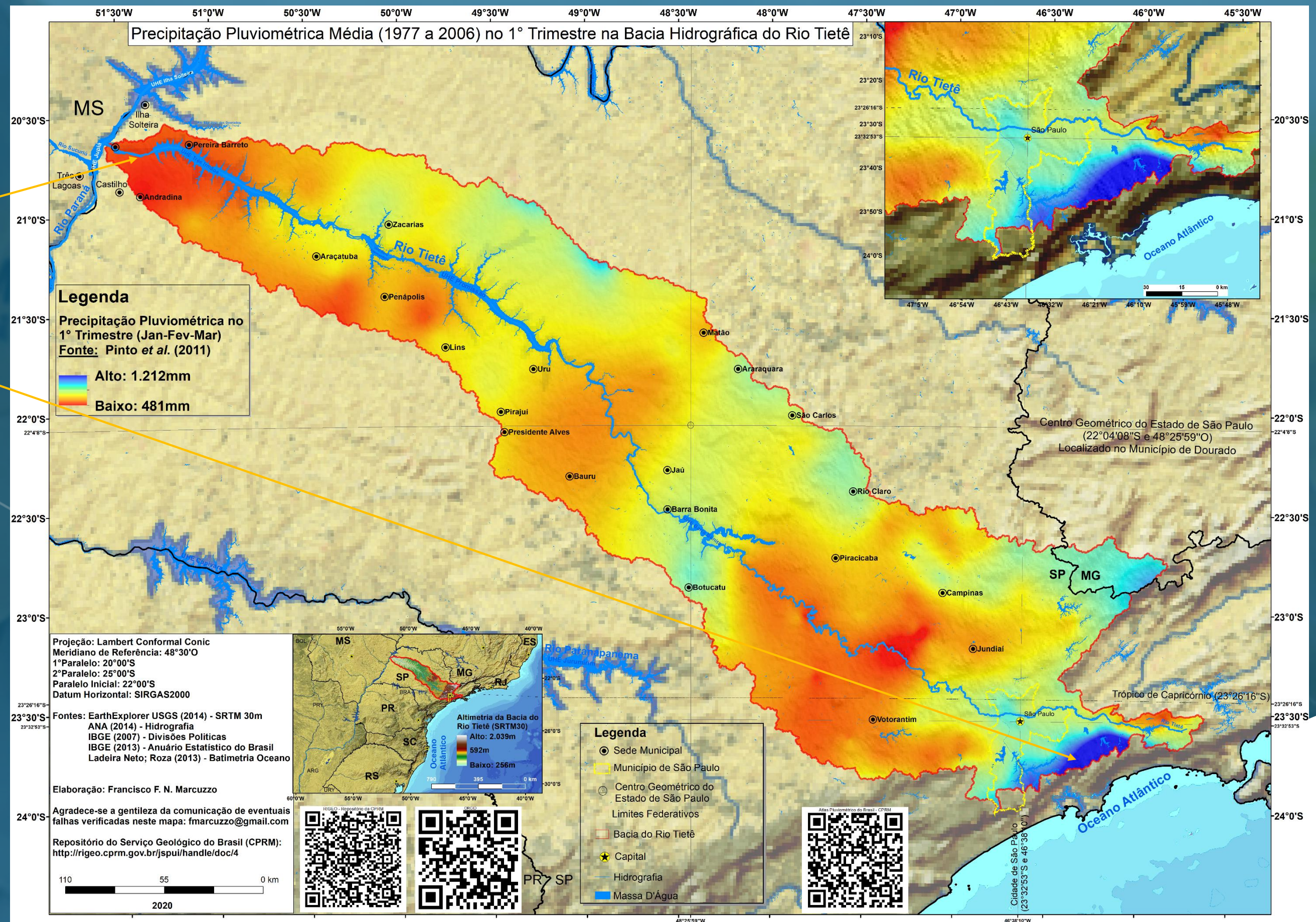
The Cerrado presents diverse regions, ranging from clean fields devoid of woody vegetation to cerradão, a dense tree formation. Its climate is particularly striking, presenting two well-defined seasons. The Cerrado is made up of grasslands, savannahs and dry forests. It is the second largest biome behind the Amazon in South America. It covers around 21% of territory in Brazil and is located in the highlands of central Brazil.





# Average annual rain map of the Tietê river hydrographic basin

In the Tietê river basin the maximum average annual precipitation is **3,085mm**, while the average minimum annual precipitation is **1,202mm**, representing an amplitude of 1,883mm. The wettest regions, with the highest rainfall annual averages in the basin, are found in the southern region of Serra do Mar, border region between São Paulo and Minas Gerais and Southeast of the basin, in a strip that runs from the municipality of Rio Grande da Serra to Mogi das Cruzes, among others. The drier regions with the lower average annual rainfall, are located in the Northwest and Central region of the basin, in addition to a region in the Southwest of the basin, as seen in Figure.





# Köppen-Geiger climate classification map of the Tietê river hydrographic basin (Brazil)

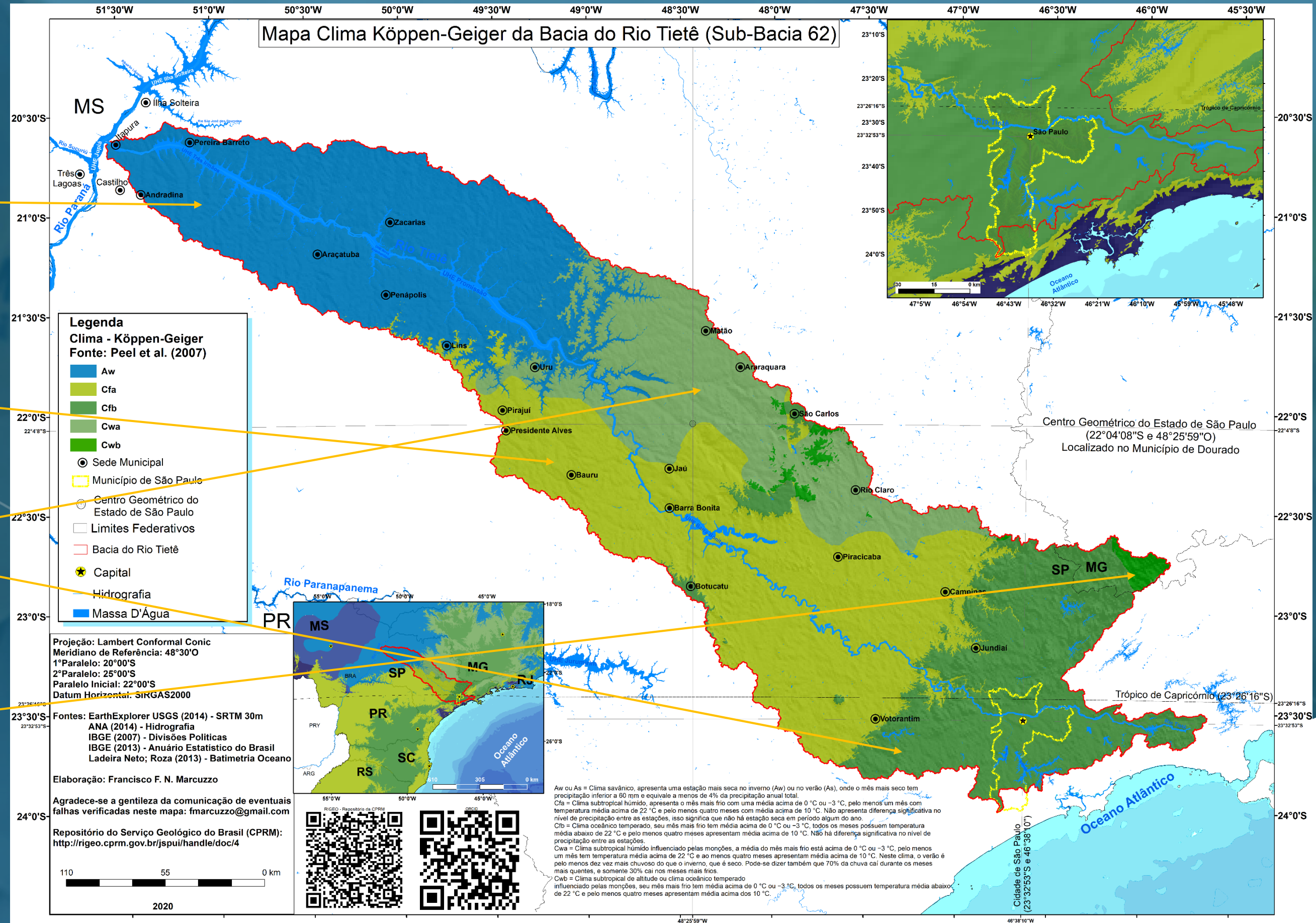
**Aw** - Tropical savanna climate with dry-winter characteristics. Aw climates have a pronounced dry season, with the driest month having precipitation less than 60mm.

**Cfa** - Humid subtropical climates. These climates usually occur on the eastern coasts and eastern sides of continents, usually in the high 20s and 30s latitudes.

**Cfb** - Oceanic climate. Marine west coast climate. Cfb climates usually occur in the higher middle latitudes on the western sides of continents.

**Cwa** - Dry-winter humid subtropical climate. Cwa is monsoonal influenced, having the classic dry winter – wet summer pattern associated with tropical monsoonal climates.

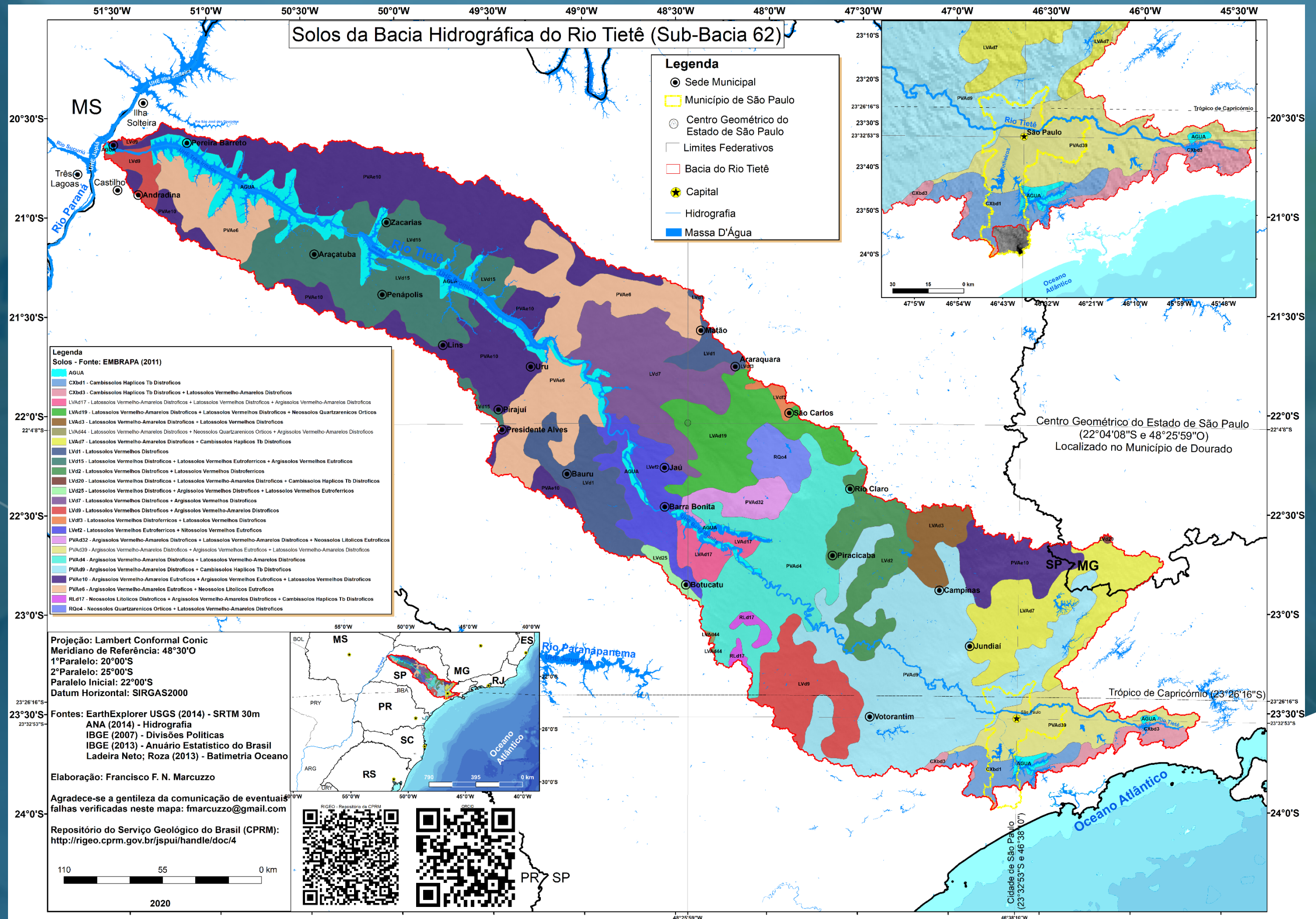
**Cwb** - Dry-winter subtropical highland climate. Dry-winter subtropical highland climate (Cwb) is a type of climate mainly found in highlands inside the tropics of Central America, South America, Africa, and Asia or areas in the subtropics.





# Soil map of the Tietê river hydrographic basin (Brazil)

There is a great diversity of soils in the Tietê river basin, which makes difficult characterization or grouping.





# Infiltration capacity of the Tietê river hydrographic basin (Brazil)

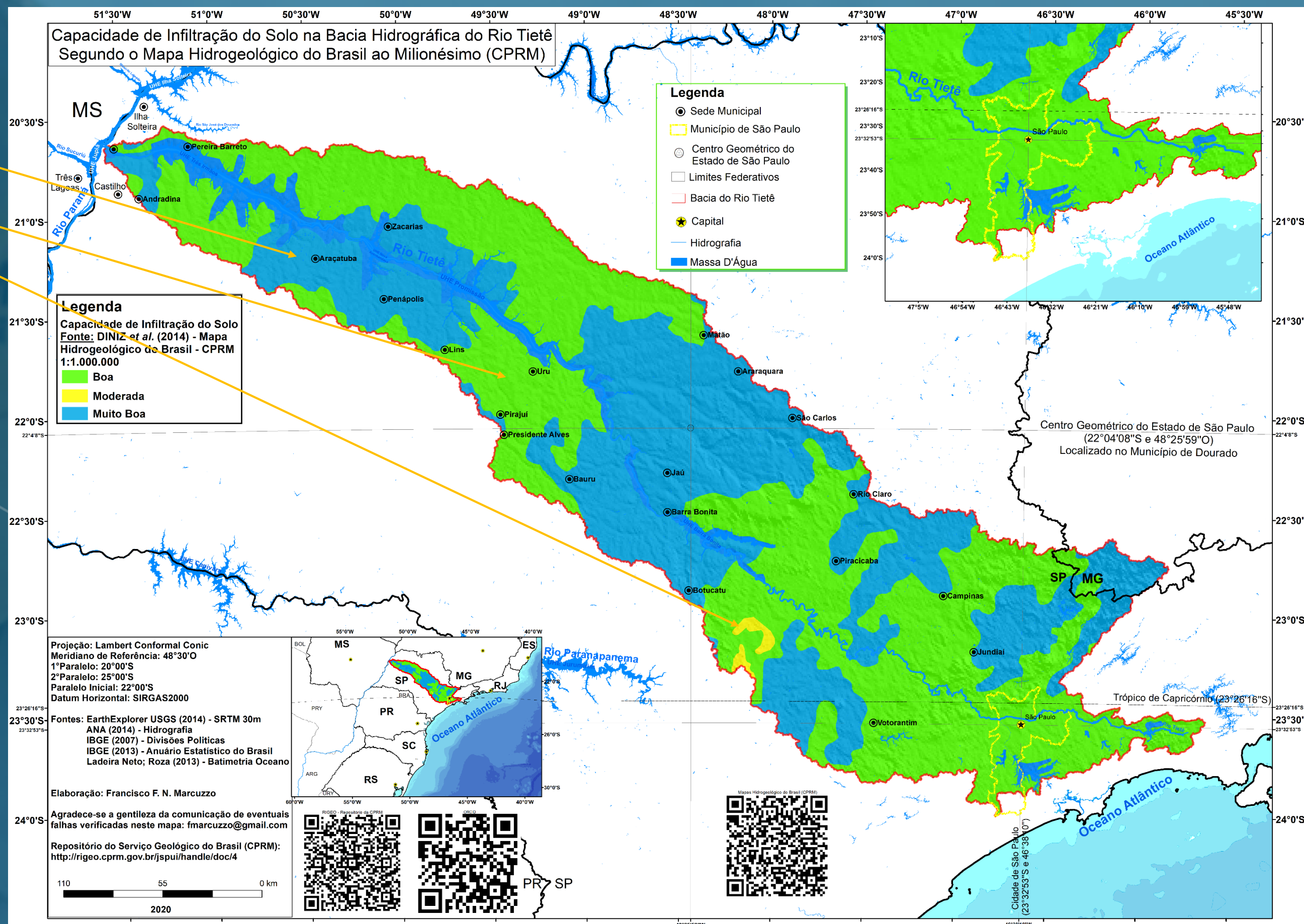
Very good water infiltration

Good water infiltration

Moderate water infiltration

The infiltration capacity of the soil is **good** or **very good** in most of the Tietê basin and a small part, in the southwest of its territory, is considered **moderate**.

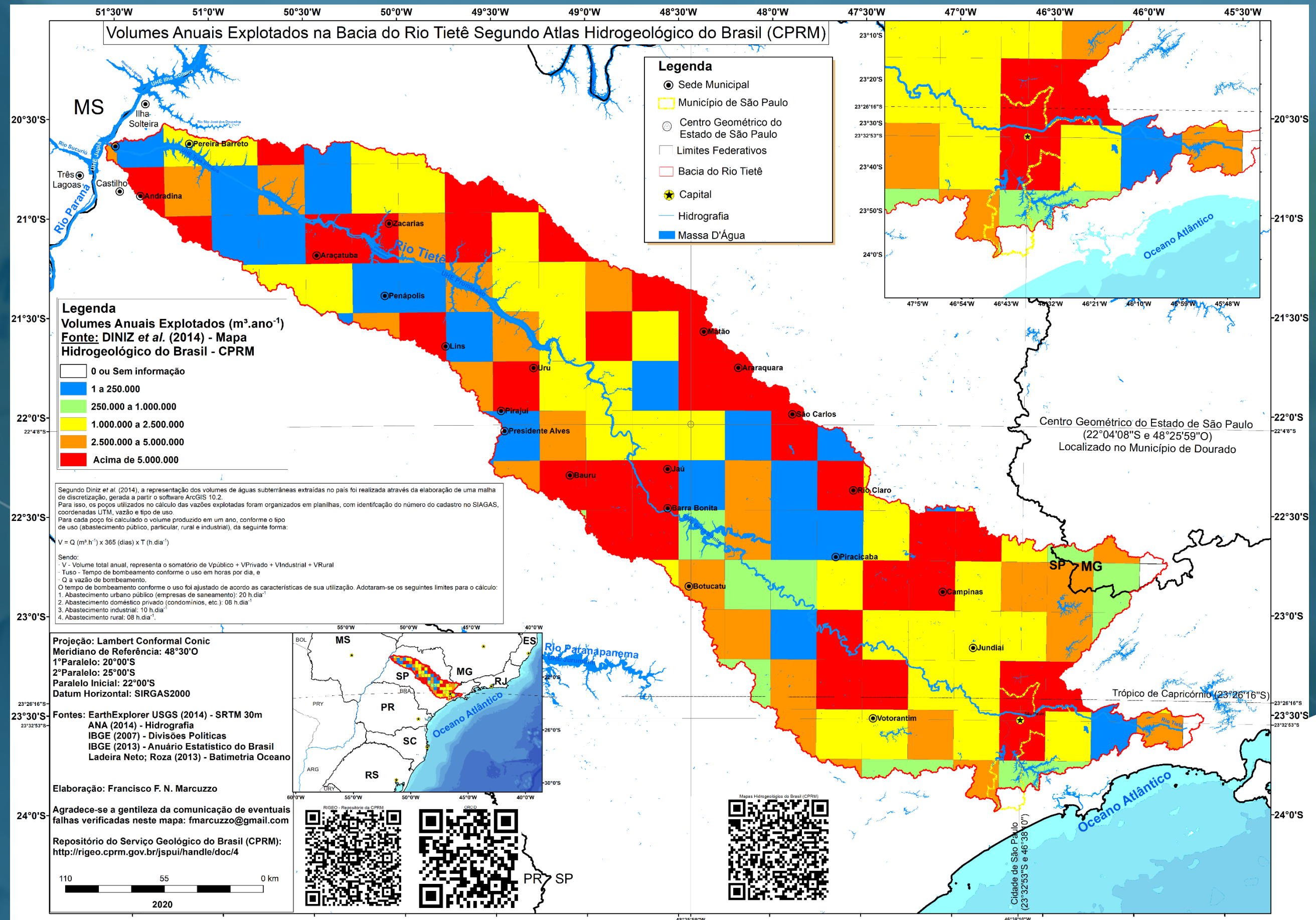
Once you have maps of soils in certain areas, with estimates of their infiltration capacity, you can, from the realization of a water balance and the determination of the respective surplus of available water for underground infiltration, perform qualitative estimates of the recharge of the aquifers. In areas where no more hydrogeological information is available detailed, these data can constitute important tools for estimate local aquifer productivity.





# Explored annual volume map of the Tietê river hydrographic basin (Brazil)

In general, in the territory of the Tietê river basin, the exploited volumes are greater than **5 million cubic meters per year**, in the most populated part.



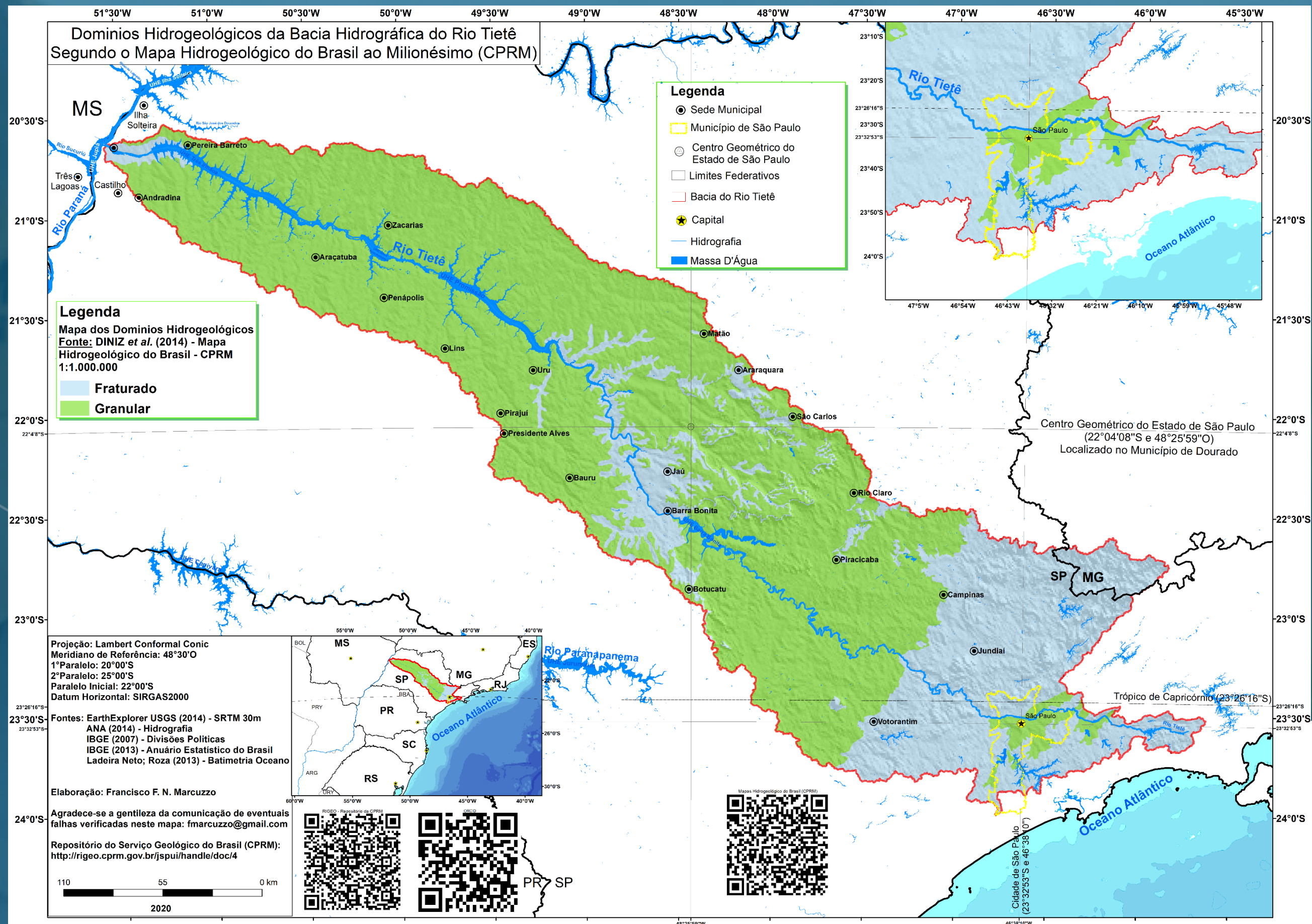


# Hydrolytic map of the Tietê river hydrographic basin (Brazil)

The hydrolytic map of the Tietê basin shows the **granular unit (Gr)** with generally low and moderate productivity and **fractured units (Fr)** with low or low productivity or generally very low productivity.

The hydrolithology of the basin was separated by the grouping of geological units that store and transmit groundwater in a similar way, being the porous or granular, karst and fractured units.

The hydrolytic map of the basin shows the **granular unit (Gr)** with an area greater than 80% of the entire basin, while the **fractured unit (Fr)** shows an area less than 20%.

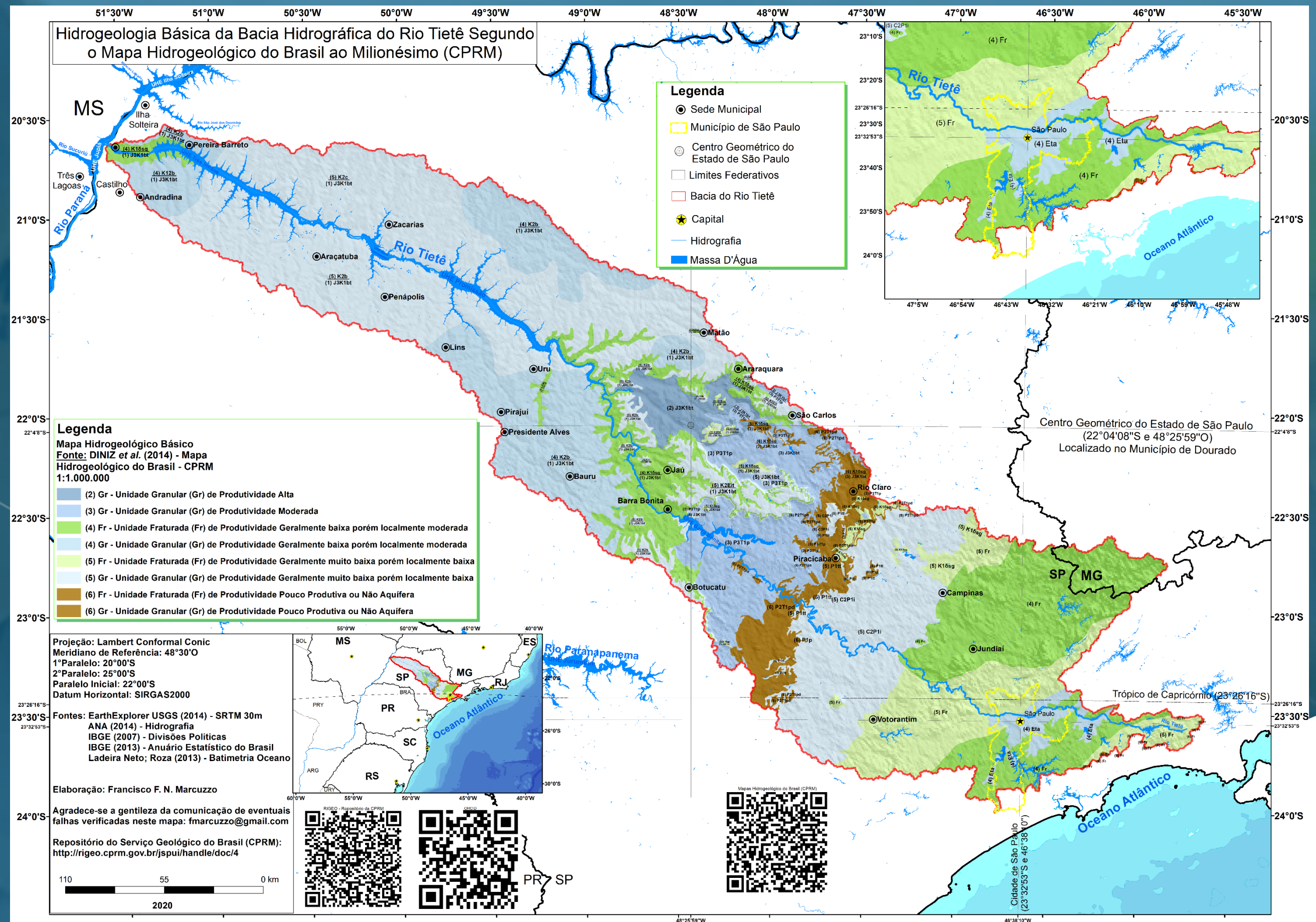




# Hydrogeological map of the Tietê river hydrographic basin (Brazil)

The hydrogeological map is represented by a set of hydro-stratigraphic units, obtained from each existing aquifer, explaining their spatial variations in productivity and generating hydrogeological polygons.

According to information from the Hydrogeological Map of Brazil to the Millionth, published by the Geological Survey of Brazil, hydro-stratigraphic units represent geological formations or parts of them, which store and transmit groundwater in a similar way and with productivity of the same order of magnitude, that is, considering aquifers in places where they do not suffer variations in their productivity.





# Find the material on hydrogeology, hydrology and water resources available on the website of the Geological Survey of Brazil:

<https://www.cprm.gov.br/> and <https://rigeo.cprm.gov.br/jspui/>

www.cprm.gov.br

Geologia Recursos Hídricos Geologia Ambiental Hidrologia

Alerta de Eventos Críticos Últimas Notícias e Produtos Notícias

Mapas e Projetos

AGOSTO DE 2007

## Hidrologia Estatística

MAURO MAGRETTINI  
EBER JOSÉ DE ANDRADE PINTO

www.cprm.gov.br

## REGIONALIZAÇÃO DE VAZÕES NAS BACIAS HIDROGRÁFICAS BRASILEIRAS

ESTUDO DA VAZÃO DE 95% DE PERMANÊNCIA DA SUB-BACIA 50

Bacias dos rios Itapicuru, Vaza Barris, Real, Inhambupe, Pajuba, Sergipe, Japaratinga, Sobuá e Jacupe.

PROJETO DISPONIBILIDADE HÍDRICA DO BRASIL  
LEVANTAMENTO DA GEODIVERSIDADE

2013

## MAPA HIDROGEOLOGICO DO BRASIL

ESCALA 1:8.000.000

BRASIL

MAPA HIDROGEOLOGICO DO BRASIL

ESCALA 1:8.000.000

BRASIL

### MAPA HIDROGEOLOGICO DO ESTADO DE SANTA CATARINA

SECRETARIA DE GESTÃO DE RECURSOS HÍDRICOS

### RECURSOS HÍDRICOS SUBTERRÂNEOS

LEVANTAMENTO DE RECURSOS HÍDRICOS SUBTERRÂNEOS

#### REDE INTEGRADA DE MONITORAMENTO DAS ÁGUAS SUBTERRÂNEAS

Relatório Diagnóstico

### SISTEMA AQUIFERO GUARANI NOS ESTADOS DE SÃO PAULO, MATO GROSSO DO SUL E PARANÁ

BACIA SEDIMENTAR DO PARANÁ

Volume 15

RIMAS

2012

### ACOMPANHAMENTO DA ESTIAGEM NA REGIÃO SUDESTE DO BRASIL

RELATÓRIO Nº 6

Área de Atuação da Superintendência Regional da CPRM de São Paulo

2016

SAGAS

Sistema de Informações de Águas Subterrâneas

### LEVANTAMENTO DA GEODIVERSIDADE

PROJETO ATLAS PLUVIOMÉTRICO DO BRASIL

ISOJETAS ANUAIS MÉDIAS PERÍODO 1977 A 2006

## HIDROGEOLOGIA

Conceitos e Aplicações

2011

CPRM

### AÇÕES EMERGENCIAIS DE COMBATE AOS EFEITOS DAS SECAS

Execução de Testes de Bombeamento em Poços Tubulares

Manual Prático de Orientação

Programa de Perfurção, Instalação, Recuperação de Poços e Aplicação de Técnicas de Dessalinização de Água Subterrânea

CPRM

### AÇÕES EMERGENCIAIS DE COMBATE AOS EFEITOS DAS SECAS

#### NOÇÕES BÁSICAS SOBRE POÇOS TUBULARES

CARTILHA INFORMATIVA

CPRM

### MONITORAMENTO ESPECIAL DA BACIA DO RIO DOCE

RELATÓRIO IV

MAIO/16

CPRM

### BACIAS MONITORADAS

Os Sistemas de Alertas Hidrológicos que emitem boletins com previsões hidrológicas são:

1. Bacia do Rio Amazonas: em operação desde 1989
2. Bacia do Rio Paraguai (Pantanal): em operação desde 1994
3. Bacia do Rio Doce: em operação desde 1996
4. Bacia do Rio Cai: em operação desde 2010
5. Bacia do Rio Muriá: em operação desde 2014
6. Bacia do Rio Acre: em operação desde 2014
7. Bacia do Rio Madeira: em operação desde 2014
8. Bacia do Rio Parnaíba: em operação desde 2015
9. Bacia do Rio Taquari: em operação desde 2015
10. Bacia do Rio Branco: em operação desde 2015
11. Bacia do Rio Xingu: operação a partir de janeiro de 2017

Contra-se em fase de avaliação técnica a implantação de 3 novos sistemas, das bacias dos rios Mundaú, Uruguai e das Velhas, e até o final de 2018 a CPRM terá 14 sistemas em operação.

Thank you for your attention!

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<https://rigeo.cprm.gov.br/jspui/>



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