Ameaças e Pressões na Amazônia Brasileira e Riscos nos Ecossistemas Aquáticos

Crédito: Sandro Kakabadze/MapBiomas

Carlos Souza Jr., Ph.D.
souzajr@Imazon.org.br
Pesquisador Associado, Imazon

Bianca Nunes
Júlia Ribeiro
Luis Oliveira
Dalton Cardoso
Bruno Ferreira
Stefany Pinheiro
Jailson Souza
Larissa Amorim
Raíssa Ferreira
Alexandra Alvez
Ives Brandão
Camila Damasceno

AMEAÇA & PRESSÃO

MAPBIOMAS

MAPBIOMAS ÁGUA

previsia

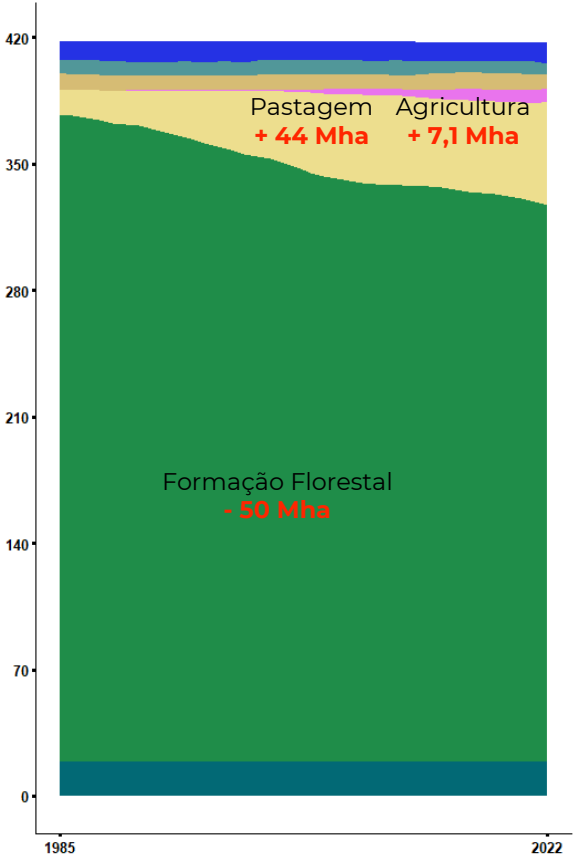
Manaus, 21 de Maio de, 2024

Apresentação

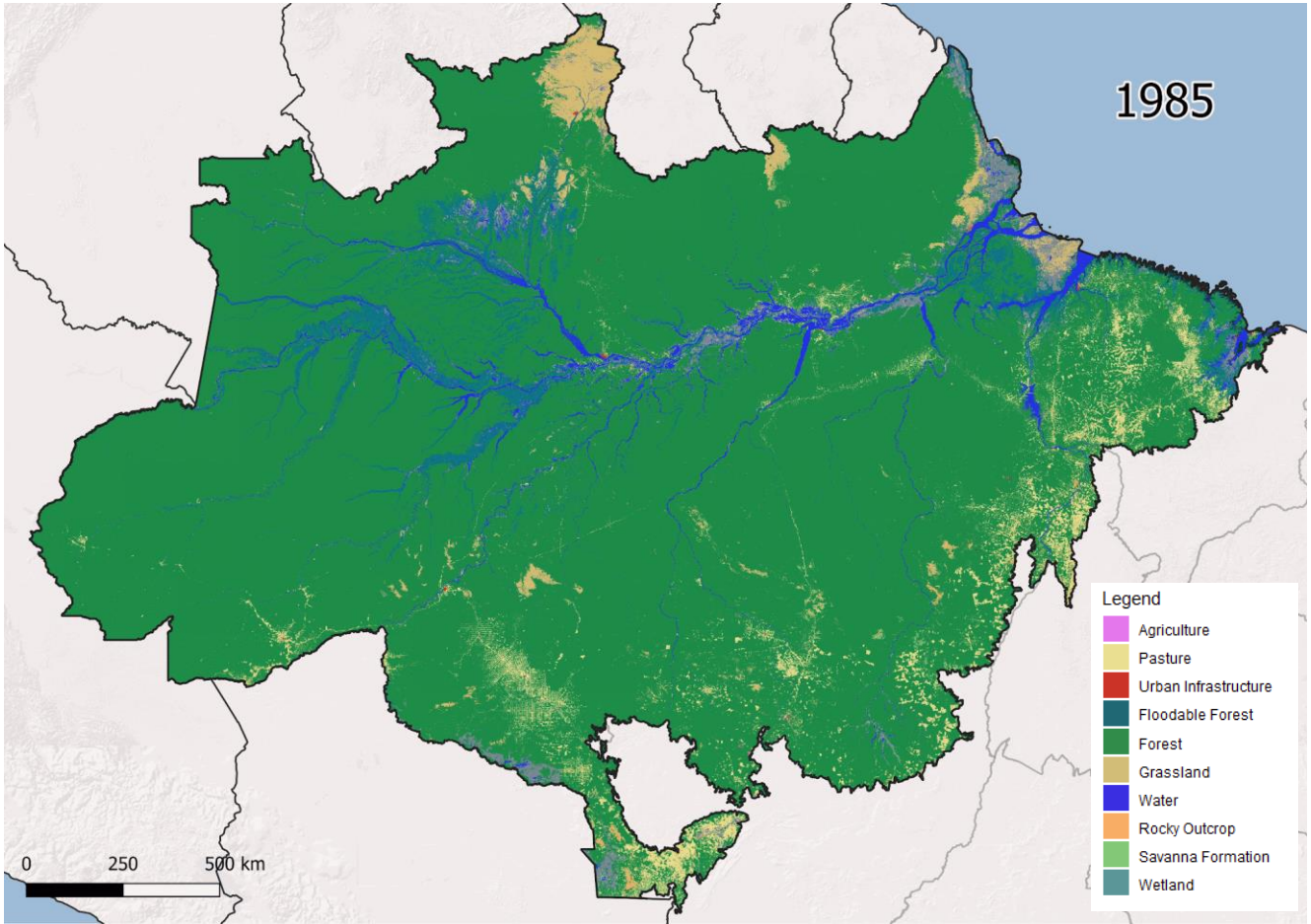
1. *Dinâmica da Cobertura e Uso da Terra do Bioma Amazônia.*
2. *Principais mudanças na cobertura da terra.*
3. *Mudanças nos ecossistemas aquáticos na Amazônia.*
4. *A seca da Amazônia de 2023.*
5. *Considerações finais.*

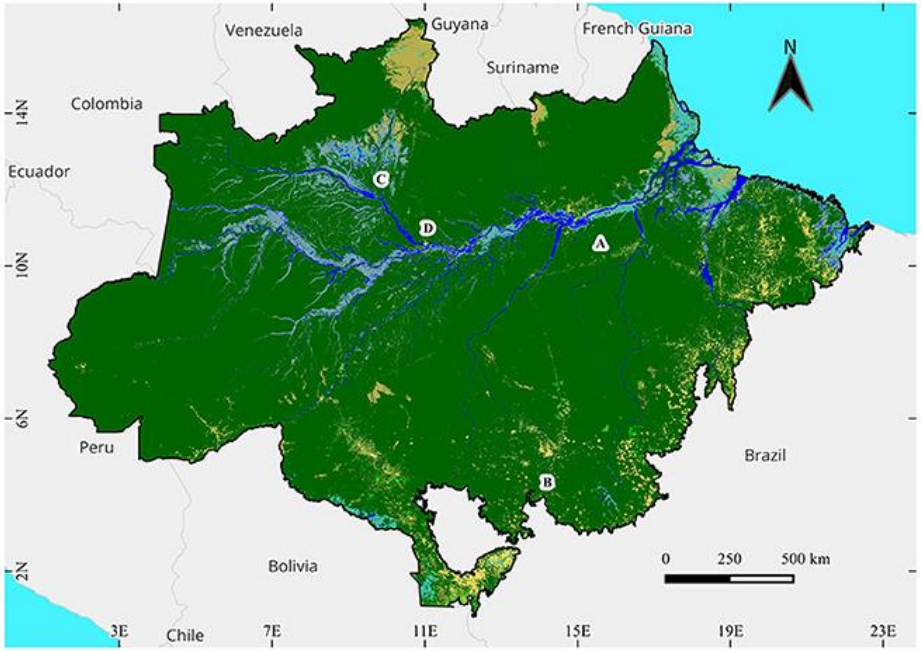
Cobertura e Uso da Terra no Bioma Amazônia

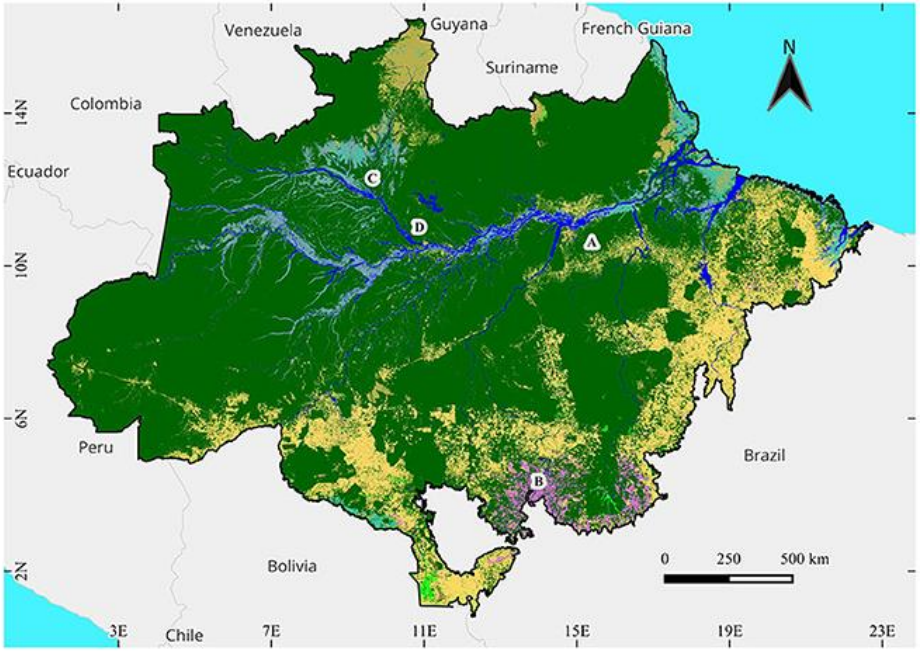
1985 a 2022

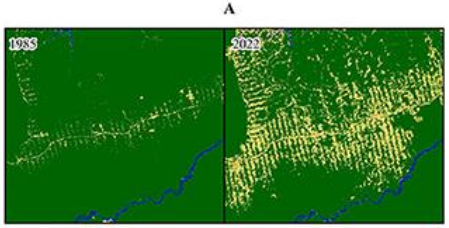


Souza et al., (2023)

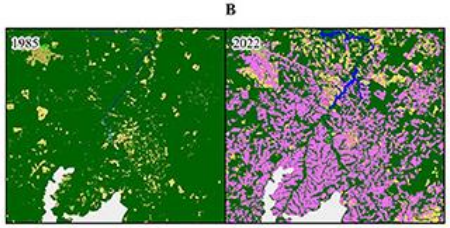




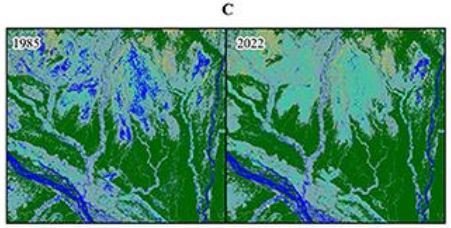




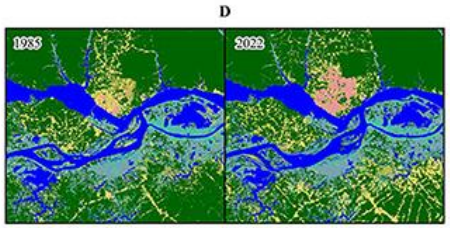
Expansion of deforestation along the transamazon highway (BR-230)



Expansion of soybean in the state of Mato Grosso



Loss of surface water in northern Amazon



Increase of urban area, Manaus, Amazonas

Legend

Forest | Cropland | Flooded Forest | Rocky Outcrop | Wetland | Amazon biome (Source: IBGE - Brazilian Institute of Geography and Statistics)

Water | Pastureland | Natural Grassland | Beraland and impervious | Shrubland | South America Countries (Source: Natural Earth and Statistics)

Fonte: Souza et al., 2023

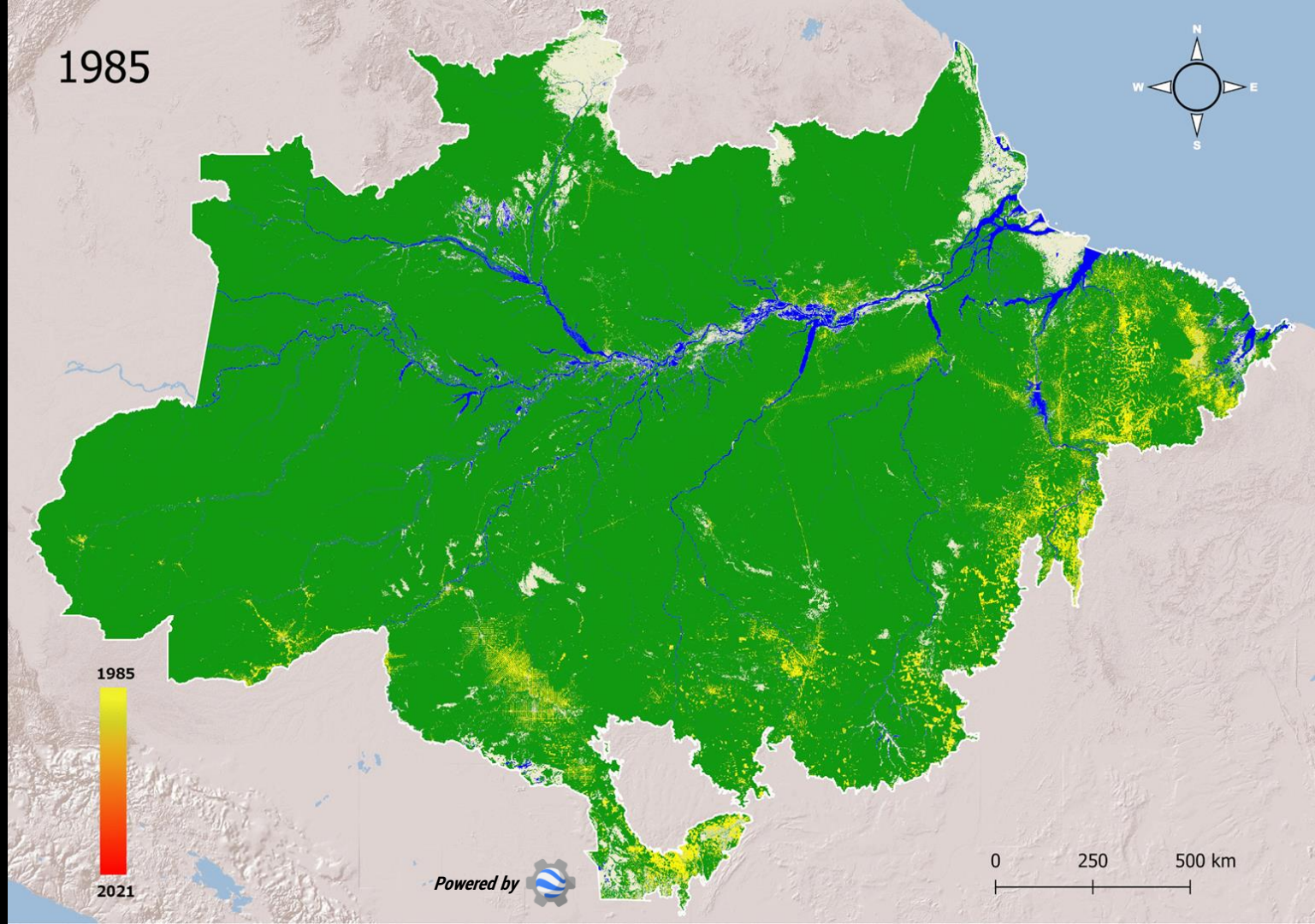
Desmatamento Anual no Bioma Amazônia

1985-2022

50 M ha

Desmatamento

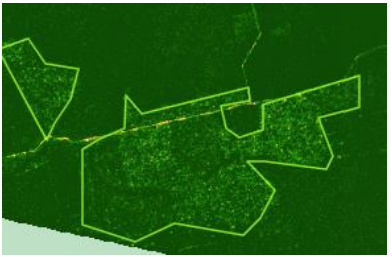
Souza Jr. et al. (2023), Frontiers



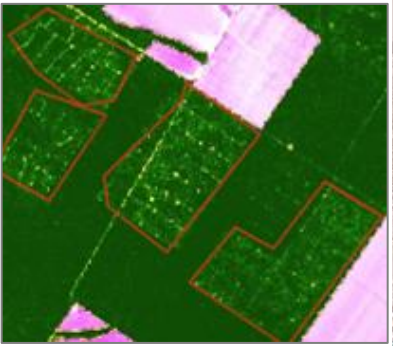
SIMEX

Exploração Madeireira

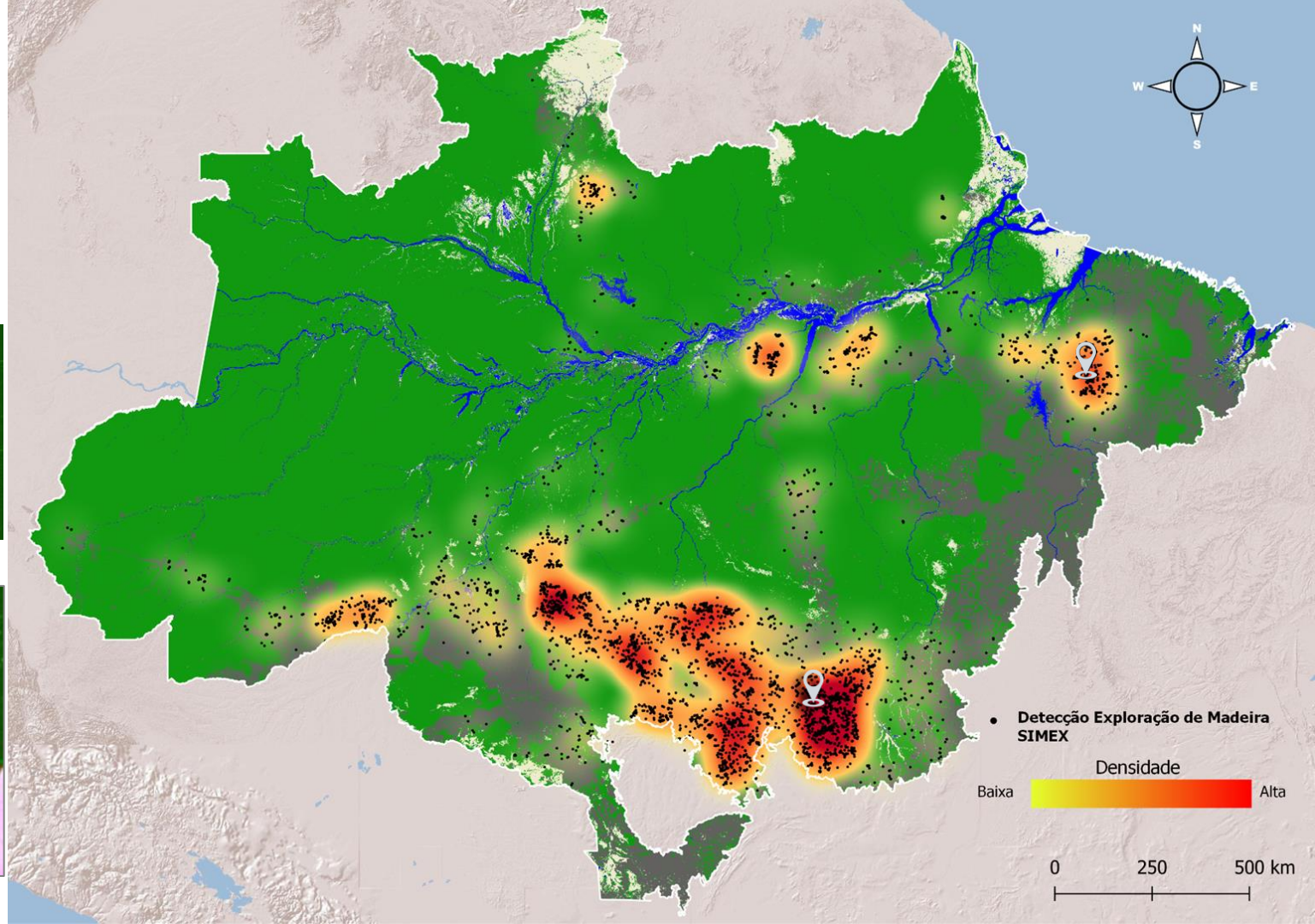
2020 e 2021



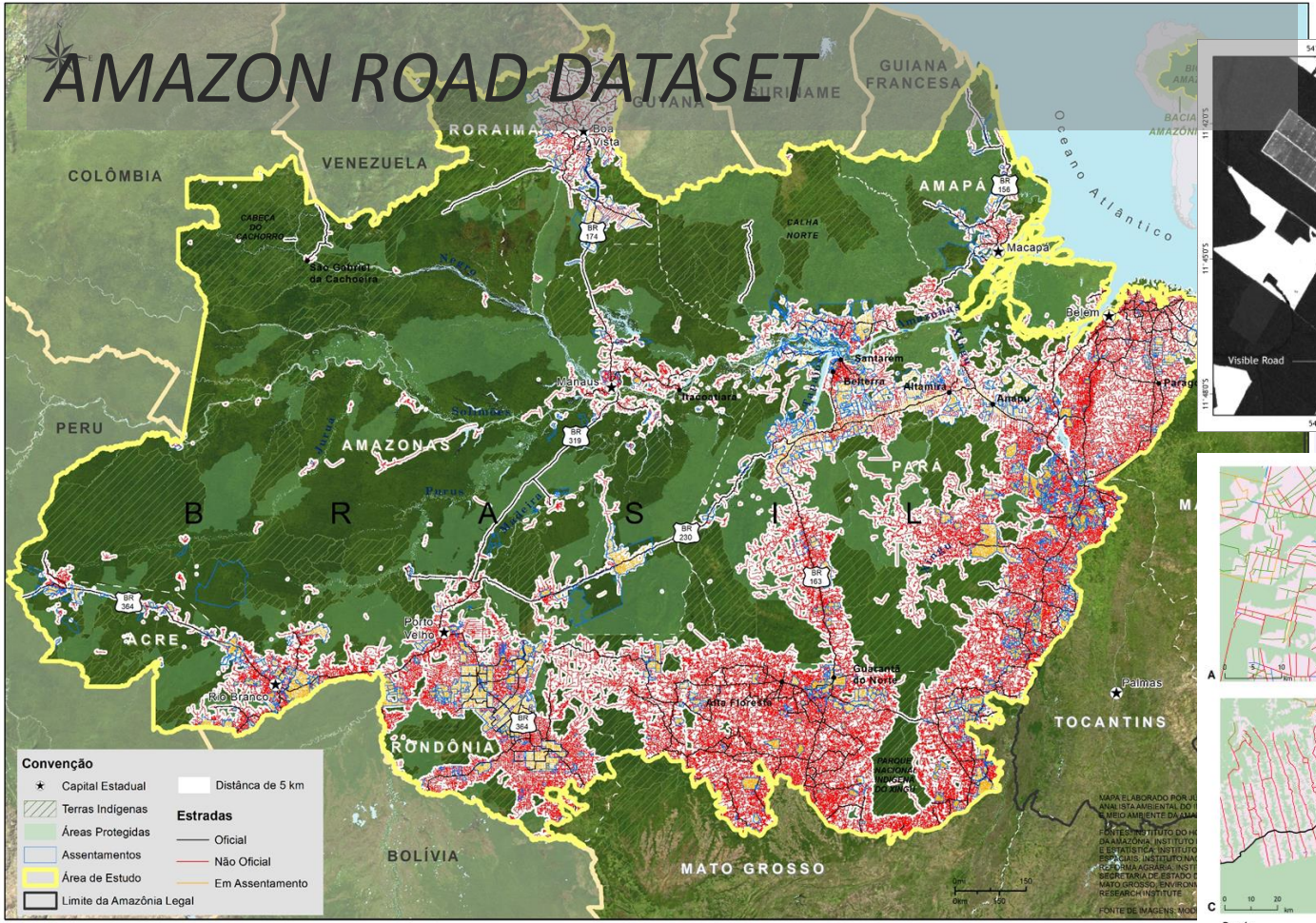
Paragominas - PA



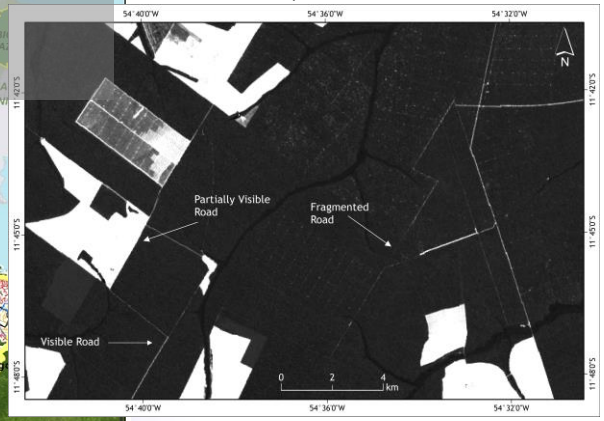
Santa Carmem - MT

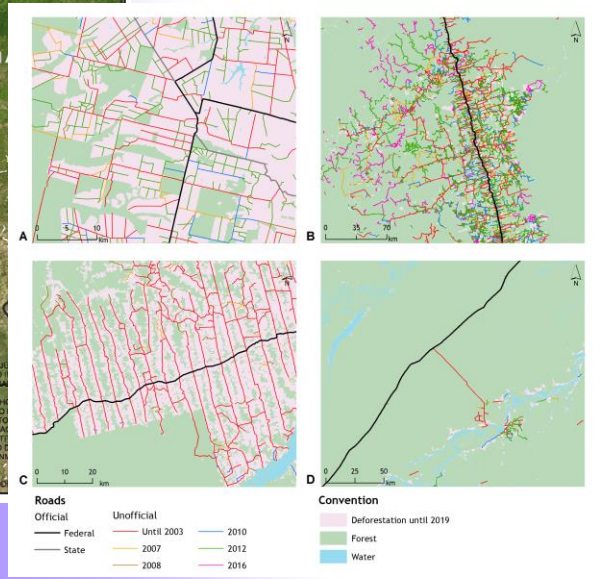


AMAZON ROAD DATASET



Landsat 5, Band 5





Brandão, A.O. & Souza, C.M. (2006). Mapping unofficial roads with Landsat images: A new tool to improve the monitoring of the Brazilian Amazon rainforest. *Int. J. Remote Sens.*


remote sensing

MDPI

Article

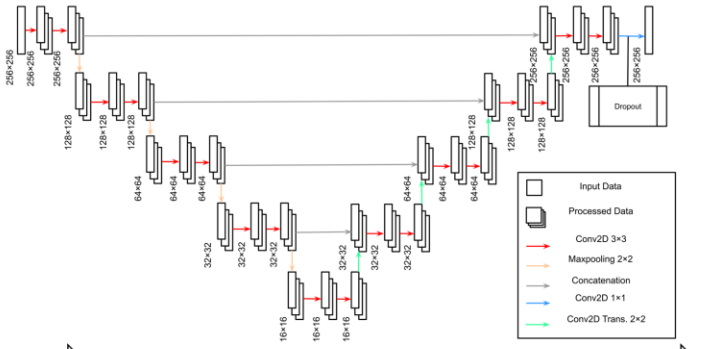
Mapping Roads in the Brazilian Amazon with Artificial Intelligence and Sentinel-2

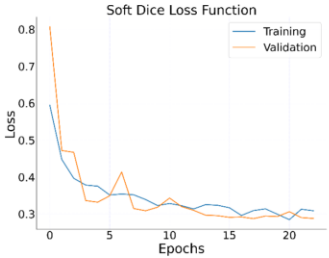
Jonas Botelho, Jr., Stefany C. P. Costa, Júlia G. Ribeiro and Carlos M. Souza, Jr. *

IMAZON-Amazon Institute of People and the Environment, Belém 66055-200, PA, Brazil; jonas@imazon.org.br (J.B.J.); stefany.pinheiro@imazon.org.br (S.C.P.C.); juliagabriela@imazon.org.br (J.G.R.)
* Correspondence: souzajr@imazon.org.br; Tel.: +55-91-3182-4000

AI Road Mapping

Sentinel-2
(SWIR 1, NIR, Red)



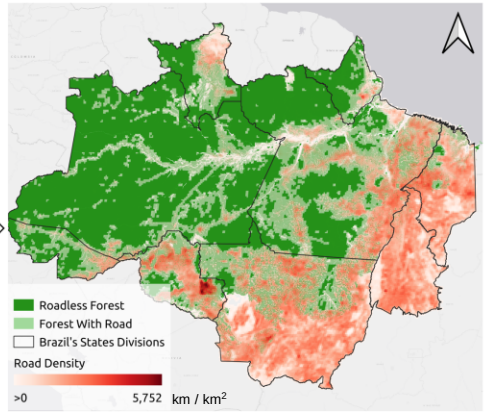


U-Net Road Prediction

Post-AI Processing

Vectorized Center Line Road

Road Density



remote sensing

MDPI

Article

Mapping Roads in the Brazilian Amazon with Artificial Intelligence and Sentinel-2

Jonas Botelho, Jr., Stefany C. P. Costa, Júlia G. Ribeiro and Carlos M. Souza, Jr. *

IMAZON-Amazon Institute of People and the Environment, Belém 66055-200, PA, Brazil;
jonas@imazon.org.br (J.B.J.); stefany.pinheiro@imazon.org.br (S.C.P.C.); juliagabriela@imazon.org.br (J.G.R.)
* Correspondence: souzajr@imazon.org.br; Tel.: +55-91-3182-4000

- ✓~55% *em áreas privadas*
- ✓25% *terras públicas sem proteção*
- ✓41% *cortam florestas ou a 10 km das estradas*
- ✓59% *florestas sem estradas*

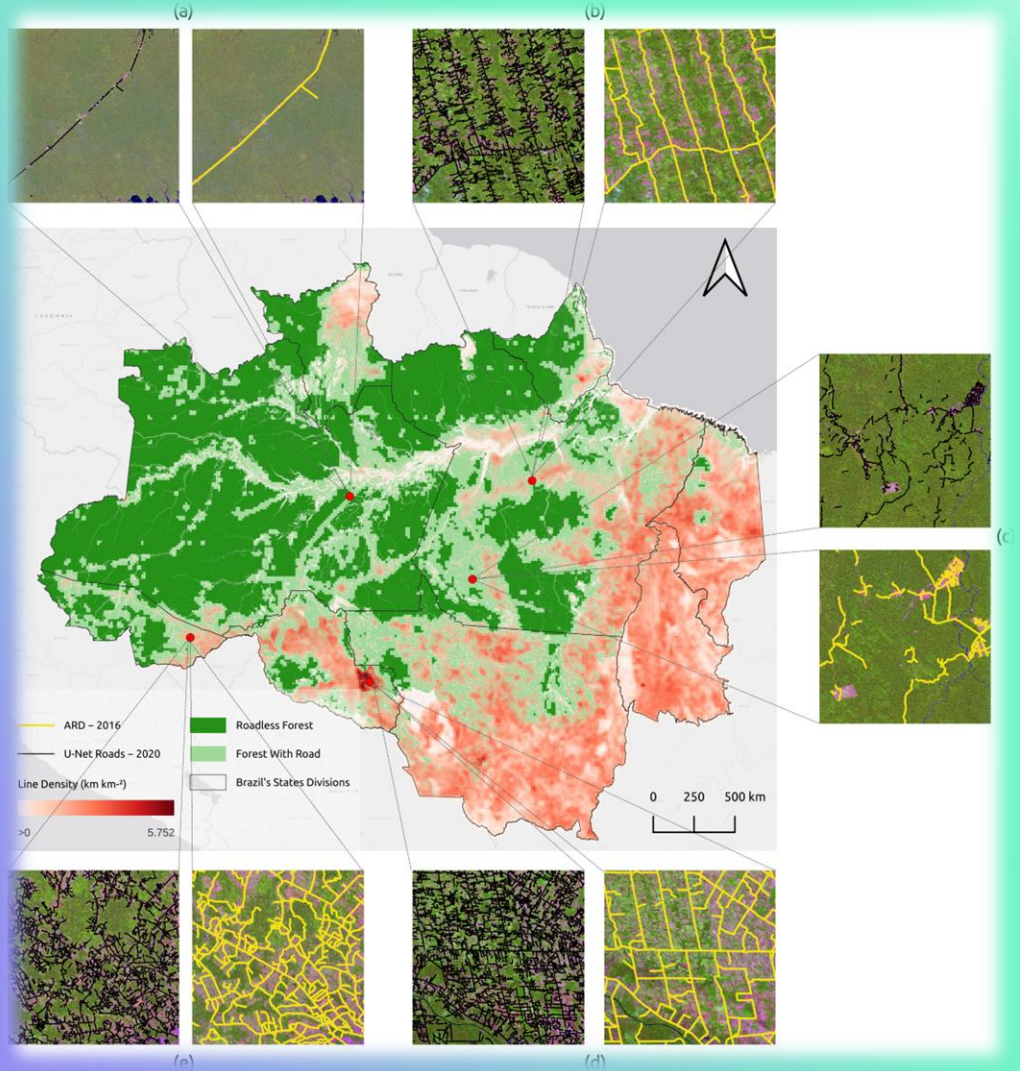
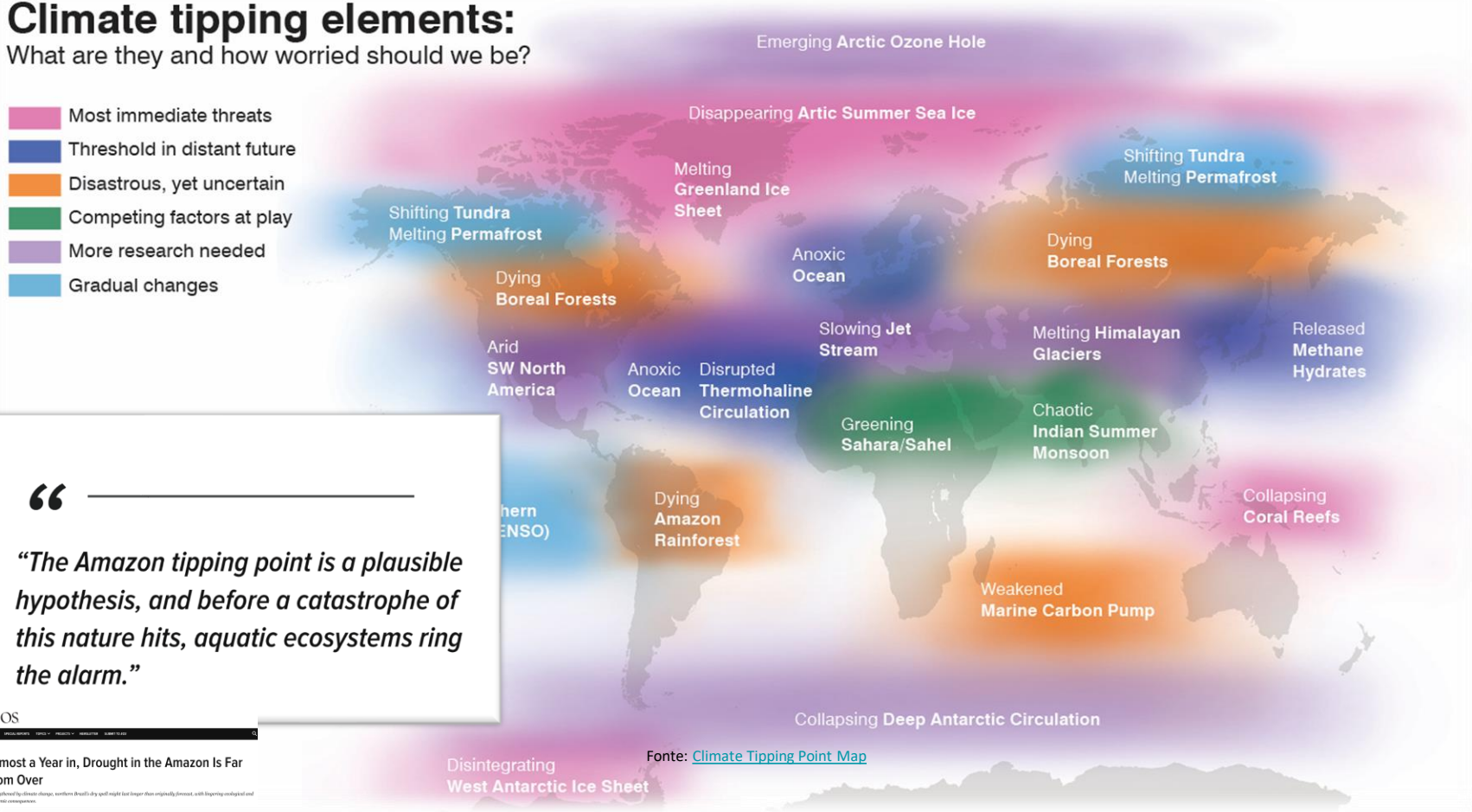


Figure 9. Road density obtained with the U-Net road model. A comparison of the U-Net model (2020) and the Amazon Road Dataset (ARD, 2016) is shown in the image panels: (**a**) the BR-319 highway with unconnected segments by the U-Net road model (black line) and ARD showing the full connected length; (**b**) the fishbone road pattern of the Trans-Amazonia highway main road (BR-230) and perpendicular ones; (**c**) a typical road pattern of selective logging; (**d**,**e**) a geometric road pattern in agriculture lands.

Climate tipping elements:

What are they and how worried should we be?



> *"The Amazon tipping point is a plausible hypothesis, and before a catastrophe of this nature hits, aquatic ecosystems ring the alarm."*

Eos

Almost a Year in, Drought in the Amazon Is Far from Over

Fonte: Climate Tipping Point Map

Vetores de Mudanças nos Ecossistemas Aquáticos

FIGURE 4
Hovmöller diagram showing monthly rainfall from 1951 to 2014 in the south of the Amazon (mm/month). The 100 mm/month isoline is an indicator of dry months[37]. Drought years are indicated in the figure. Red lines show the beginning and end of the dry season and yellow lines shows the deviation in the dry season (adapted from Marengo and collaborators[35] and updated until 2014).

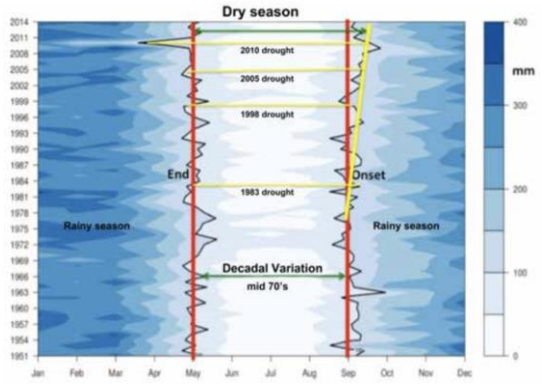
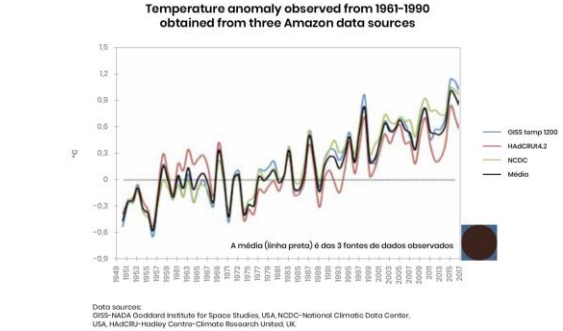


FIGURE 1
Observed temperature change from 1961-1990 obtained from three different data sets from 1949 to 2017 for the Amazon region.



Extreme Droughts in the Amzon

- *2005*: A severe drought event affected large portions of the Amazon basin[1].
- *2010*: Another significant drought, larger in extent than the one in 2005[1].
- *2015/2016*: Record-breaking warmth and drought during the El Niño event[2].
- *2023*: A recent extreme drought event that was made more likely due to climate change[3].

As Áreas Úmidas estão Secando durante o Verão

water

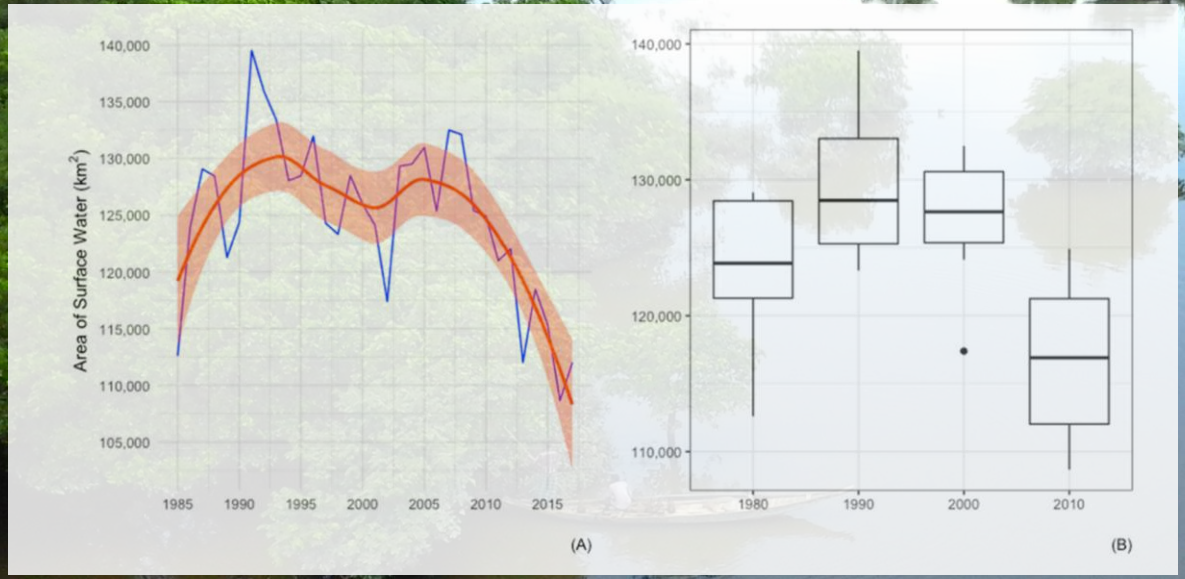
MDPI

Article

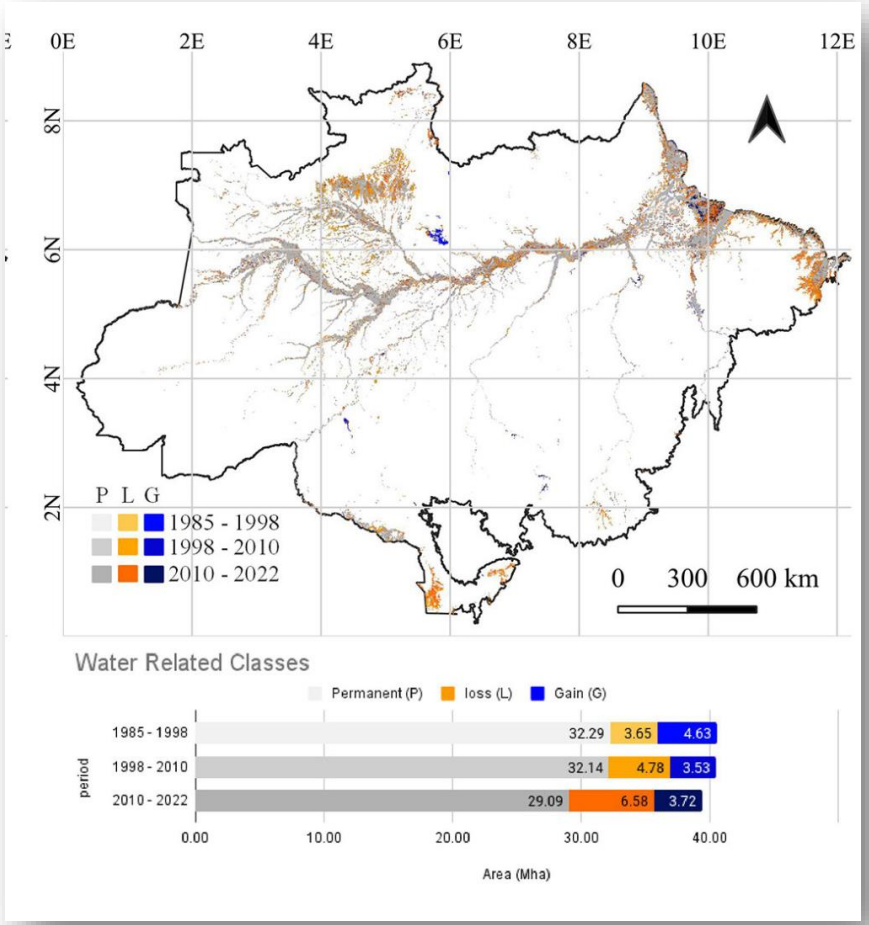
Long-term Annual Surface Water Change in the Brazilian Amazon Biome: potential links with deforestation, infrastructure development and climate change

Carlos Souza Jr.[1,*], Frederic T. Kirchhoff[1], Bernardo Oliveira[2], Júlia G. Ribeiro[2] and Márcio H. Sales[3].

[1] Instituto do Homem e Meio Ambiente da Amazônia - Imazon; souzajr@imazon.org.br
[1] Imazon; frederic@imazon.org.br
[2] WWF-Brasil; bernardo@wwf.org.br
[3] MHR Sales Consultoria; marciosales@outlook.com



Distribuição Espacial de Perda e Ganho de Superfície de Água

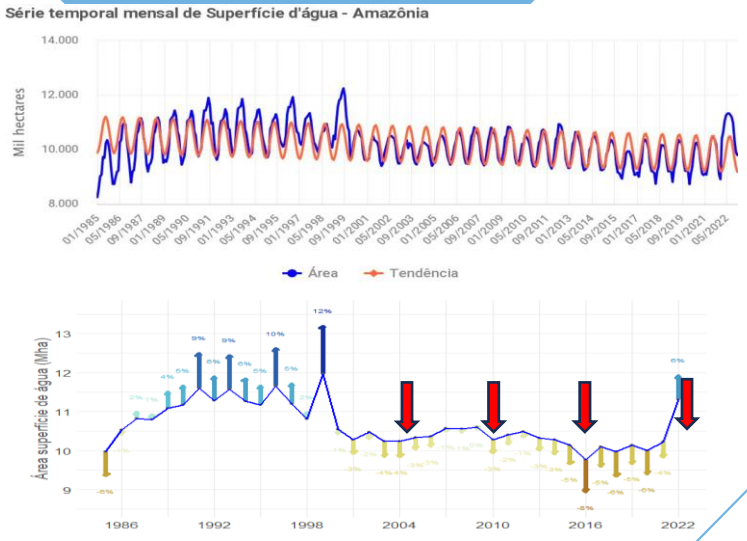


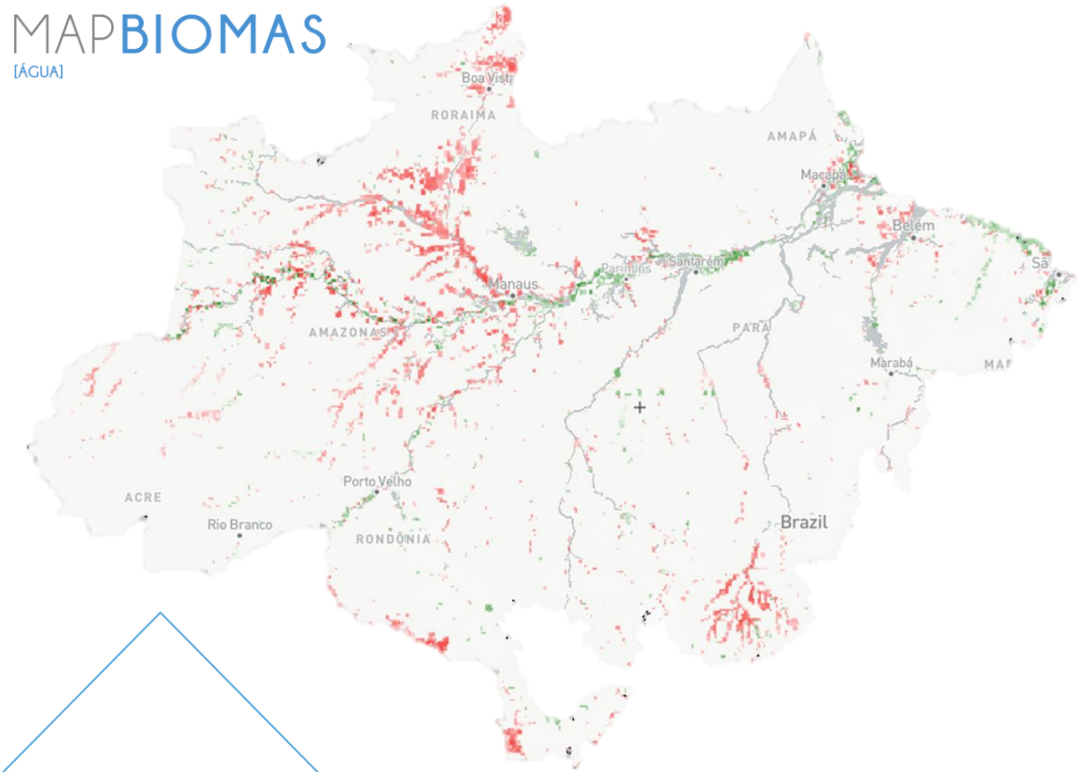
- *A perda de água nas **margens** e no **estuário** do Rio **Amazonas**.*
- *As **várzeas de Roraima** apresentaram a maior perda de superfície de água.*
- *A região de **transição do bioma Amazônia** com o **Pantanal** também apresentou perda expressiva de superfície de água.*
- *O **ganho** de água ocorre principalmente em **represas** de **hidrelétricas**.*

Souza Jr. et al. (2023), Frontiers

A tendência no Bioma Amazônia segue com a redução de superfície de água

MAPBIOMAS
[ÁGUA]

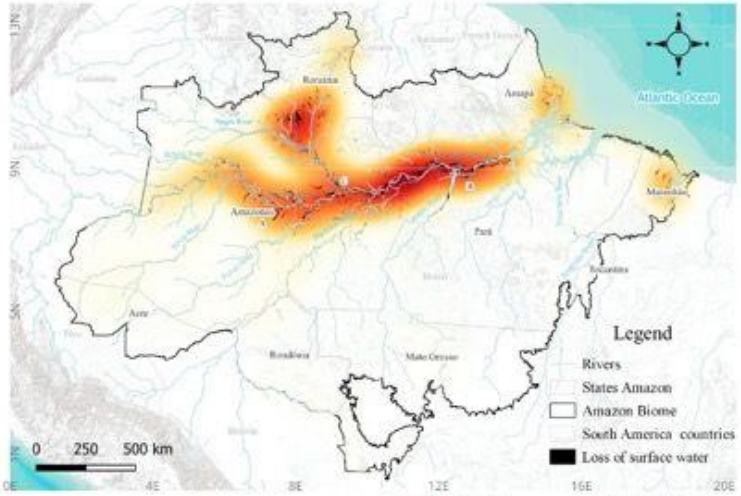


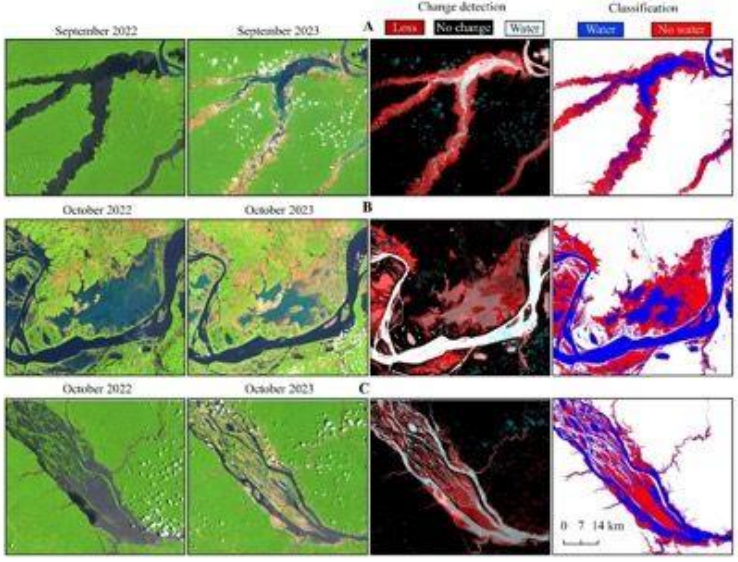


Apesar do sinal positivo em 2022, a Amazônia teve sua pior sequência nos anos recentes

Decréscimo — Acréscimo

Seca Severa de 2023





- ***3,3 milhões de hectares de perda de superfície de água***
- ***1,1 mihões de hectares em Áreas Protegidas.***
- ***Alto impacto negativo nas populações e na biodiversidade.***

Souza et al., (in review) Amazon Severe Drought in 2023 Triggered Surface Water Loss, ERC

Mapa Harmonizado

Floodplains as an Achilles' heel of Amazonian forest resilience

Bernardo M. Flores[a,b,c,1], Milena Holmgren[b], Chi Xu (徐驰)[d], Egbert H. van Nes[a], Catarina C. Jakovac[e], Rita C. G. Mesquita[f], and Marten Scheffer[a,1]

"... annually inundated lowland forests that run through the heart of the system may be trapped relatively easily into a fire-dominated savanna state".

Venezuela
Guyana
Colombia
Perú
Bolivia
Brasil

11N
7N
3N
3E
7E
11E
15E
19E
23E
27E

Legend
- Open water
- Aquatic macrophyte
- Flooded forest
- Marshes wet meadows
- Flooded woodland
- General marshes
- Floodplains
- Flooded shurb
- Mangroves
- Glaciar

N
E

0 250 500 km

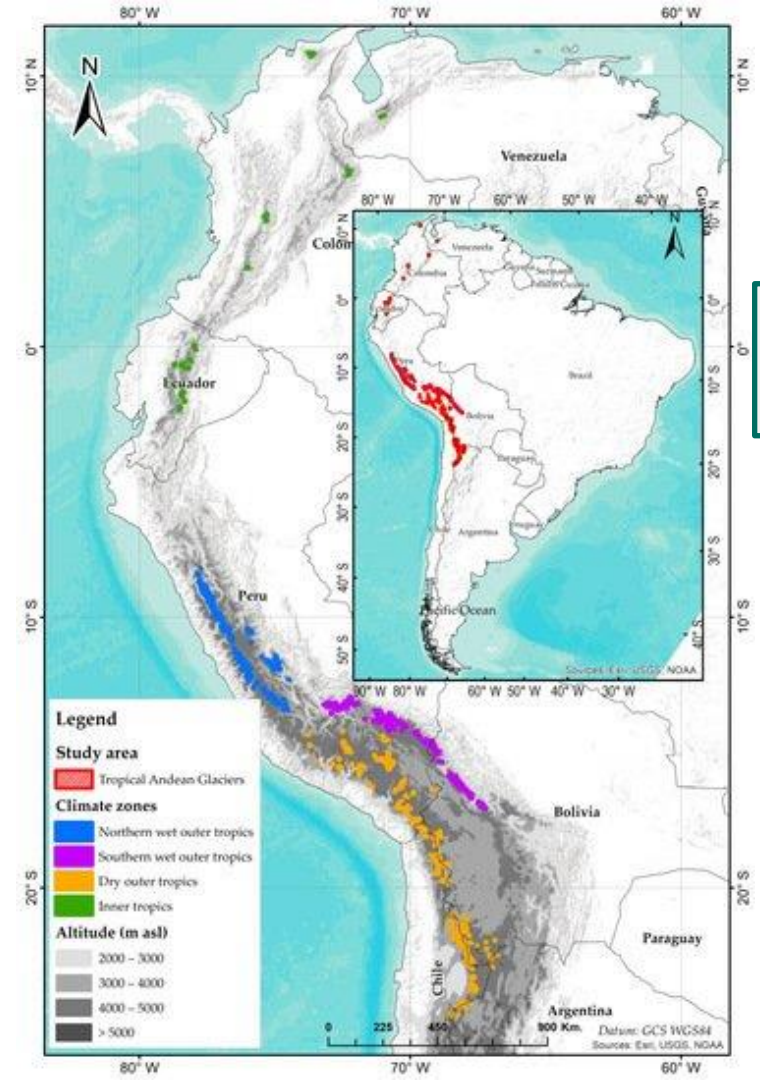
MAPBIOMAS ÁGUA

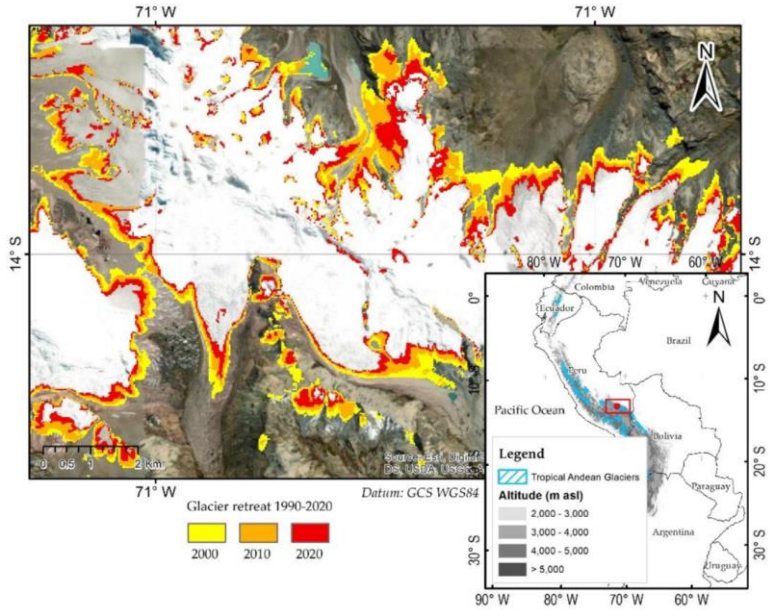
RAISG
RED AMAZÓNICA DE INFORMACIÓN SOCIOAMBIENTAL GEORREFERENCIADA

Mapping Three Decades of Changes in the Tropical Andean Glaciers Using Landsat Data Processed in the Earth Engine

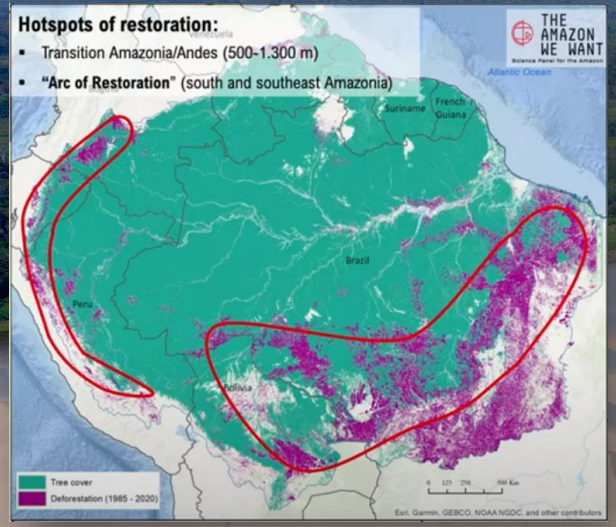
by Efrain Yury Turpo Cayo [1,2,*], Maria Olga Borja [3], Raul Espinoza-Villar [2], Nicole Moreno [1], Rodney Camargo [4], Claudia Almeida [2,5], Kathrin Hopfgartner [1], Christian Yarleque [6] and Carlos M. Souza, Jr. [7]

"The TAGs reduced from 2,429.38 km² to 1,409.11 km² between 1990 and 2020, representing a loss of 42% of the total glacier area".





Ainda há tempo para mudar!

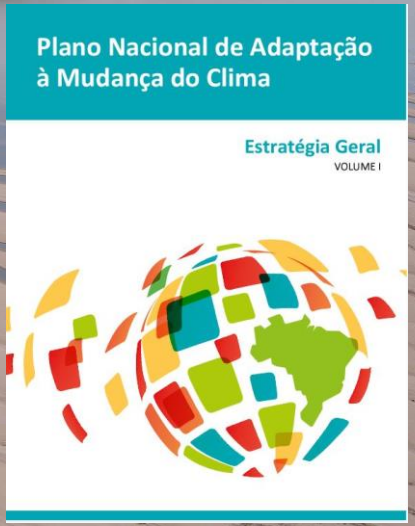


Floresta Viva

BNDES

A meta é recuperar, pelo menos, 12 milhões de hectares até 2030

Plano Nacional de Recuperação da Vegetação Nativa (Planaveg).



Credit: Sandro Kakab

Apoio


iCS
instituto
CLIMA e SOCIEDADE


Quadrature
Climate Foundation


instituto
arapyaú


WWF


GORDON AND BETTY
MOORE
FOUNDATION