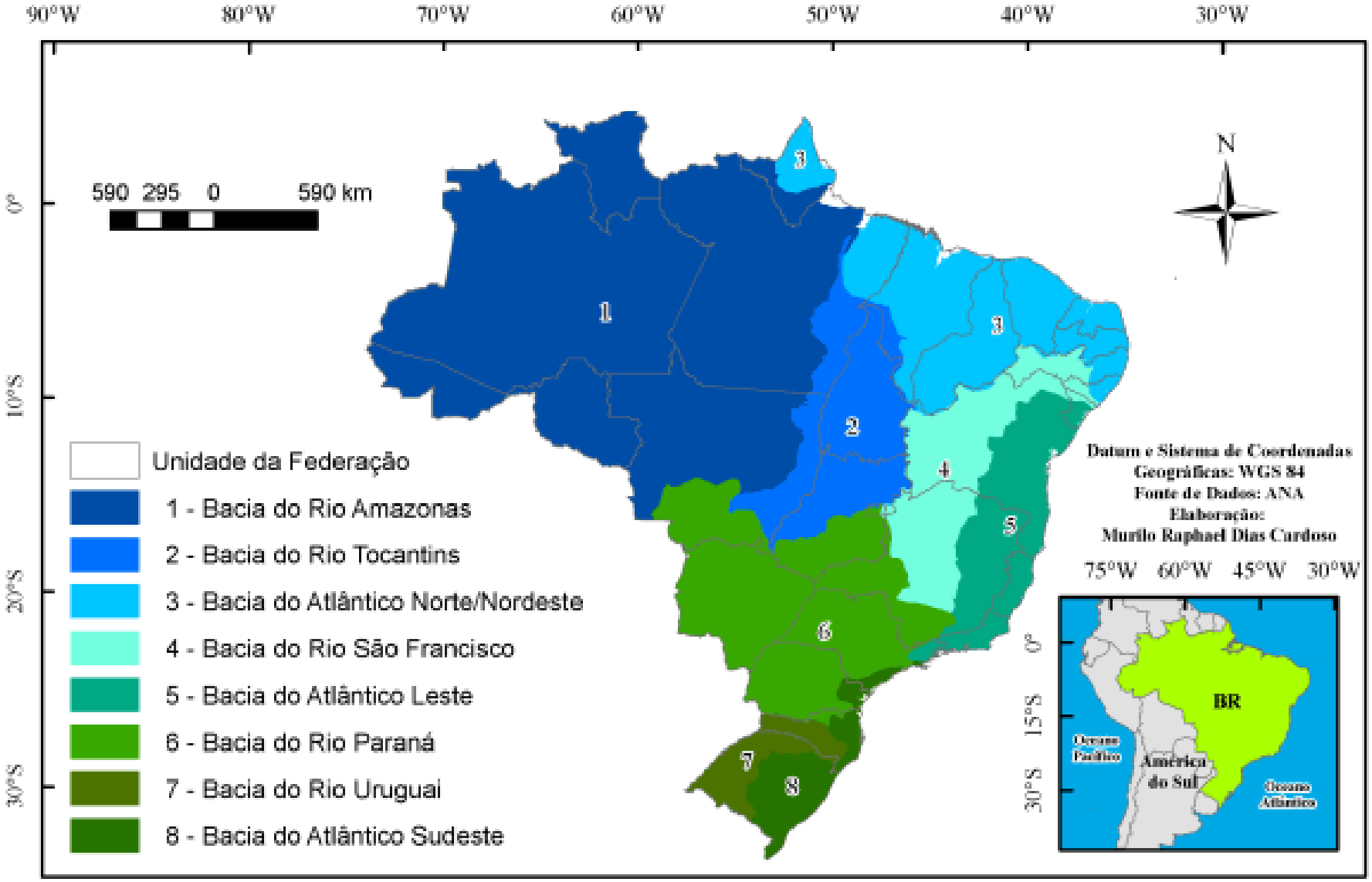
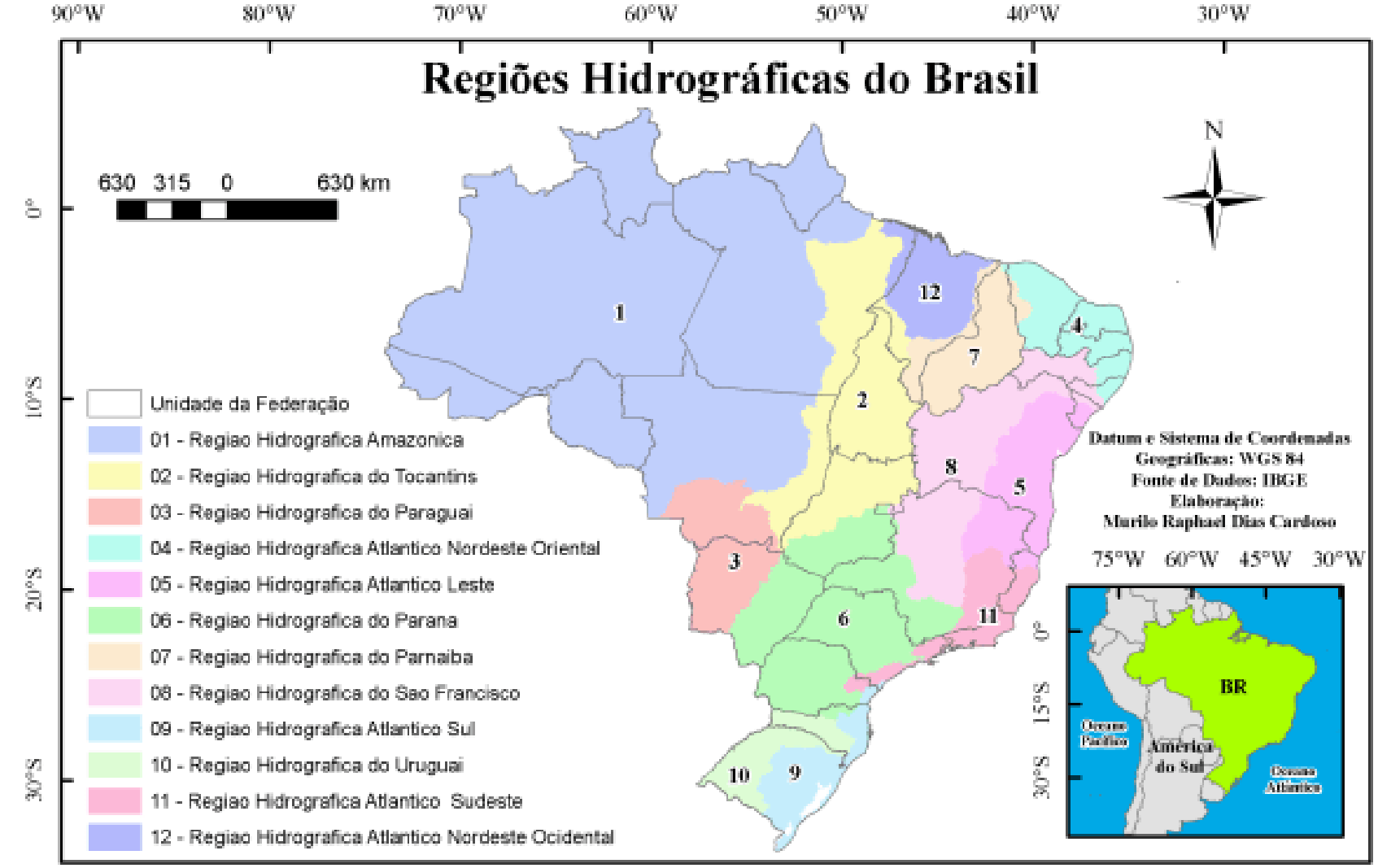
Brazil
&
The Water Situation

Brazil Water Basins



Source: ANA (Agência Na de Águas).

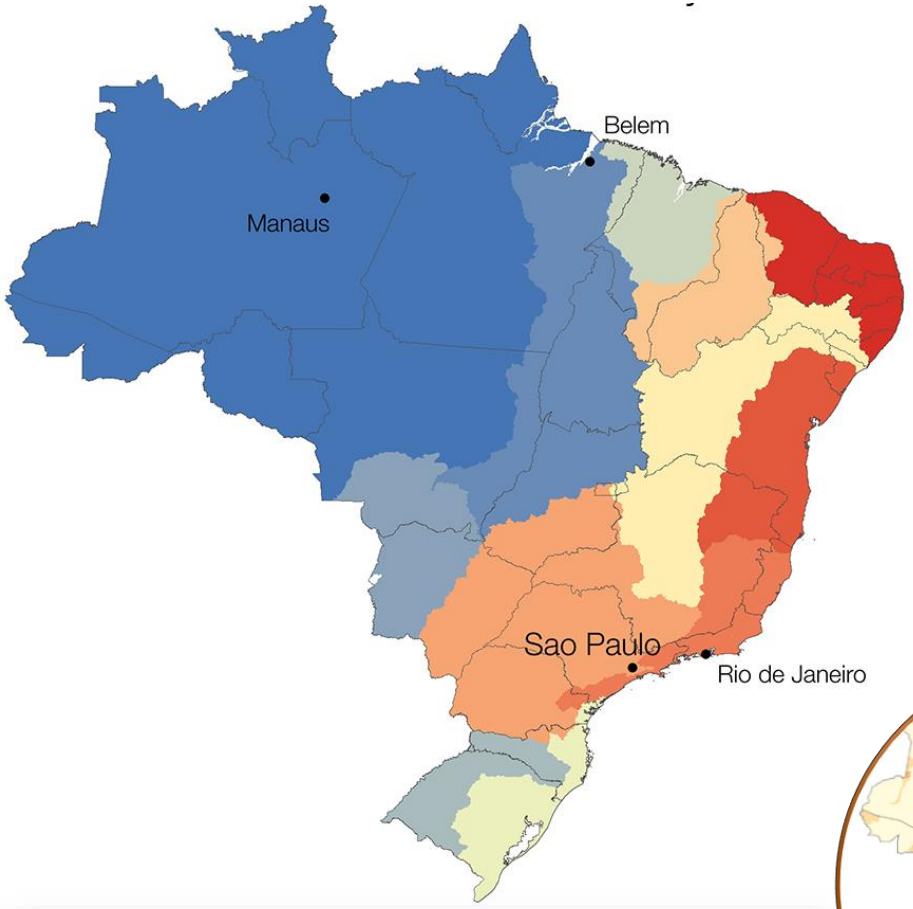
Brazil Water Basin Districts

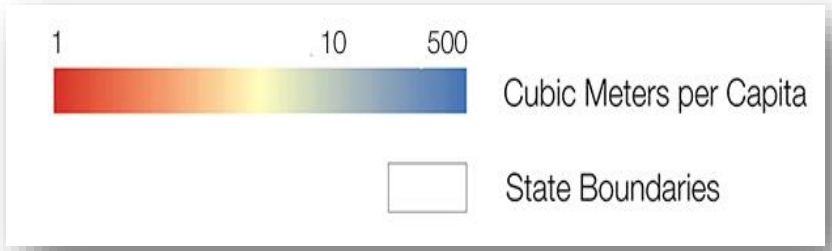


The river basin districts are established by the National Water Resources Council based on the presence of a watershed.

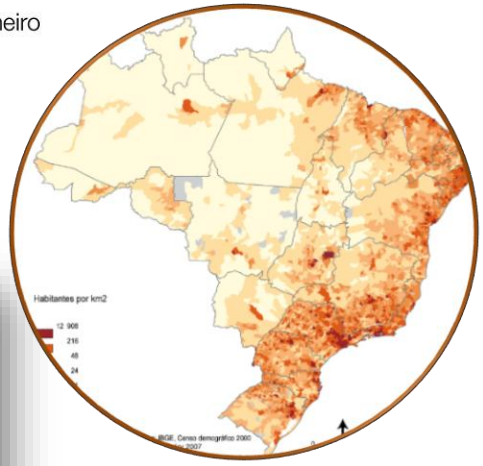
Source: IBGE.

Annual Water Volume of Brazil by Basin





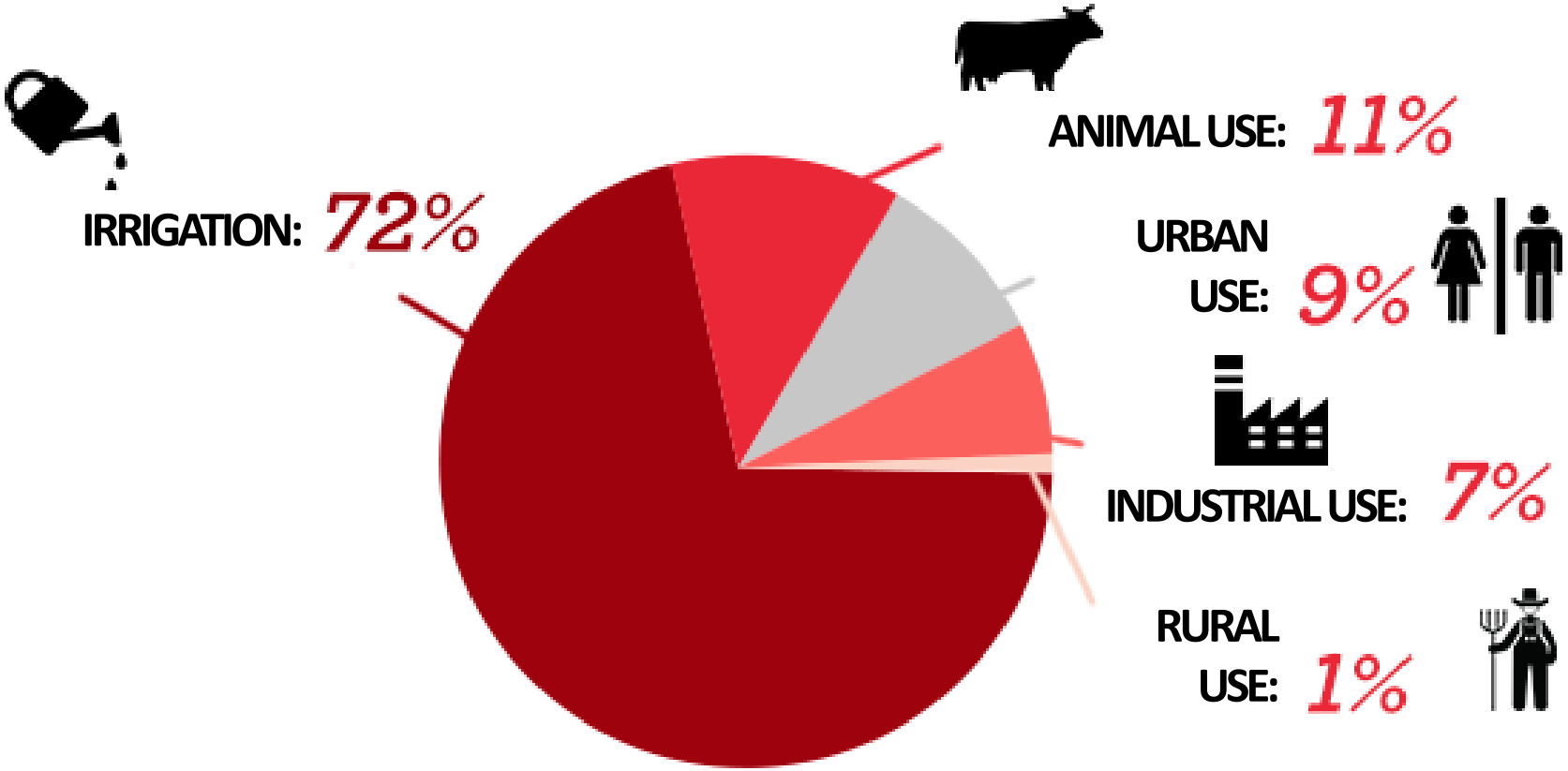
Population Density



Brazil has one of the most abundant freshwater resources in the world. However, many of its population centers are located in regions where there is less water availability.

Sources: Brazilian National Water Agency (ANA), Instituto Brasileiro de Geografia e Estatistica, United Nations FAO Aquastat

Use of Water in Brazil



According to FAO (Food and Agriculture Organization), the water waste in irrigation reaches 3.2 trillion liters (45%) mostly due to lack of farmer control in the amount used on crops and products processing.

Source: ANA (Agência Nacional de Águas), 2013 & FAO (Food and Agriculture Organization).

Brazil

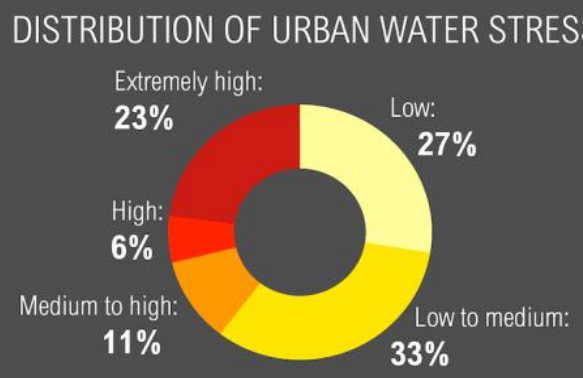
Drought & Impacts

BRAZIL DROUGHT
POWER PRICE UP 60%

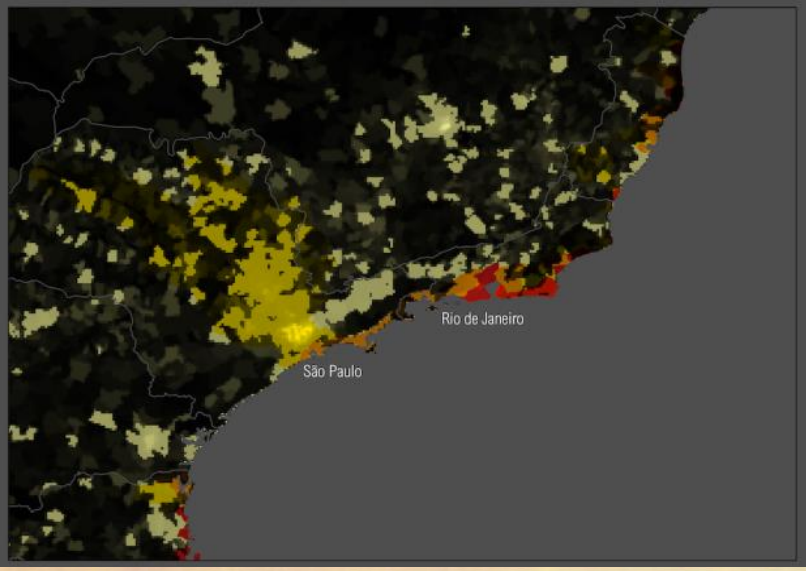
Brazil's drought brings water supply to near zero capacity at many hydroelectric facilities most located in Southeast region.

Source: Rio Times
Photo: flickr: queulat00

Brazilian Population Density and Baseline Water Stress



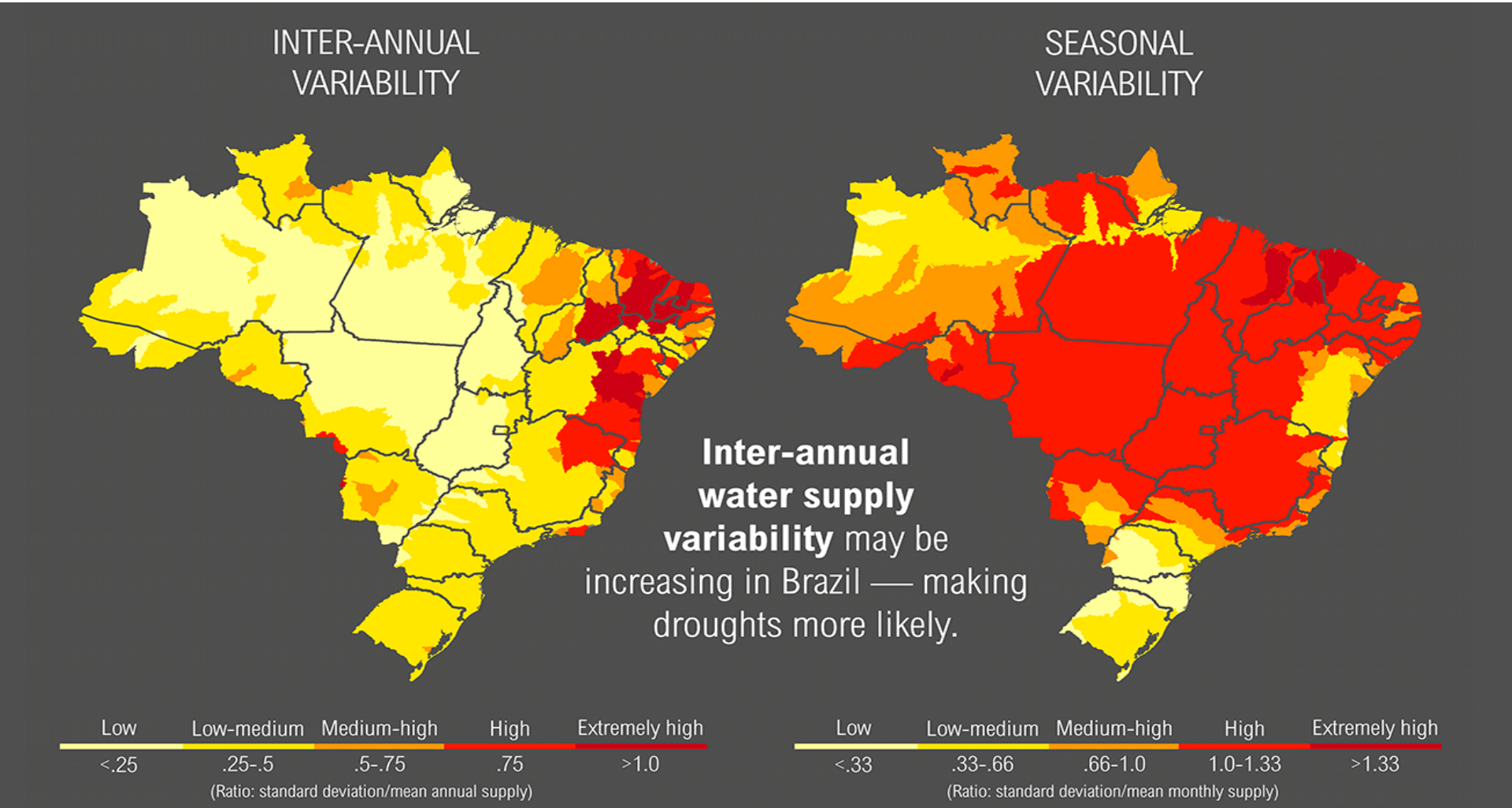
40% OF BRAZIL'S URBAN POPULATION
FACES **MEDIUM TO EXTREMELY HIGH WATER STRESS**



Source: World Resources Institute, 2013

Sources: Water Stress, WRI Aqueduct 2013; Population, WRI Aqueduct 2013
Notes: Higher color saturation indicates higher population.
Urban is defined as living in a city of 1 million or more.

Water Supply Variability in Brazil

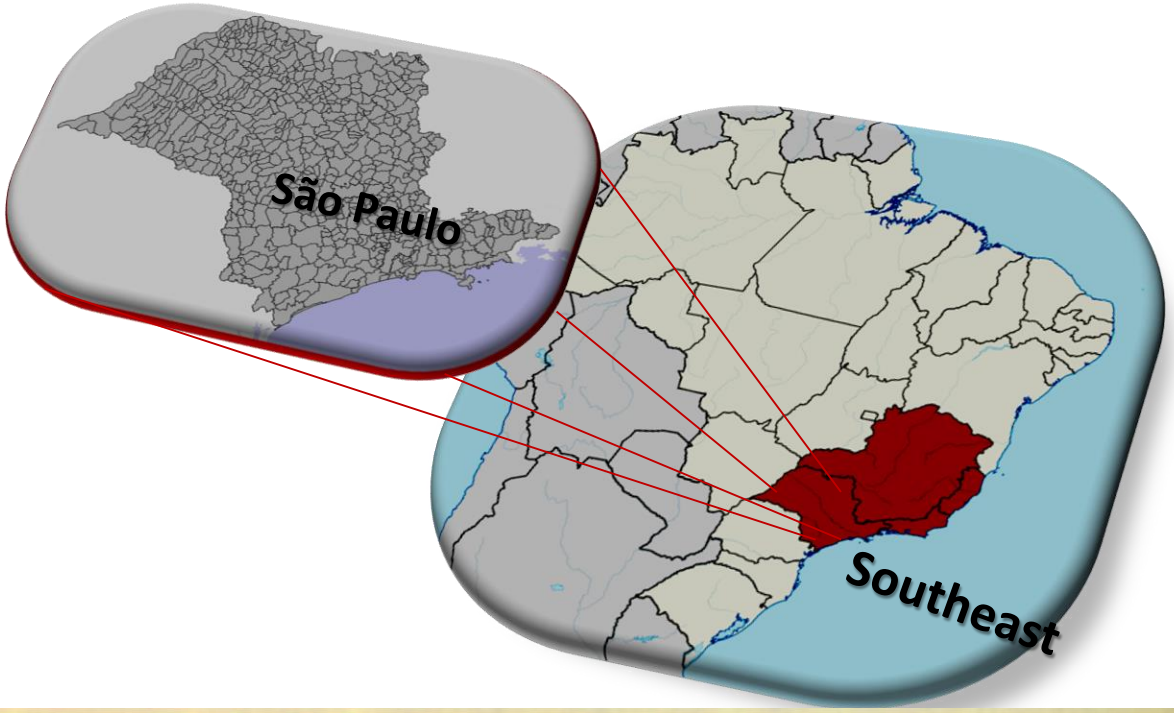


NOTE: Inter-annual variability measures water supply variation from year-to-year.

NOTE: Seasonal variability measures water supply variation among months of the year.

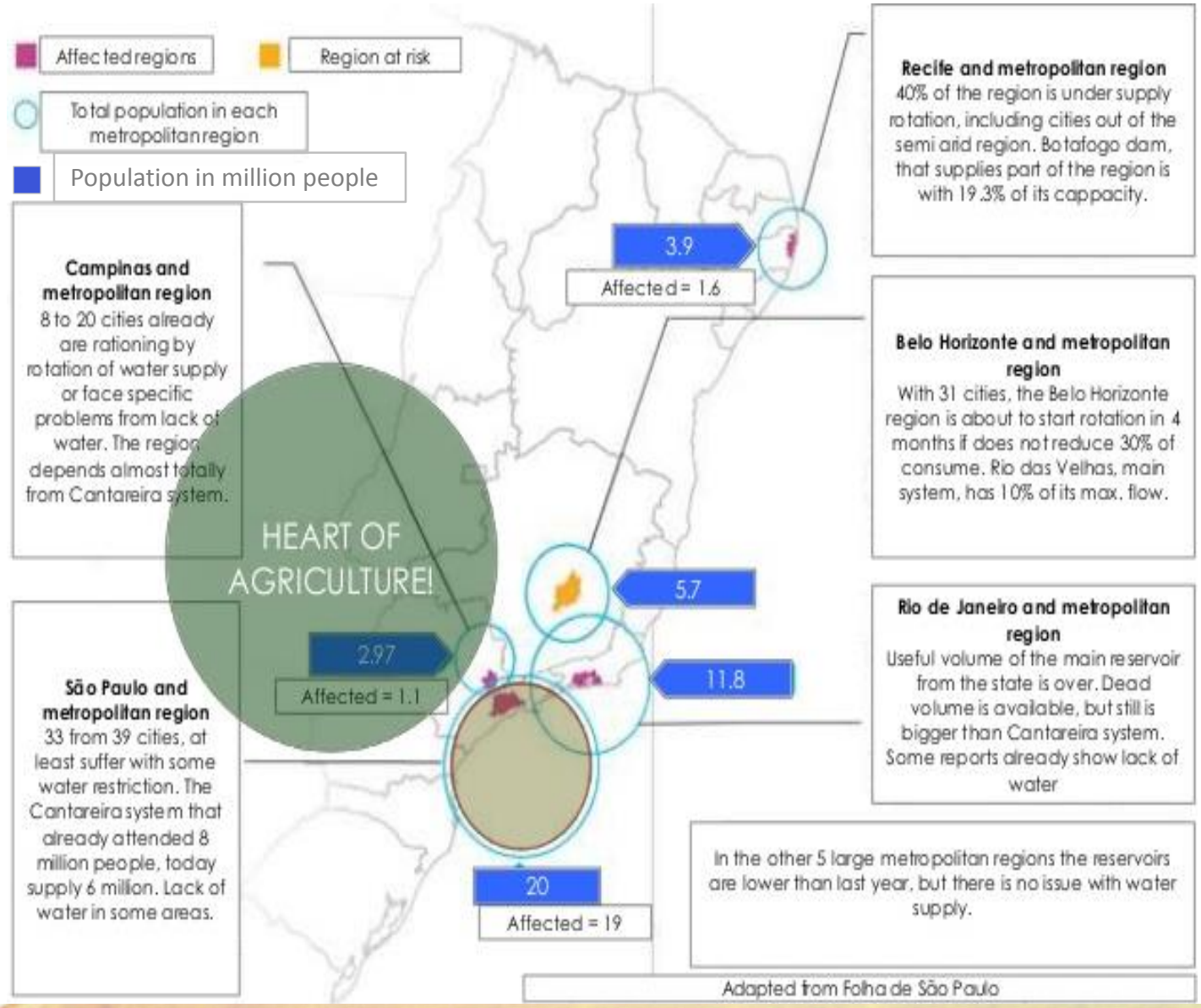
Source: Aqueduct - World Resources Institute.

Southeast & São Paulo
Water Crisis




CANTAREIRA – 50% OF SÃO PAULO'S WATER
Pumping Station = EE Sta. Inês
Paiva Castro
Jacareí /Jaguari
Túnel 5
Cachoeira
Túnel 7
Túnel 6
Atibainha
ETA = Water Treatment Facility
Guaraú
SISTEMA EQUIVALENTE
São Paulo

Mapping the Drought

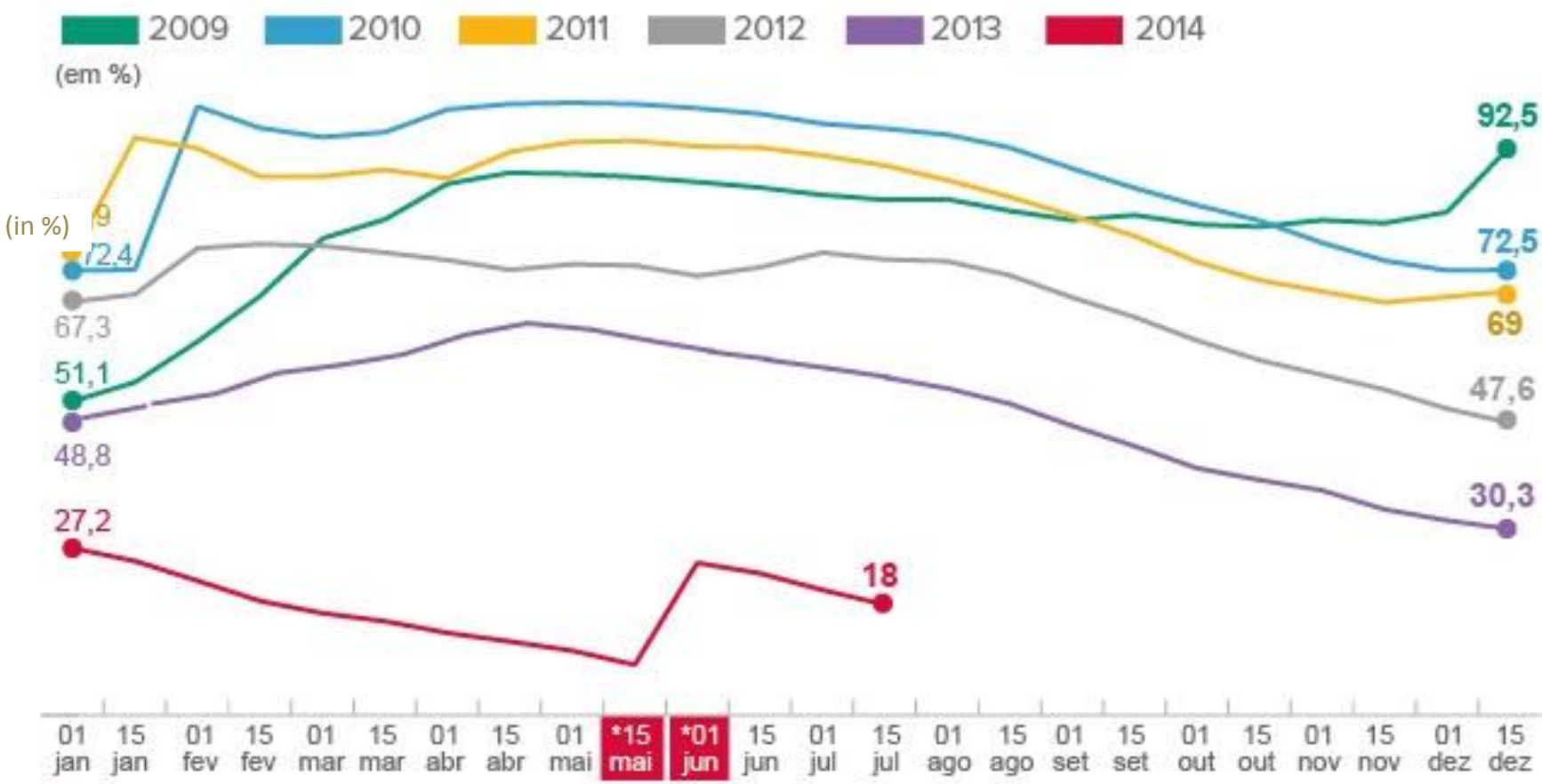


São Paulo:
Like California, the southeastern Brazilian state is in the midst of an ongoing drought — it is the worst drought in eight decades — leading to a severe water crisis.

Source: Folha de São Paulo.

Situation of the Cantareira System

Graphic shows variation of water volume in the reservoir along the year, since 2009



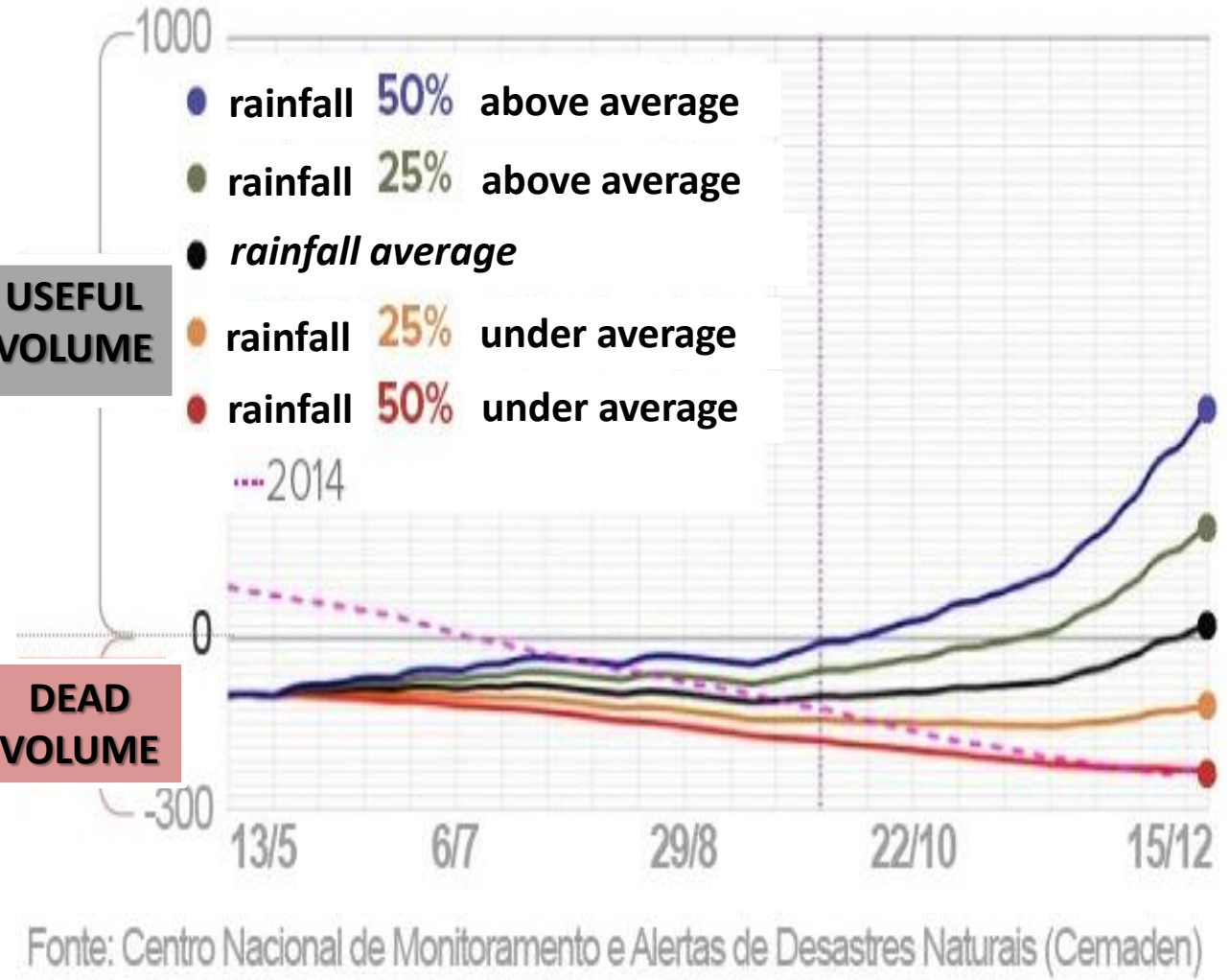
*In May 16, the water volume of the reservoir jumped from 8.2% to 26.7% with the inclusion of the dead volume

G1.com.br

Infographic actualized in 07/15/2014

Source: G1, 2014

Rainfall Projection for Cantareira – Dec 2015



- 2014 was the driest year in history for the Cantareira Reservoir.
- São Paulo's urban population increased 400% from 4.8 million in 1960s to 20 million in 2015.
- In May 2014, for the first time, São Paulo had to use the dead volume of Cantareira.

Source: Centro Nacional de Monitoramento e Alertas de Desastres Naturais (Cemaden) & G1, 2015.

Drought Shrinking Jaguari Reservoir

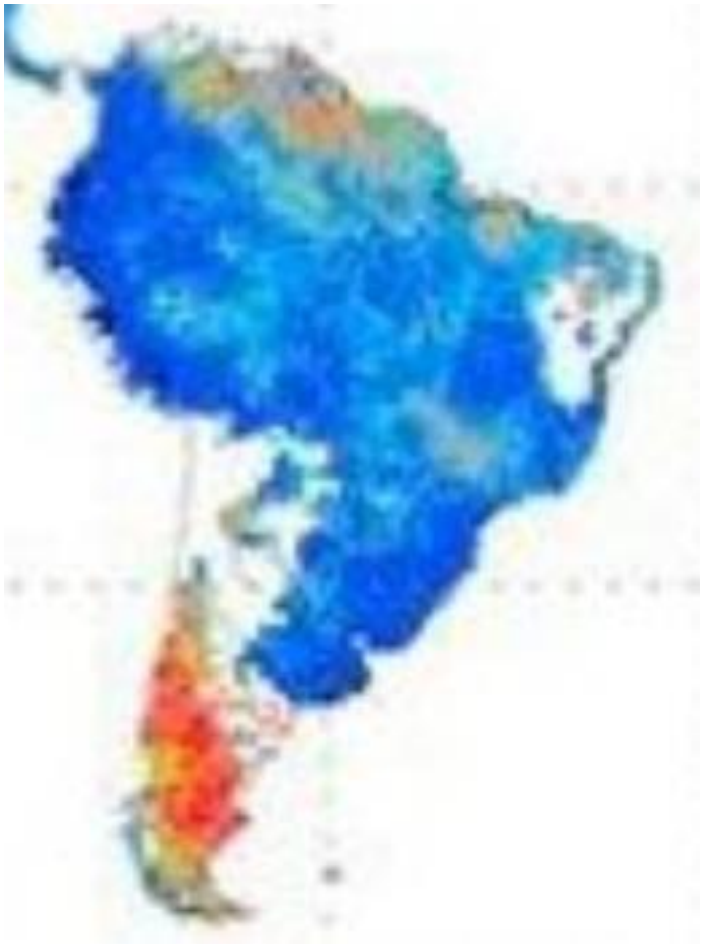
Jaguari is one of five reservoirs in the Cantareira System, which supplies water to roughly **half** of the people in the São Paulo metropolitan area.

- Southeastern Brazil is suffering through one of the worst droughts in decades.
- Rainfall totals for the year are at 12 to 16 inches below normal.
- Reservoirs have dwindled to 3 to 5 percent of storage capacity.

Source: Earth Observatory

Floods & Impacts

Major Floods - Century Projection



- The darker blue represents a higher severity in flood potential, while the red represents lower threat levels.
- The frequency of major floods in Brazil could increase four times during the next century.
- In almost all of Brazil, the destructive rains will be more frequent. Rainfall occurring once a century will occur every 50 to 75 years (the lighter blue areas of Brazil) and every 25 to 50 years (the darker blue areas of Brazil).

Source: Nature Climate Change, Yukiko Hirabayashi & Época Magazine.

Short Term Flood Protection – 10 years

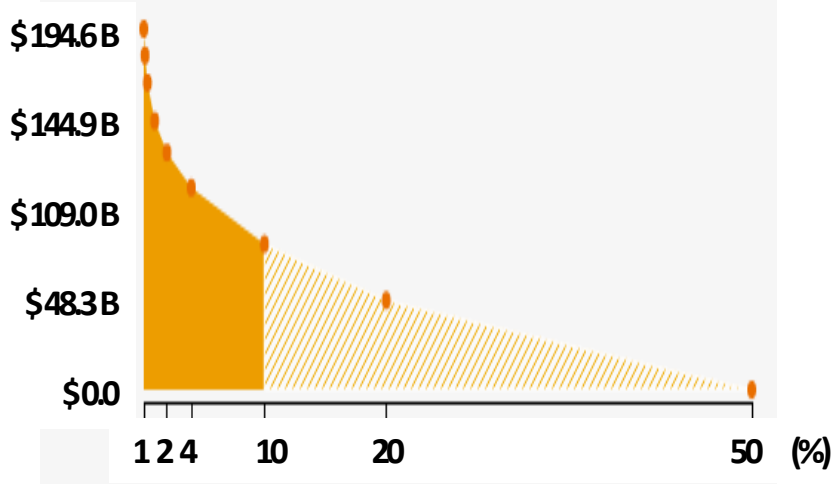
WORLD RESOURCES INSTITUTE

AQUEDUCT Global Flood Analyzer

10 year protection

Flood Risk in Brazil

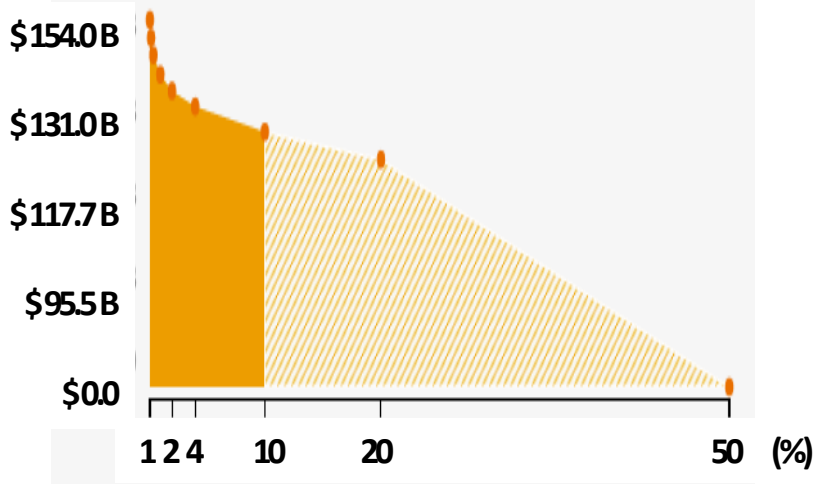
Urban Damage



- Annual Expected Urban Damage: $11.0 B
- Annual Avoided Urban Damage: $13.6 B

Net Savings: $ 2.6 B

Affected GDP



- Annual Expected Urban Damage: $11.8 B
- Annual Avoided Urban Damage: $24.4 B

Net Savings: $ 12.6 B

Long Term Flood Protection – 50 years

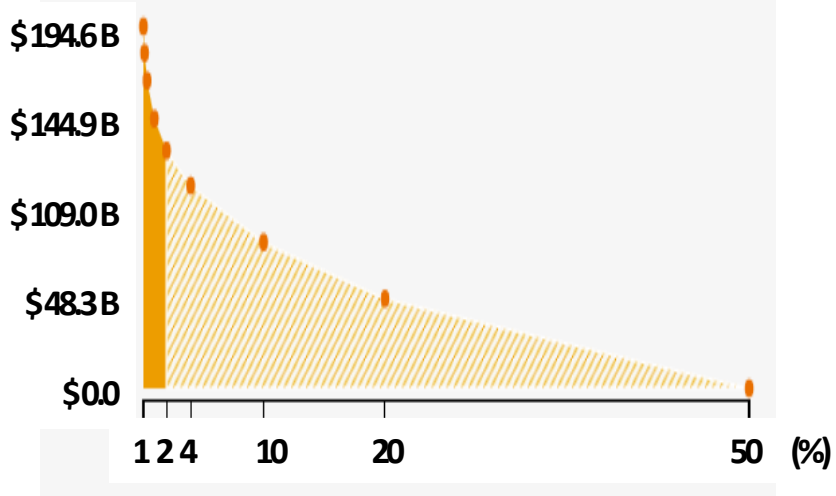
WORLD RESOURCES INSTITUTE

AQUEDUCT Global Flood Analyzer

50 year protection

Flood Risk in Brazil

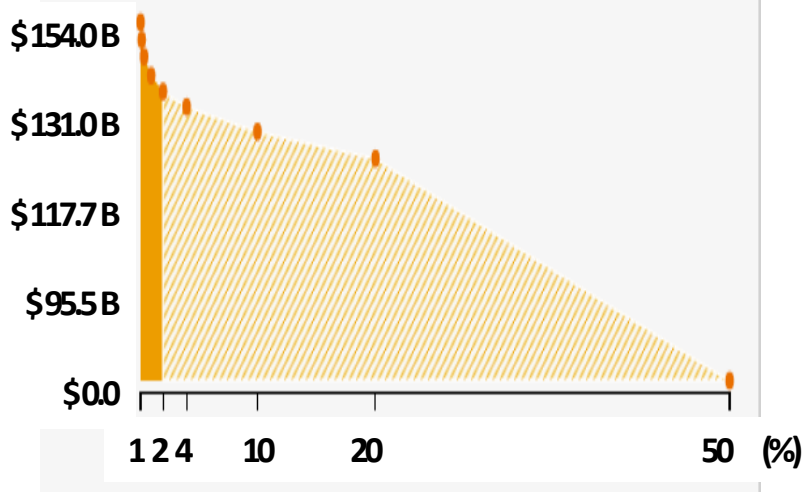
Urban Damage



- Annual Expected Urban Damage: $3.0 B
- Annual Avoided Urban Damage: $21.6 B

Net Savings: $ 18.6 B

Affected GDP

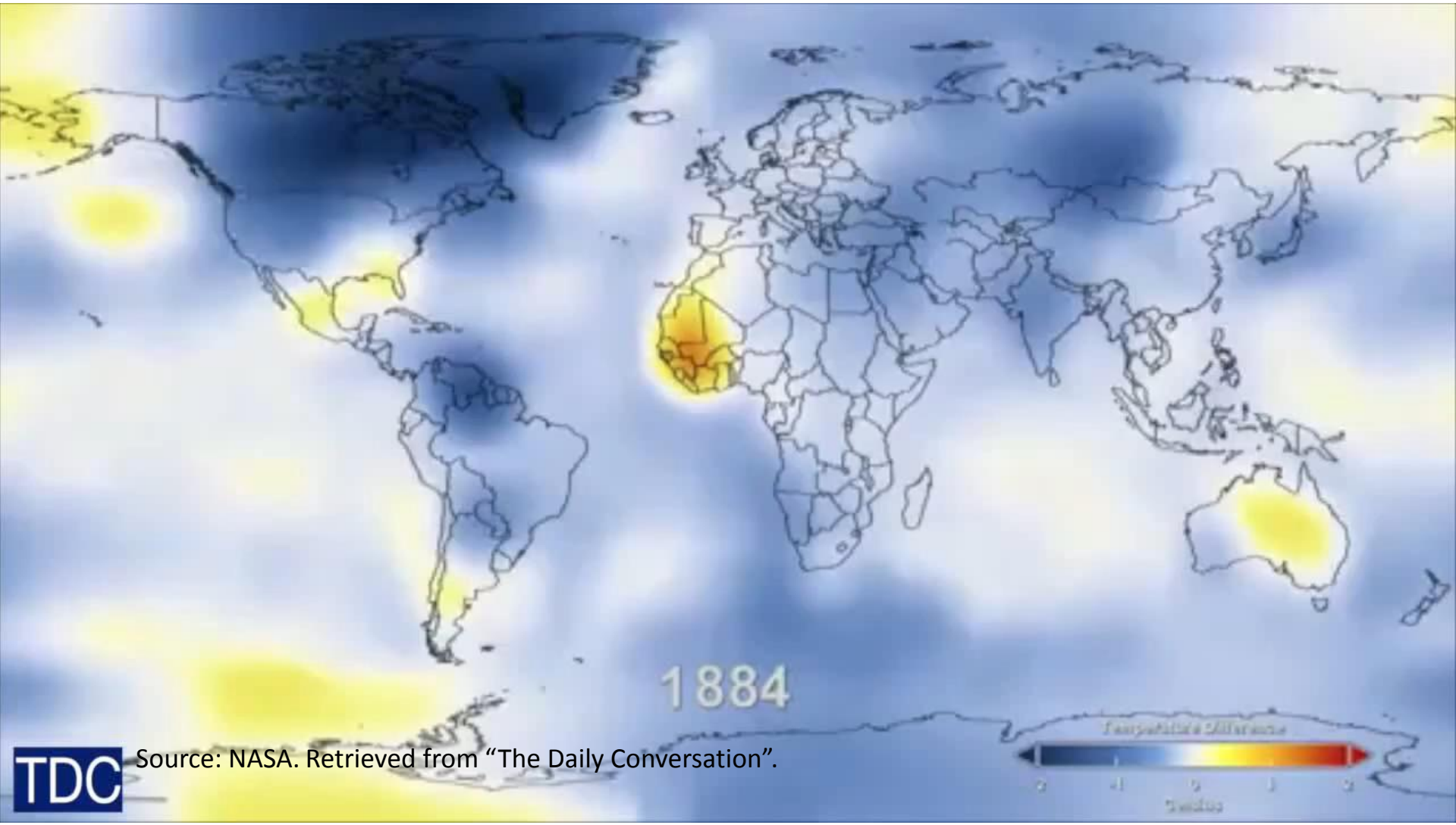


- Annual Expected Urban Damage: $2.7 B
- Annual Avoided Urban Damage: $ 33.6 B

Net Savings: $ 30.9 B

Brazil &
Deforestation

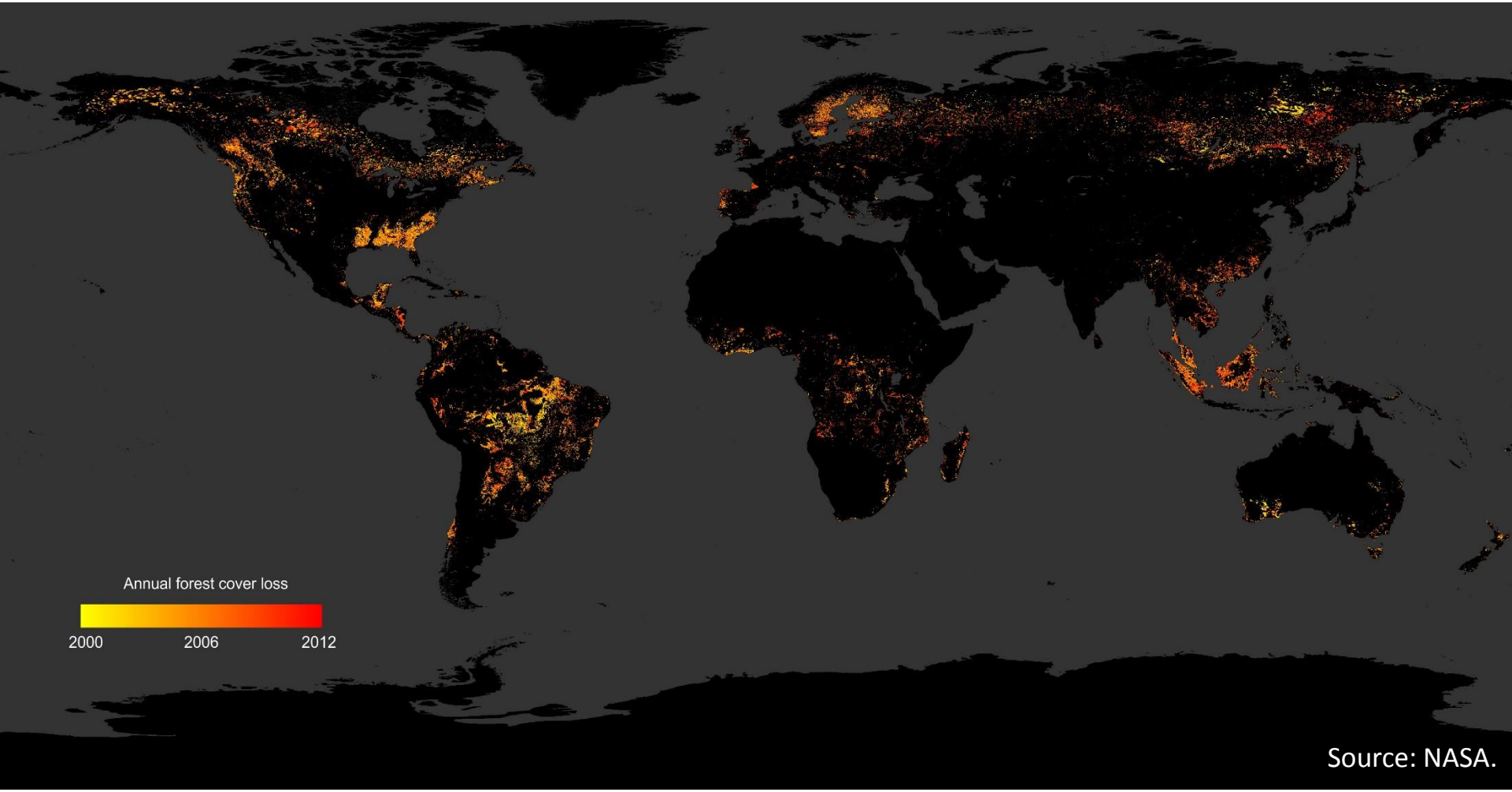
Global Warming 1880 to 2011:



TDC Source: NASA. Retrieved from “The Daily Conversation”.

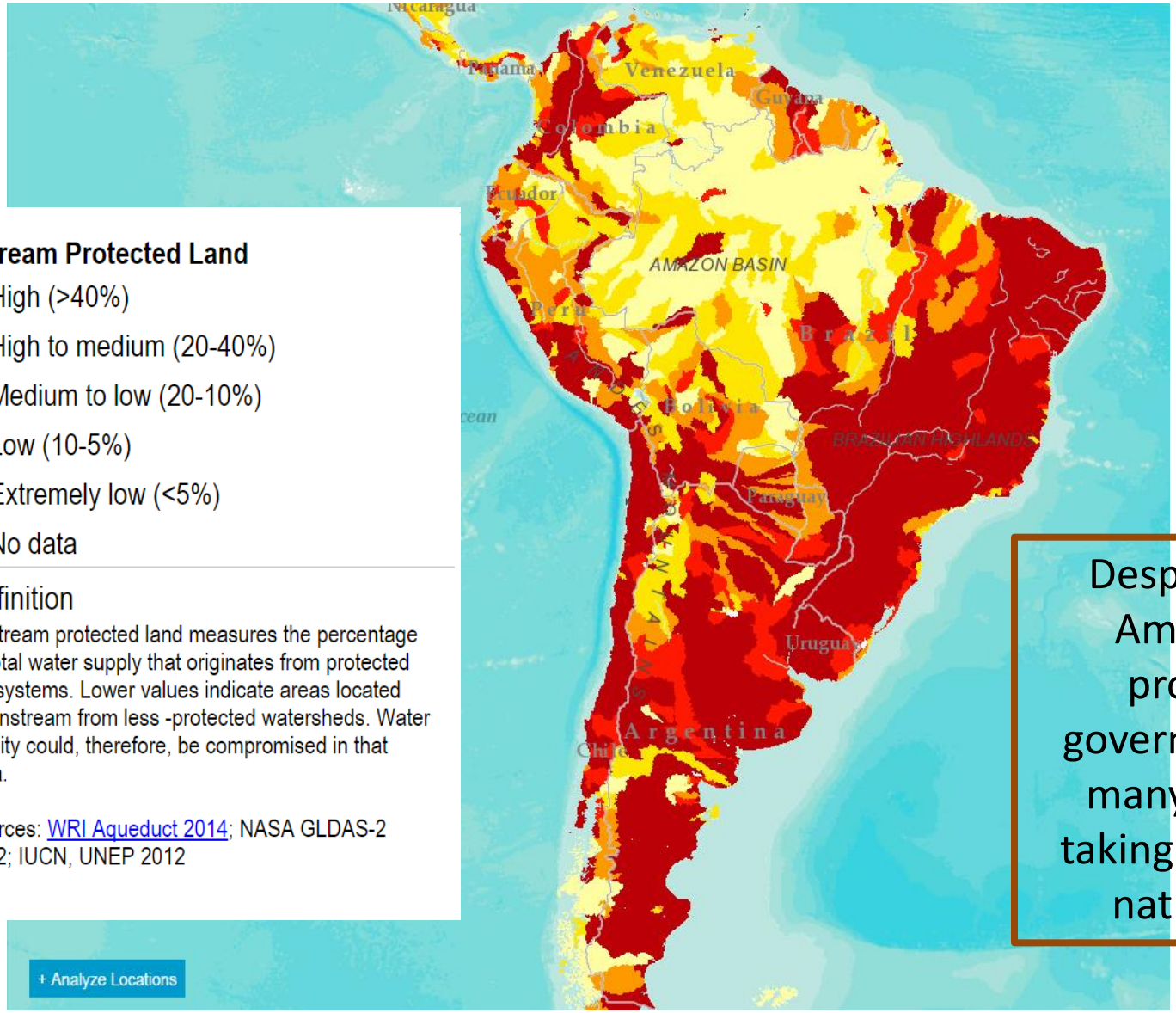
Time-lapse: Devastating Deforestation of the Amazonian Rainforest

Forest Cover



Between 2000 and 2012, researchers created a year-by-year map of forest loss. Brazil decreased forest loss more than any other country. Conversely, Indonesia maintained the highest rate of forest loss in that time period.

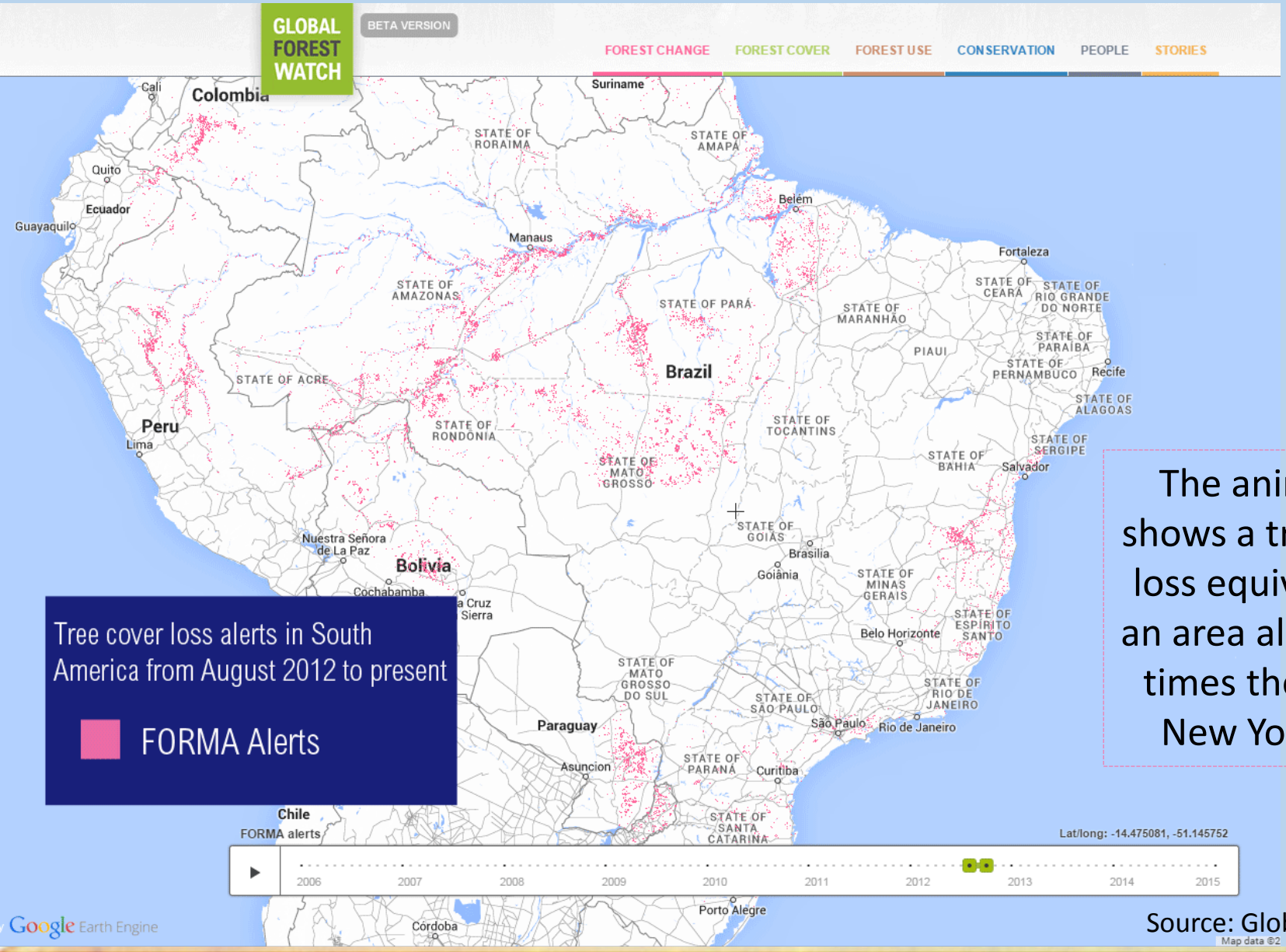
Upstream Protected Land



Despite the fact that Amazon has been protected under government mandates, many people are still taking advantage of the natural resources.

Source: WRI Aqueduct, 2014.

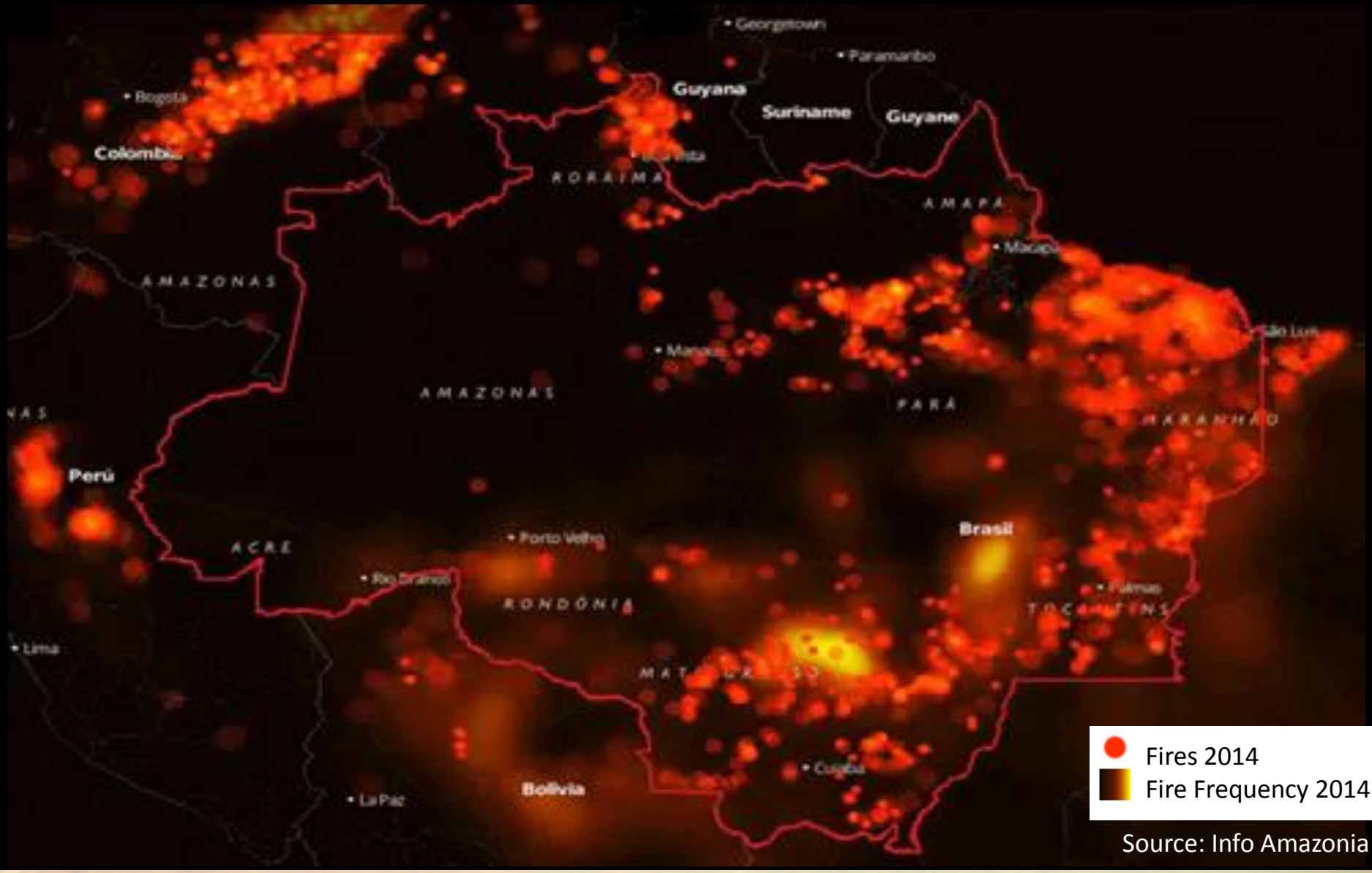
Tree Cover Loss



The animation shows a tree-cover loss equivalent to an area almost five times the size of New York City.

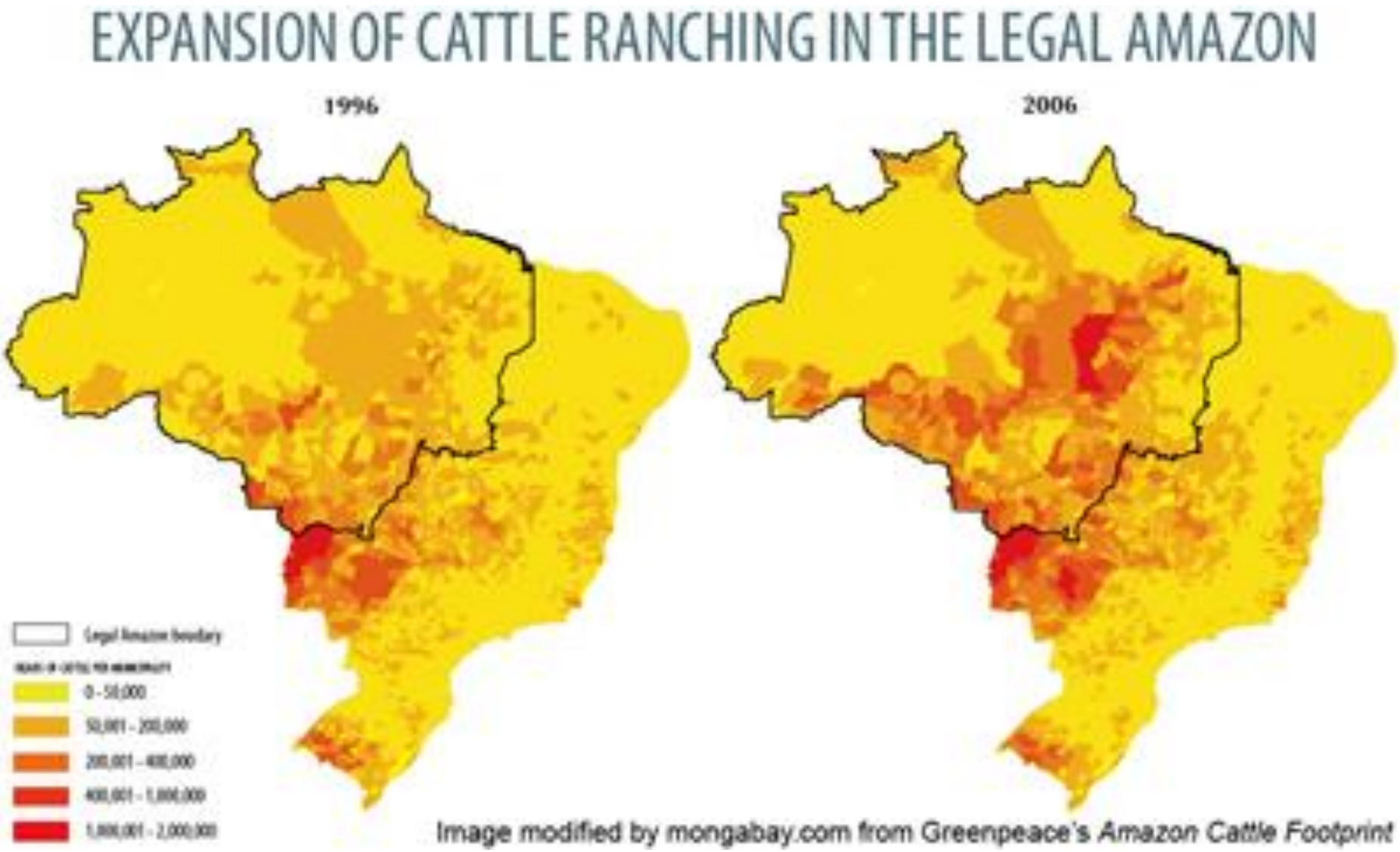
Source: Global Forest Watch

FIRES IN THE AMAZON 2014



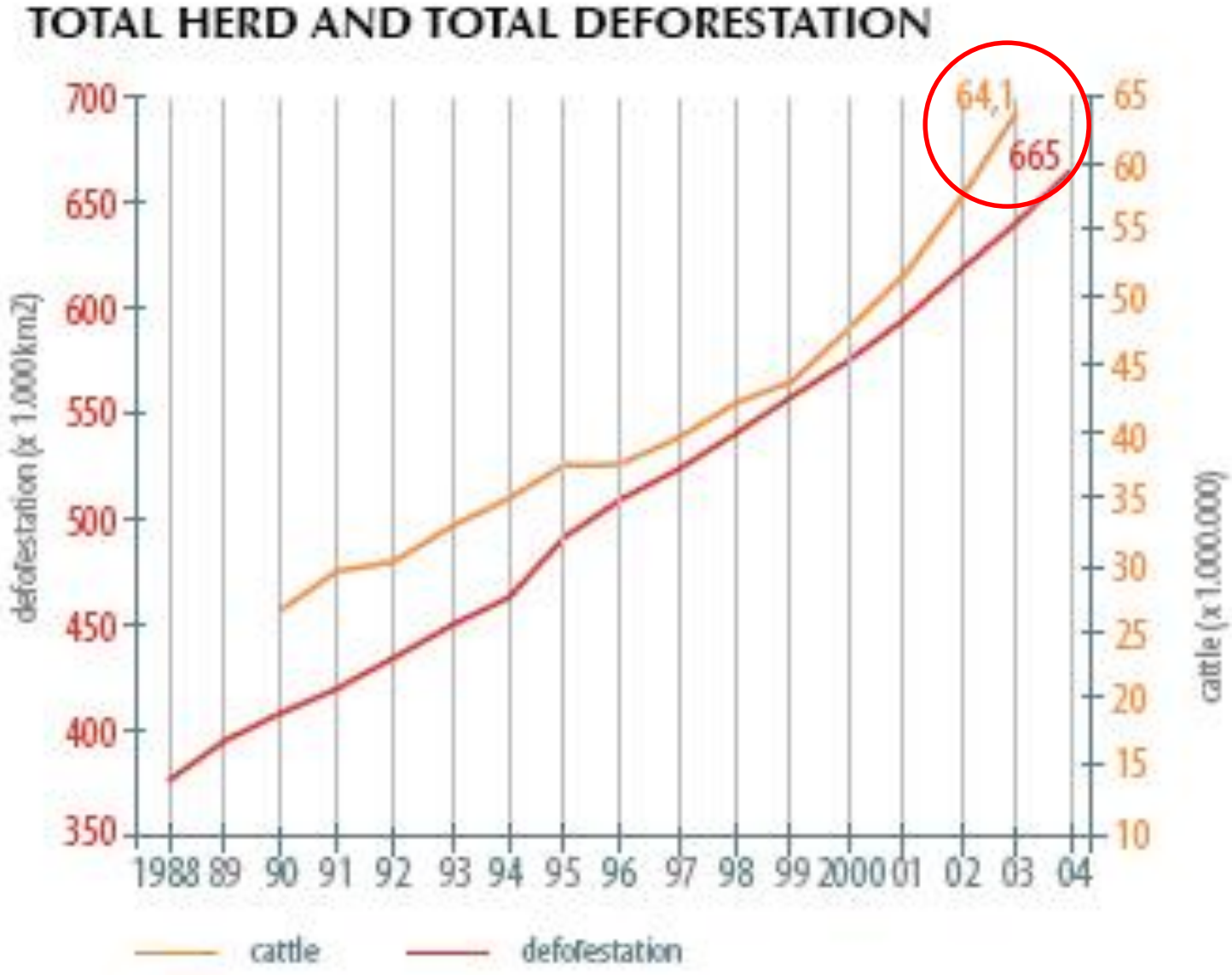
Source: Info Amazonia

Cattle Impacts in Amazon Forest



Source: Greenpeace's Amazon Cattle Footprint

Cattle Impacts in Amazon Forest



Raising cattle requires grazing land – trees are cut down to make room.

Source: Imazon

Curious?

- Next presentation in 2 weeks
- Thursday, August 6 - 6pm to 8pm
- “Energy and Water Solutions do Exist. Best Practices from around the World”

Questions

Presenters

Ana Flavia Brandao
anaflaviabrand@gmail.com

Leticia Carvalho
la7x9@mst.edu

Research Team

Ana Brandão
Arnaud Vedy
Gabriela Simões
Guilherme Barbosa

Leticia Carvalho
Pedro Matos
Renan Micha

Production

Gabriela Simões

Guilherme Barbosa

Michael Russell

Paul Michael

Pedro Matos

Renan Micha