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GEMTI
Gerência de Monitoramento
Territorial Indígena da Coiab

THE AMAZON ON THE BRINK OF COLLAPSE

Quarterly Bulletin on Extreme Drought in
Indigenous Lands in the Brazilian Amazon

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Joint Coordination of Indigenous Organizations of the Brazilian Amazon (Coiab)

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1. Introduction

Through the efforts of the Indigenous Territorial Monitoring Management of the Joint Coordination of Indigenous Organizations of the Brazilian Amazon (GEMTI/Coiab), as part of actions within the Climate Justice and Security priority, we make public here the Quarterly Bulletin on Extreme Drought in Indigenous Lands of the Brazilian Amazon. This document aims to present an overview of the drought and dry periods experienced in the territories and communities that make up Coiab, . Brazil's largest regional Indigenous coalition. Founded in 1989, it works in the nine Brazilian Amazon states, defending Indigenous Peoples' right to land, education, culture and sustainability. It also considers the diversity of Peoples and strives for their autonomy through advocacy and the strengthening of Indigenous organizations.

In the context of severe global and national environmental degradation, extreme climate events are becoming increasingly frequent and unpredictable. Brazilian greenhouse gas emissions, along with deforestation practices and large-scale illegal fires, amplify, exacerbate, and prolong drought periods in the Amazon, turning them into extreme phenomena. It is necessary to establish a network of collaborators and supporters to build regional strategies for addressing these challenges from the perspective of Climate Justice and Security. Indigenous territories, often located in remote and hard-to-reach areas, form the front line of forest protection, and so they are the first to experience the devastating effects of severe climate events. Monitoring these events is therefore part of an urgent strategy for mitigation and adaptation in the context of these emergencies.

Specifically, this bulletin aims to:

- a) Share with the Coiab network data obtained through monitoring of extreme drought;
- b) Support the Coiab network's political advocacy on the themes of drought, dry periods, wildfires, and climate change;
- c) Strengthen the network around the defense of the Brazilian Amazon and Indigenous peoples;
- d) Analyze and disseminate climatological and hydrological indicators that allow for the assessment of the progression of extreme drought and its socio-environmental impacts in the Brazilian Amazon;
- e) Identify and map critical areas of vulnerability in Indigenous communities, using available geospatial data and climate impact statistics.

2. Dry Periods and Drought

The Brazilian Amazon has its natural rhythm and cycle of floods and droughts. From June to November, the water levels drop, which we call the vazante (low water period), and from December to May, the water rises, resulting in the flood season. From time to time, this rhythm changes, creating a natural variability that's expected for the Amazon. However, this process is **distinct from the current situation that's being experienced now, in which historical climate records are being broken each year.**

Whereas the flood season refers to the annual period when rivers reach their highest levels due to the increased volume of water from rainfall, drought is a climatic phenomenon characterized by the absence or scarcity of precipitation over a prolonged period, resulting in a water deficit in some regions of the country. However, even in the different humid regions of the Brazilian Amazon, it is natural for drought periods to occur, although less frequently and with shorter duration.

A dry period, on the other hand, would be a prolonged time of dry but mild weather with little or no precipitation. Unlike drought, which has more severe and prolonged effects, a dry period is usually temporary and has minimal impacts on agricultural crops.

In 2024, drought indicators are now at extreme levels: we have rivers below historical minimums, record temperatures, record numbers of consecutive days without rain, as well as record drought indices. Therefore, the severity of the extreme drought is causing serious impacts on water supply, agriculture, and other ecosystems, directly affecting water and food security, as well as the quality of life of Indigenous, urban, riverside, and traditional populations.

For us as Indigenous peoples, drought is not just the lack of rain, but rather an imbalance in the relationship between the land and living beings, caused by the reckless exploitation of natural resources. Without water, the ability for us to accomplish different cultural traditions is interrupted, reflecting a crisis that affects not only the physical body but also the spirit.

Drought Severity Classification

In Brazil, there is a drought monitoring and management mechanism called the Drought Monitor, which is a process of regular and periodic tracking of drought conditions in the country. The data is released monthly and presents the drought situation in each state (and the federal capital) for the previous month. Thus, the timeframe for this bulletin covers up to the most recently available month, from May to July 2024, from data released at the end of August.

This initiative was created by a group of specialists and Brazilian institutions from the federal and state levels, universities, and civil society, but currently relies on the National Water and Basic Sanitation Agency (ANA) as the central institution in the process.

The goal of the Drought Monitor is to integrate technical and scientific knowledge from different state and federal institutions to reach a common understanding of drought conditions based on their severity, spatial and temporal evolution, as well as their impacts on the various sectors involved. At the same time, the monitor aims to translate data and information dispersed across partner institutions into usable products, in order to strengthen the mechanisms for Monitoring, Forecasting, and Early Warning for droughts.

The choice of the Drought Monitor as the informational basis for the bulletin is bolstered by its role as a mechanism for integrating information at the federal, state, and municipal levels in the areas of meteorology, water resources, and agriculture. In this context, the data are the result of collaborative action between different institutions, with the goal of becoming a new benchmark in the history of drought preparedness and response in Brazil, serving as a resource for decision-making across the three levels of government.



Category	Description	Percentage	Frequency	Possible Impacts in the Territories
S0	Weak Drought	30%	Once every 2-5 years	Short-term phenomenon reducing planting. Some water deficits, pastures, and crops not fully recovered
S1	Moderate Drought	20%	Uma vez a cada 5-10 anos	Damage to crops, streams, reservoirs, and wells, developing water shortages, voluntary use restrictions.
S2	Severe	10%	Once every 10-20 years	Crop or pasture losses, water shortages, imposed water restrictions.
S3	Extreme Drought	5%	Once every 20-50 years	Grandes perdas de culturas e pastagens, escassez de água generalizada, restrições de uso.

Table 1. Classification of Drought Processes based on the CEMADEN Drought Monitor.

Extreme drought is a highly severe phenomenon and the focus of this bulletin, as its occurrence is predicted every 20-50 years. The consecutive episodes in 2023 and 2024 indicate an unprecedented and unpredictable scenario regarding the climate extremes that will be experienced in the future. Coming off an atypical year like 2023, which saw a record drought in the Brazilian Amazon, **the year 2024 points to a worsening of this extreme drought.**

In this century alone, we have experienced several extreme droughts. Research and monitoring institutions, such as the National Center for Monitoring and Early Warning of Natural Disasters (CEMADEN/MCTI), state that their regularity should be every 50 years or every 20 years. However, we are now witnessing the occurrence of extreme droughts from one year to the next, with the 2024 drought being the worst in the last four decades, in other words, the worst ever since CEMADEN began measurements.

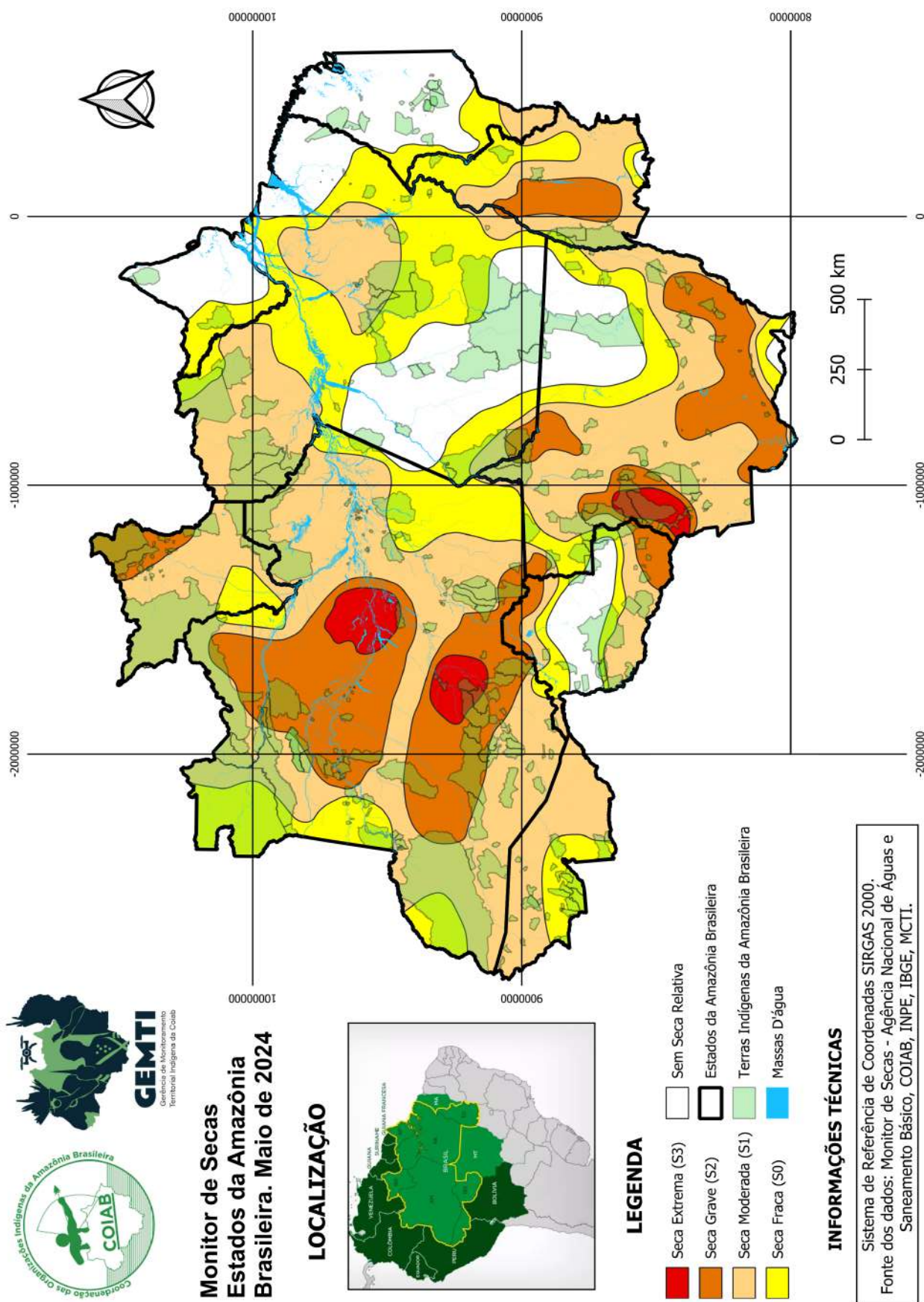


Figure 1. Drought Monitor - May 2024. Prepared by GEMTI (Indigenous Territorial Monitoring Management of the Coordination of Indigenous Organizations of the Brazilian Amazon).

Indigenous Territories located in regions of Extreme Drought

In the month of May, **17 Indigenous territories and 15 Indigenous peoples** experienced extreme drought, primarily affecting the central region of Amazonas state, as well as the far west of Mato Grosso state. At the same time, it is estimated that more than 90 Indigenous territories experienced severe drought, specifically in the central-west and northern regions of Amazonas state; the far north and southeast regions of Rondônia state; the central region of Tocantins state; as well as the western, northern, and southern borders of Mato Grosso state.

Amazonas State

Indigenous Territory	Indigenous Peoples
Cajuhiri Atravessado	Kambeba, Miránha e Tikúna
Itixi Mitari	Apurinã
Lago Aiapua	Múra
Paumarí do Lago Manissuã	Paumarí
Paumari do Lago Paricá	Paumarí
Paumari do Cuniua	Paumarí
Banawá	Banawá
Hi Merimã	Himarimã
Jarawa / Jamamadi / Kanamati	Yaminawa / Jamamadi / Kanamari
Paumarí do Rio Ituxi	Paumarí
Caititu	Apurinã

Table 2. Territories located in regions of extreme drought.
Amazonas State (11 Indigenous Territories).

Mato Grosso State

Indigenous Territory	Indigenous Peoples
Enawenê-Nawê	Enawenê-Nawê
Parque do Aripuanã	Cinta Larga
Nambikwára	Nambikwára
Pequizal	Nambikwára
Vale do Guaporé	Nambikwára
Taihantesu	Wasusu

Table 3. Territories located in regions of extreme drought.
Mato Grosso state (6 Indigenous Territories).

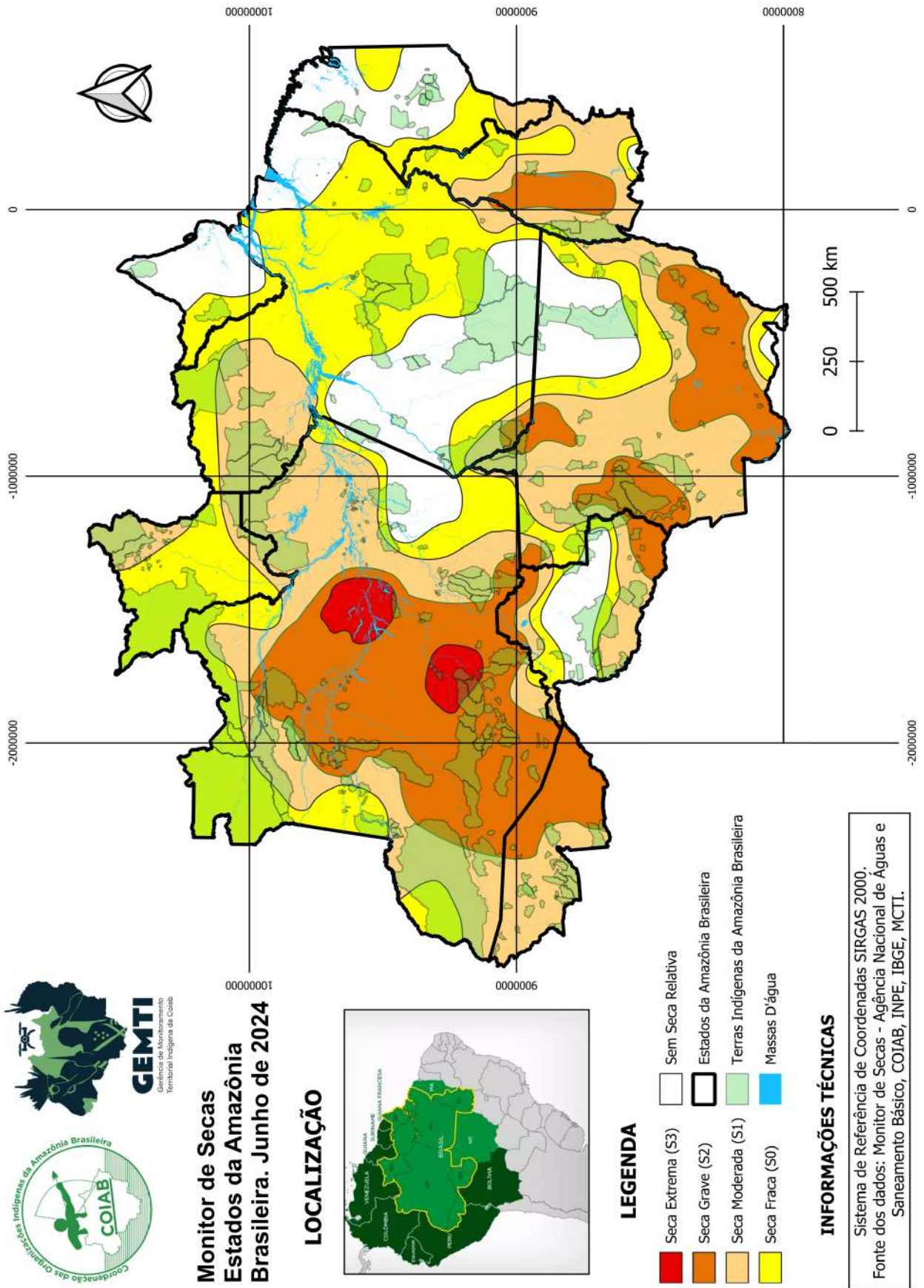


Figure 2. Drought Monitor - June 2024. Prepared by GEMTI.

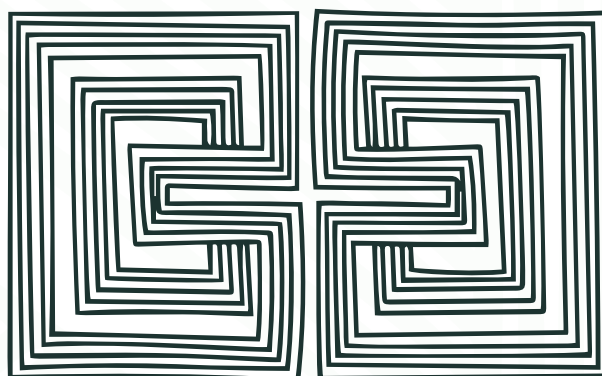
Indigenous Territories Located in Regions of Extreme Drought

In the month of June, 11 Indigenous territories experienced extreme drought, with the epicenter of the drought in the central region of the state of Amazonas. The extreme drought previously observed in May in the western region of Mato Grosso was downgraded from extreme to severe. As for severe drought, 123 Indigenous territories experienced it, distributed across the following regions: central and eastern Acre; central, western, and southern Amazonas; far north and southeast Rondônia; central Tocantins; as well as the western, northern, and southern borders of the state of Mato Grosso.

Amazonas State

Terra Indígena	Povos
Cajuhiri Atravessado	Kambeba, Miránha e Tikúna
Itixi Mitari	Apurinã
Lago Aiapua	Múra
Paumarí do Lago Manissuã	Paumarí
Paumari do Lago Paricá	Paumarí
Paumari do Cuniua	Paumarí
Hi Merimã	Himarimã
Jarawa / Jamamadi / Kanamati	Yaminawa / Jamamadi / Kanamari
Banawá	Banawa
Paumari do Rio Ituxi	Paumarí
Caititu	Apurinã

Table 4. Territories located in regions of extreme drought. Amazonas State (a total of 11 Indigenous Territories).



July 2024 (and the trends for the coming months)

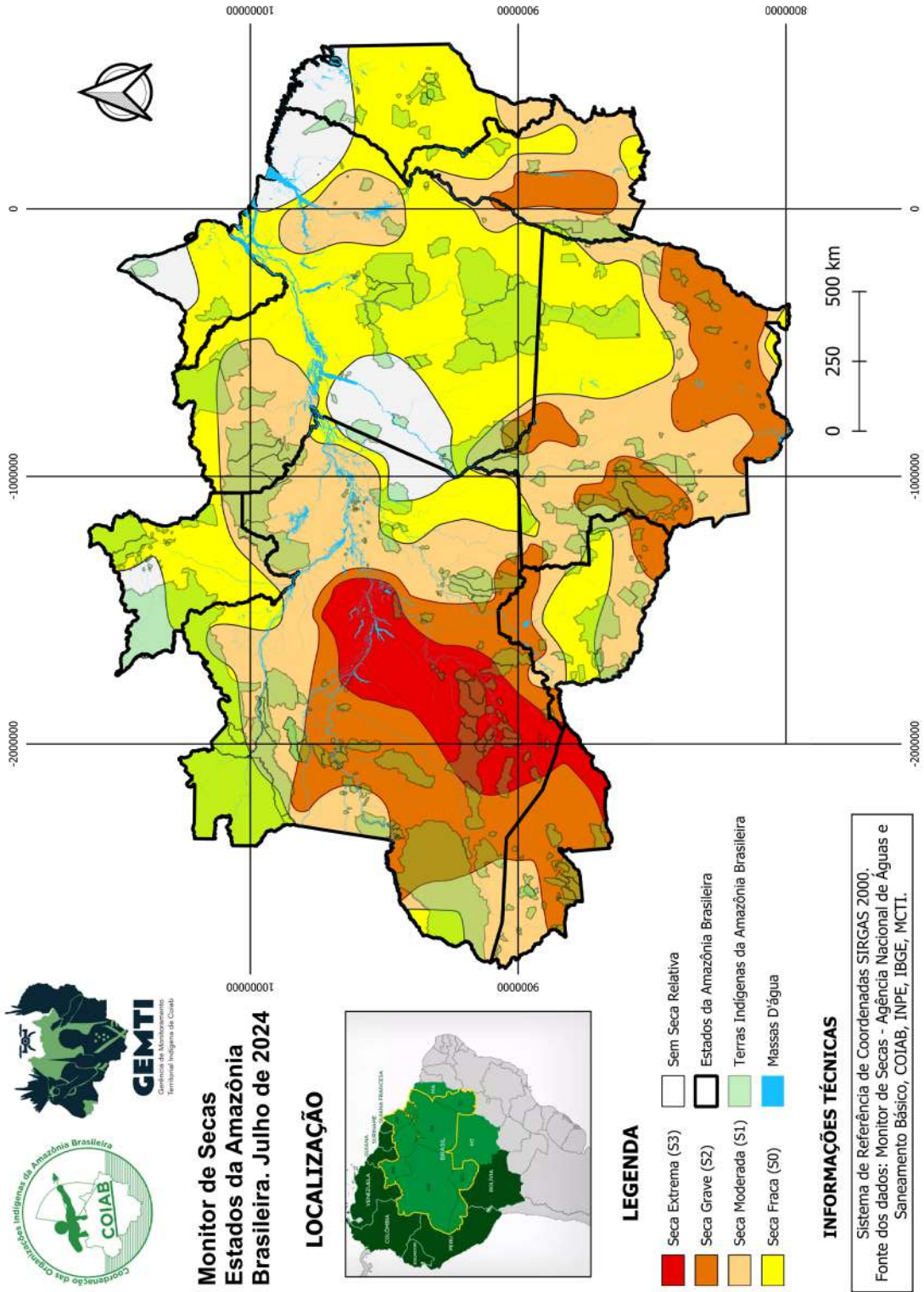


Figure 3. Drought Monitor - July 2024. Prepared by GEMTI.

Indigenous Territories Located in Regions of Extreme Drought

The extreme drought affected 42 Indigenous territories, including 15 peoples and one isolated group. This area corresponds to 53% of the Indigenous territories in the Brazilian Amazon, directly impacting more than 3,000 Indigenous households, as well as 110 schools and 40 health units within the territories.

As for severe drought, the same trends remain in the regions observed in previous months: central and eastern Acre; central, western, and southern Amazonas; far north and southeast Rondônia; central region of Tocantins; as well as the western, northern, and southern borders of Mato Grosso state. It is worth noting that, **outside the severe and extreme drought areas indicated here, a mild drought process covered almost all of the other areas in the entire Brazilian Amazon.**

Outside of the Indigenous territories, a large number of families in the states of Amazonas, Acre, and Rondônia are being affected by the extreme drought that began in July, impacting approximately 298,000 households, 1,595 schools, and 718 health units.

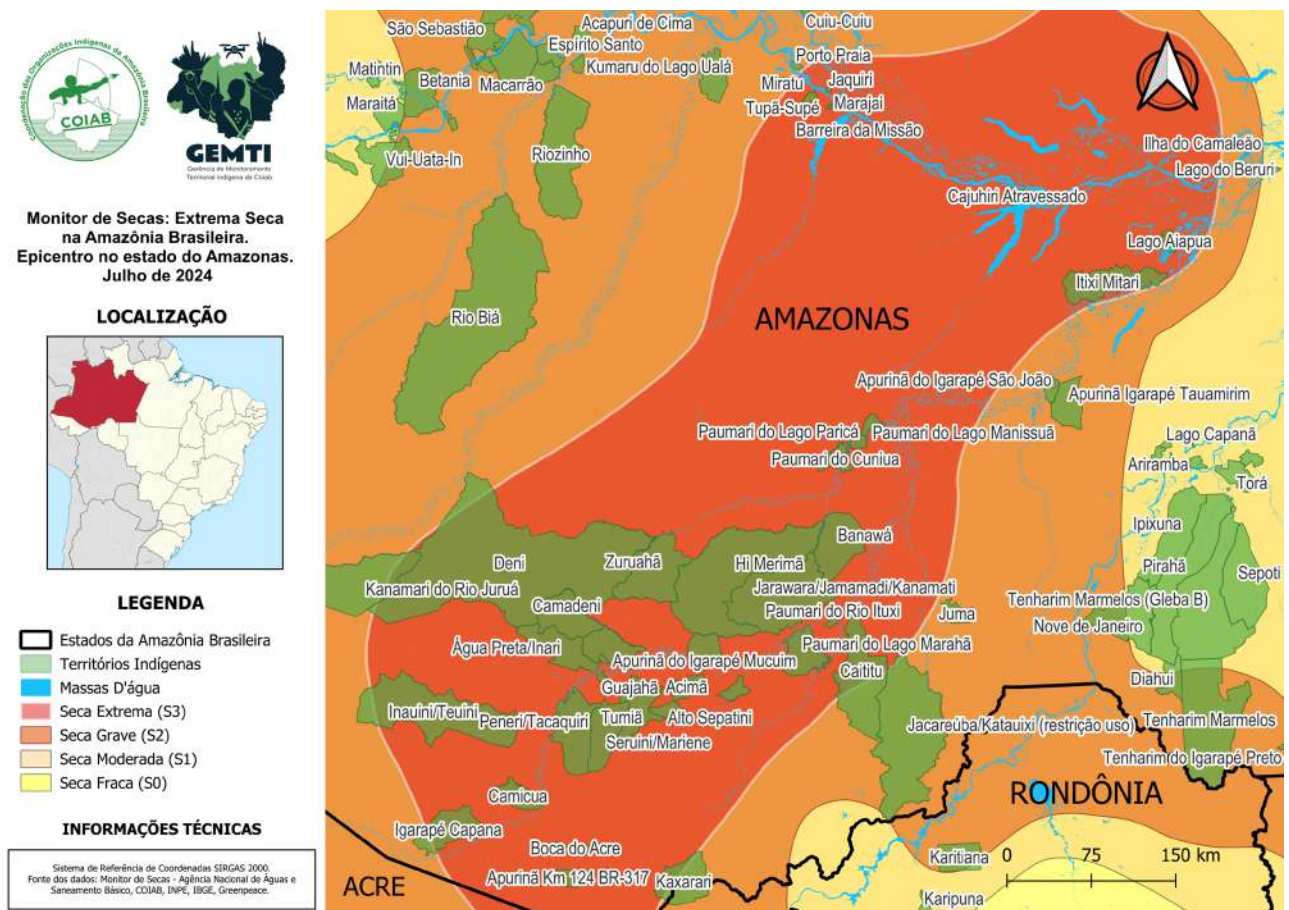


Figure 4. Drought Monitor - July 2024. Map showing the approximate extreme drought epicenter in the state of Amazonas. Prepared by GEMTI.

Indigenous Territory	Peoples	State	Area (km2)	Households/ Families	Schools	Health Units
DENI	Deni	AM	14.676,10 (27,30%)	273	6	5
HI MERIMÃ	Himerimã	AM	6.768,22 (12,59%)	2	0	0
INAUINI/TEUINI	Jamamadí	AM	4.312,50 (8,02%)	38	1	0
JARAWARA/ JAMAMADI/ KANAMATI	Yaminawa, Jamamadí e Kanamarí	AM	3.889,58 (7,24%)	136	7	6
ZURUAHÃ	Zuruahã	AM	2.381,21 (4,43%)	25	0	0
BANAWÁ	Banawa	AM	1.925,98 (3,58%)	44	1	1
PENERI/ TACAQUIRI	Apurinã	AM	1.898,08 (3,53%)	159	8	1
ITIXI MITARI	Apurinã	AM	1.822,17 (3,39%)	176	6	1
CAITITU	Apurinã	AM	1.651,02 (3,07%)	335	14	9
CAMADENI	Jamamadí	AM	1.508,84 (2,81%)	26	1	1
SERUINI/ MARIENE	Apurinã	AM	1.449,24 (2,70%)	25	2	0
ÁGUA PRETA/ INARI	Apurinã	AM	1.397,40 (2,60%)	78	4	0
TUMIÃ	Apurinã	AM	1.241,98 (2,31%)	3	1	0
PAUMARI DO LAGO MARAHÃ	Apurinã	AM	1.186,83 (2,21%)	265	17	3
CATIPARI/ MAMORIA	Apurinã	AM	1.149,58 (2,14%)	90	5	0
IGARAPÉ CAPANA	Jamamadí	AM	1.108,95 (2,06%)	9	1	0
APURINÃ DO IGARAPÉ MUCUIM	Apurinã	AM	733,68 (1,36%)	13	1	2
CAMICUA	Apurinã	AM	583,33 (1,09%)	122	1	0
KANAMARI DO RIO JURUÁ	Kanamarí	AM	492,32 (0,92%)	18	1	0

KAXARARI	Kaxarari	AM	433,33 (0,81%)	0	0	0
PAUMARI DO CUNIUA	Paumarí	AM	428,12 (0,80%)	15	1	0
APURINÃ KM 124 BR-317	Apurinã	AM	423,90 (0,79%)	99	4	0
ACIMÃ	Apurinã	AM	406,22 (0,76%)	18	2	0
SÃO PEDRO DO SEPATINI	Apuinã	AM	276,01 (0,51%)	22	2	1
BOCA DO ACRE	Apurinã	AM	264,43 (0,49%)	81	0	0
ALTO SEPATINI	Apurinã	AM	260,78 (0,49%)	12	0	0
LAGO AIAPUA	Múra	AM	239,34 (0,45%)	140	4	0
PAUMARI DO LAGO MANISSUÃ	Paumarí	AM	229,71 (0,43%)	15	2	0
PAUMARI DO LAGO PARICÁ	Paumarí	AM	157,93 (0,29%)	12	2	0
CAJUHIRI ATRAVESSADO	Kambéba, Miránha e Tikúna	AM	125,40 (0,23%)	54	2	0
TUPÃ-SUPÉ	Tikúna	AM	85,85 (0,16%)	4	1	0
PAUMARI DO RIO ITUXI	Paumarí	AM	75,69 (0,14%)	41	3	1
GUAJAHÃ	Apurinã	AM	50,30 (0,09%)	7	0	0
JACAREÚBA/ KATAUIX (RESTRIÇÃO USO)	Isolated peoples	AM	28,81 (0,05%)	0	0	0
CABECEIRA DO RIO ACRE	Yaminawa	AC	25,39 (0,05%)	13	2	0
BARREIRA DA MISSÃO	Kambéba e Kokama	AM	17,74 (0,03%)	180	7	5
JAQUIRI	Kambéba	AM	14,07 (0,03%)	9	0	1
IGARAPÉ GRANDE	Kambéba	AM	11,90 (0,02%)	0	0	0
MARAJAI	Matsés	AM	9,80 (0,02%)	472	2	2

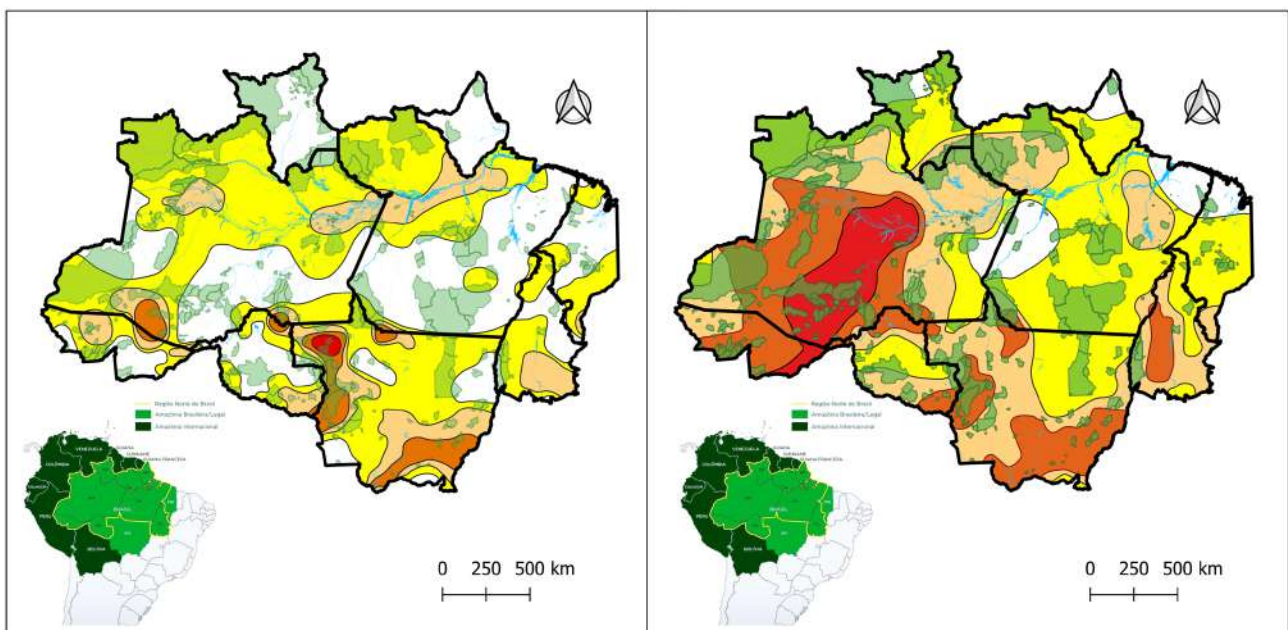
MERIA	Miránha	AM	5,83 (0,01%)	1	0	0
KAXARARI	Kaxarari	RO	4,67 (0,01%)	0	0	0
TOTAL	15 peoples and 1 iso- lated people	3	53.752,23	3032	110	40

Table 5. Territories located in regions of extreme drought in the month of July. Amazonas, Acre, and Rondônia states (a total of 42 Indigenous Territories). Prepared by Greenpeace and GEMTI.

State	Area (km2)	Households/ Families Affected	Schools Affected	Health Units Affected
Amazonas	293.838,70 (93,03%)	89.271	976	270
Acre	21.570,57 (6,83%)	207.386	613	447
Rondônia	438,78 (0,14%)	1.934	6	1
TOTAL	315.848,06	298.591	1.595	718

Table 6. States of the Brazilian Amazon affected by extreme drought and their respective households, schools, and health units. Prepared by Greenpeace and GEMTI.

**Monitor de Secas:
Mapa comparativo da seca extrema em Julho de 2023 e Julho de 2024.**



INFORMAÇÕES TÉCNICAS

Sistema de Referência de Coordenadas SIRGAS 2000.
Fonte dos dados: Monitor de Secas - Agência Nacional de Águas e Saneamento Básico, COIAB, INPE, IBGE, Greenpeace.

- Estados da Amazônia Brasileira
- Territórios Indígenas
- Massas D'água
- Seca Extrema (S3)
- Seca Grave (S2)
- Seca Moderada (S1)
- Seca Fraca (S0)
- Sem Seca Relativa



Figura 5 Monitor de Secas. Mapa comparativo do mês de Julho nos anos de 2023 e 2024. Elaboração GEMTI.

The extreme drought spanning 2023 and 2024 is the most intense in Brazil's history, according to CEMADEN. Since the beginning of data monitoring, there has never been a more critical state than the current one. We observe that since the 1990s, drought conditions have become increasingly frequent and prolonged, culminating in extreme periods year after year.

The year 2023 was marked by a record drought in the Amazon. However, without sufficient time for effective water recharge in 2024, and still within the situation of the continuation and worsening of the previous drought, the trend for the second half of 2024 points to the worsening of extreme drought conditions, surpassing the historical record set in October 2023.

Consequently, the extreme drought of 2024, which currently has mainly affected Amazonas state, is expected to reach its most critical point two months earlier than in the 2023 historical record. Starting from the end of August, the extreme drought will continue through September, lasting through the beginning of October, according to the Civil Defense of the State of Amazonas.

Comparing the years, the extreme drought in July 2023 affected 15,000 km² or **1.5 million hectares**. The extreme drought of 2024 currently is affecting 315,000 km² or 31 million hectares, indicating a **2000% increase in the areas affected by the extreme drought**.

Tracking severe drought, indicated in orange, there was a **479%** increase in the affected areas from July 2023 to July 2024. In July 2023, 207,000 km² or 20 million hectares were affected, while in July 2024, 1.2 million km² or 124 million hectares were affected.

Progression of extreme, severe, and moderate drought in August and September as observed and recorded by Indigenous Monitoring Agents (AMI) of the Brazilian Amazon

The territories that are not at the epicenter of the extreme drought, but are classified as experiencing severe or moderate drought, have also been significantly affected, both by the drying of rivers and by wildfires and air pollution. Thiago Parintintins, a monitoring technician at Coiab and AMI, shared with the monitoring network some records of the drought's progression in August and early September in his territory. According to the image below, the records were taken in Aldeia Canavial, showing the Ipixuna River, Ipixuna Indigenous Territory (Humaitá - Amazonas state). It can be observed that this territory is located in an area predominantly experiencing moderate drought, transitioning to severe drought. In this classification, it is already possible to observe agricultural crop loss, drying rivers, and persistent dry conditions, as documented by the following images:

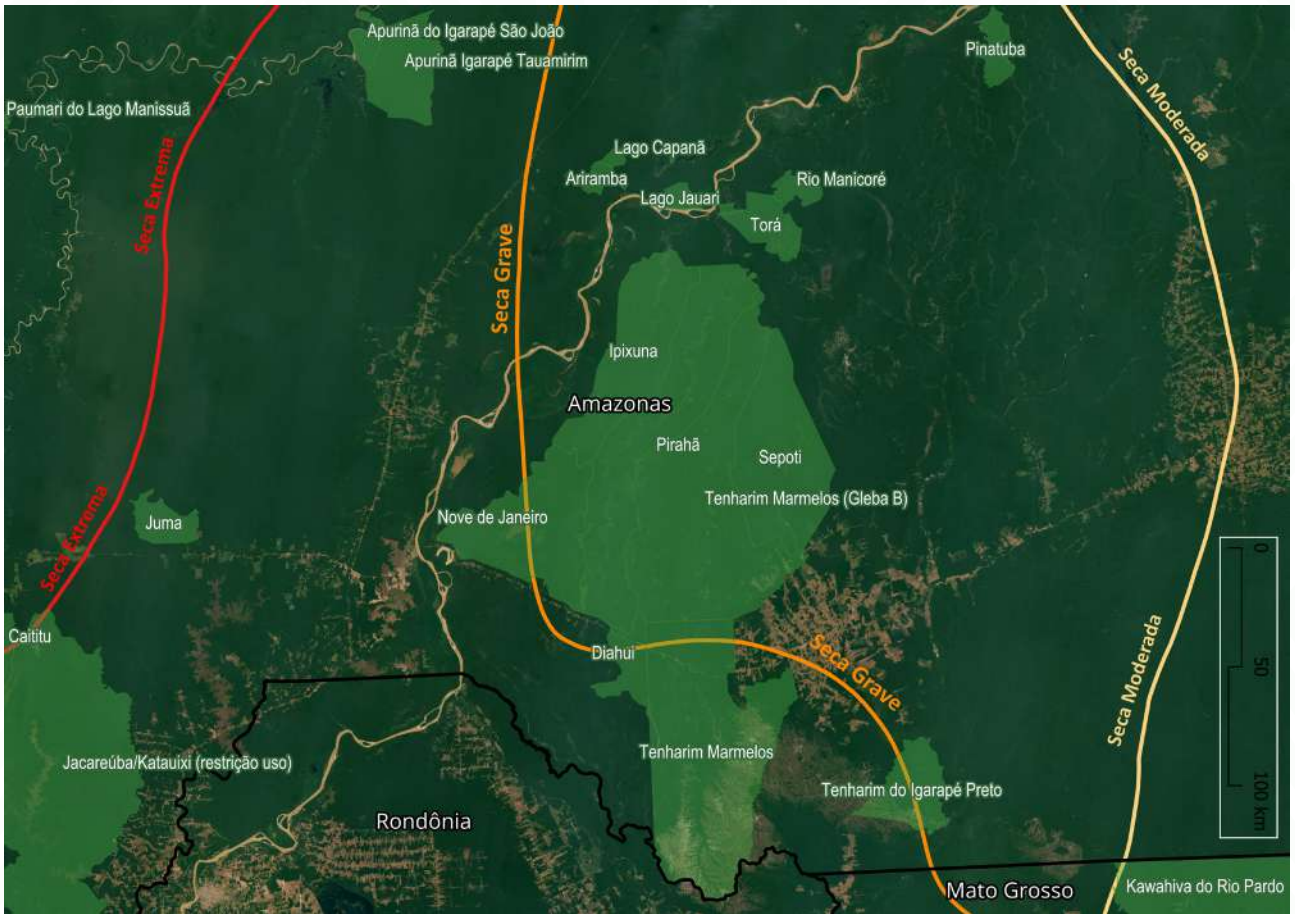


Image 1. Location and Drought Classification of Ipixuna Indigenous Territory. Prepared by GEMTI.



Image 2. Ipixuna River on August 3, 2024 (Ipixuna Indigenous Territory - Amazonas state). Credit: GEMTI via drone.



Image 3. Ipixuna River on August 3, 2024 (Ipixuna Indigenous Territory - Amazonas state). Credit: GEMTI via drone.



Image 4. Ipixuna River on August 15, 2024 (Ipixuna Indigenous Territory - Amazonas state). Credit: GEMTI via drone.



*Image 5. Ipixuna River and wildfires on September 1, 2024 (Ipixuna Indigenous Territory - Amazonas state).
Credit: GEMTI via drone.*



*Image 6. Ipixuna River and wildfires on September 1, 2024 (Ipixuna Indigenous Territory - Amazonas state). Credit:
GEMTI via drone.*



Image 7. Wildfires and air pollution on September 1, 2024 (Ipixuna Indigenous Territory - Amazonas state). Credit: GEMTI via drone.



Image 8. Ipixuna River on September 4, 2024 (Ipixuna Indigenous Territory - Amazonas state). Credit: GEMTI via drone.



Image 9. Ipixuna River on September 4, 2024 (Ipixuna Indigenous Territory - Amazonas state). Credit: GEMTI via drone.



Image 10. Ipixuna River and wildfires on September 4, 2024 (Ipixuna Indigenous Territory - Amazonas state).



Image 11. Record of the carcass of a pirarucu fish killed due to the drought.
Credit: Donizete Javé, Indigenous Monitoring Agent in Tocantins state.



Image 12. Drought at Lagoa do Bananal, Javaés River, Tocantins state. Pirarucu rescue. Credit: Donizete Javé, Indigenous Monitoring Agent of Tocantins state.

Lagoa do Bananal is located within Bananal Island, along the Javaés River, which is one of the branches of the Araguaia River. This lagoon is situated in the northern part of the island and is an important natural formation that is part of the region's complex hydrological system. Moreover, the lagoon is a historic and sacred place where the history of the Javaé people originates, with Marani-Hawá being the village responsible for the area within the Inãwébohona Indigenous Territory.

The position of Lagoa do Bananal is strategic within the flow of the Javaés River, as it helps regulate the water flow and serves as a habitat for various aquatic species and migratory birds. It is also a traditional use area for the Indigenous communities living on Bananal Island. However, today the lagoon is completely dry. According to the Drought Monitor, this region is classified as experiencing moderate drought, demonstrating that even less severe drought processes still lead to significant losses throughout the Amazon.

This is the first time the lagoon has completely dried up, according to local leaders. Many tons of dead animals from dozens of species have been identified, such as the following fish species: Pirarucu, Surubim, Pintado, Catfish, Pacu, and Tucunaré. Through the action of the Indigenous Monitoring Agents (AMI) alongside the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), it was possible to rescue some Pirarucu and small Cascudo fish.



*Image 13. Record of the carcass of a Pirarucu fish killed due to the drought.
Credit: Donizete Javé, Indigenous Monitoring Agent of Tocantins state.*



*Image 14. Drought at Lagoa do Bananal, Javaés River, Tocantins state.
Credit: Donizete Javé, Indigenous Monitoring Agent of Tocantins state.*



Image 15. Dredger for illegal gold mining stranded during the drought of the Marupá River (Munduruku Indigenous Territory - Pará state). Date: September 2024. Credit: Wakoborun Indigenous Audiovisual Collective of Alto Tapajós @coletivowakoborun.



Image 15. Dredger for illegal gold mining stranded during the drought of the Marupá River (Munduruku Indigenous Territory - Pará state). Date: September 2024. Credit: Wakoborun Indigenous Audiovisual Collective of Alto Tapajós @coletivowakoborun.

Map of Extreme and Severe Drought in Ethnoregions in Coiab's coverage area (the nine states of the legal Amazon)

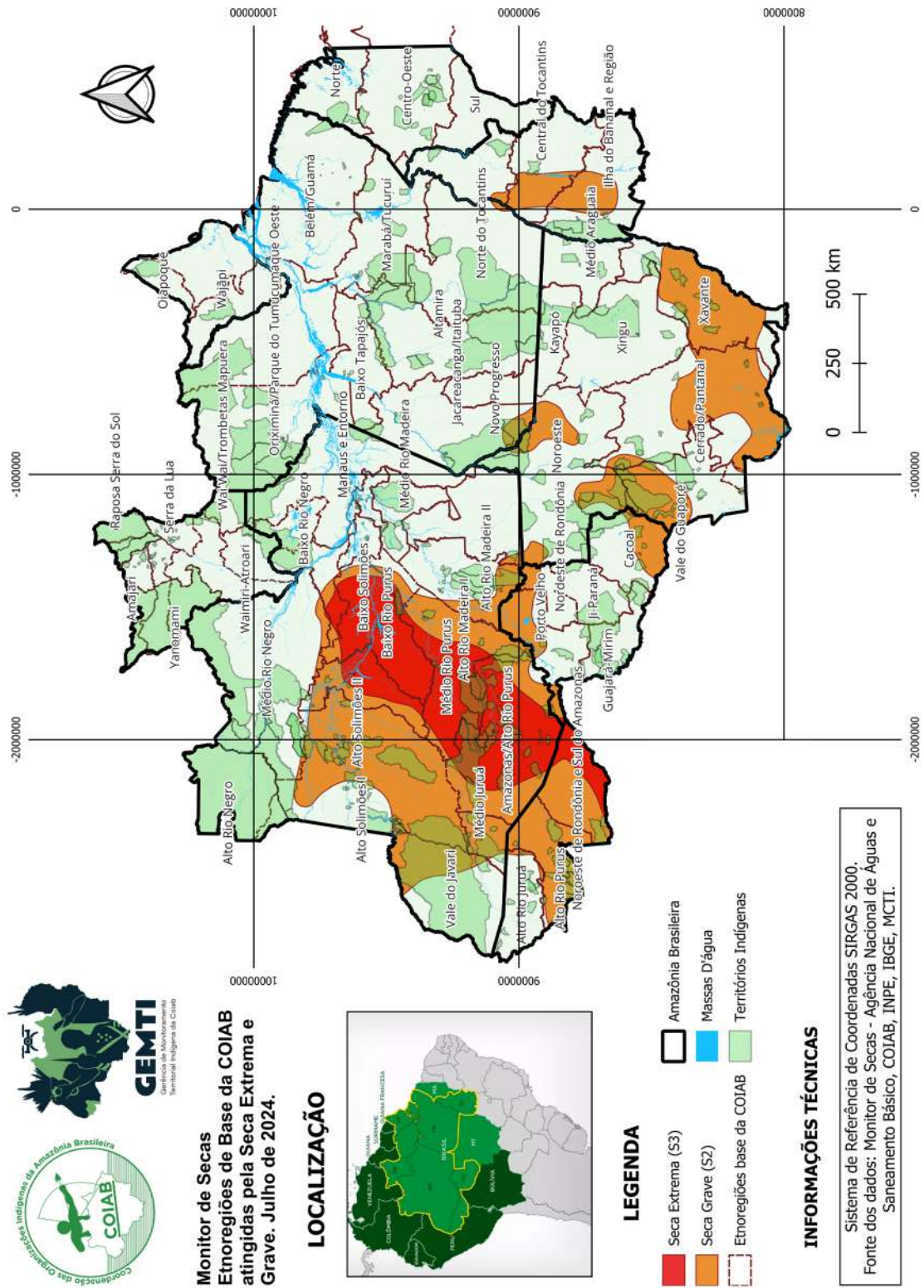


Figure 6. Drought Monitor - Ethnoregions of Coiab's coverage area (the nine states of the legal Amazon) affected by extreme and severe drought in July 2024. Prepared by GEMTI.

Ethnoregions in Coiab's coverage area in extreme drought:

Region	State
Baixo Rio Negro	AM
Médio Solimões	AM
Alto Solimões II	AM
Médio Rio Purus	AM
Amazonas/Alto Rio Purus	AM
Noroeste de Rondônia e Sul do Amazonas	AC
Porto Velho	RO

Table 7. Coiab ethnoregions affected by extreme drought in July 2024.

The mapping of extreme and severe drought across Coiab's ethnoregions shows that 7 of them are experiencing extreme drought, with 5 in the central and western regions of Amazonas, one in the far east of Acre, and one in the far west of Rondônia. As for severe drought, it is more widespread, experienced in 14 of Coiab's ethnoregions, distributed as follows: 5 along the central, southern, and western regions of Amazonas; one in the central region of Acre; one in the southeastern region of Rondônia; 4 in the western, northern, and southern borders of the state of Mato Grosso; and finally, one in the central region of Tocantins.

Ethnoregions in Coiab's coverage area experiencing severe drought:

Region	State
Vale do Javari	AM
Médio Juruá	AM
Alto Solimões I	AM
Alto Rio Madeira I	AM
Médio Rio Negro	AM
Alto Rio Purus	AC
Cacoal	RO
Noroeste	MT
Vale do Guaporé	MT
Cerrado/Pantanal	MT
Xavante	MT
Central do Tocantins	TO
Ilha do Bananal e Região	TO
Jacareacanga/Itaituba	PA

Table 8. Coiab's coverage area ethnoregions affected by severe drought in July 2024.




3 . Drought Vulnerability Index

The Drought Vulnerability Map is comprised of the index of municipalities in the Brazilian Amazon that are most vulnerable to the effects of climate change, with a focus on drought. It highlights the Indigenous Territories located in municipalities classified with a very high vulnerability index.

The database used was provided by the Information and Analysis System on Climate Change Impacts (Adapta Brasil - Ministry of Science, Technology, and Innovation), which aims to consolidate, integrate, and disseminate information to advance analyses of the impacts of these changes on national territory.

The vulnerability index represents the degree of susceptibility to damage with the potential for change and transformation of the socio-ecological system when confronted with a threat. The composition of this vulnerability is associated with the sensitivity and adaptive capacity of the socio-ecological system to climate changes, with a focus on extreme drought. Therefore, the vulnerability index is the result of the combination of the sensitivity and adaptive capacity indices.





**Mapa de Vulnerabilidade à Seca:
Índice dos Municípios da Amazônia
Brasileira vulneráveis aos efeitos das
Mudanças Climáticas**

LOCALIZAÇÃO

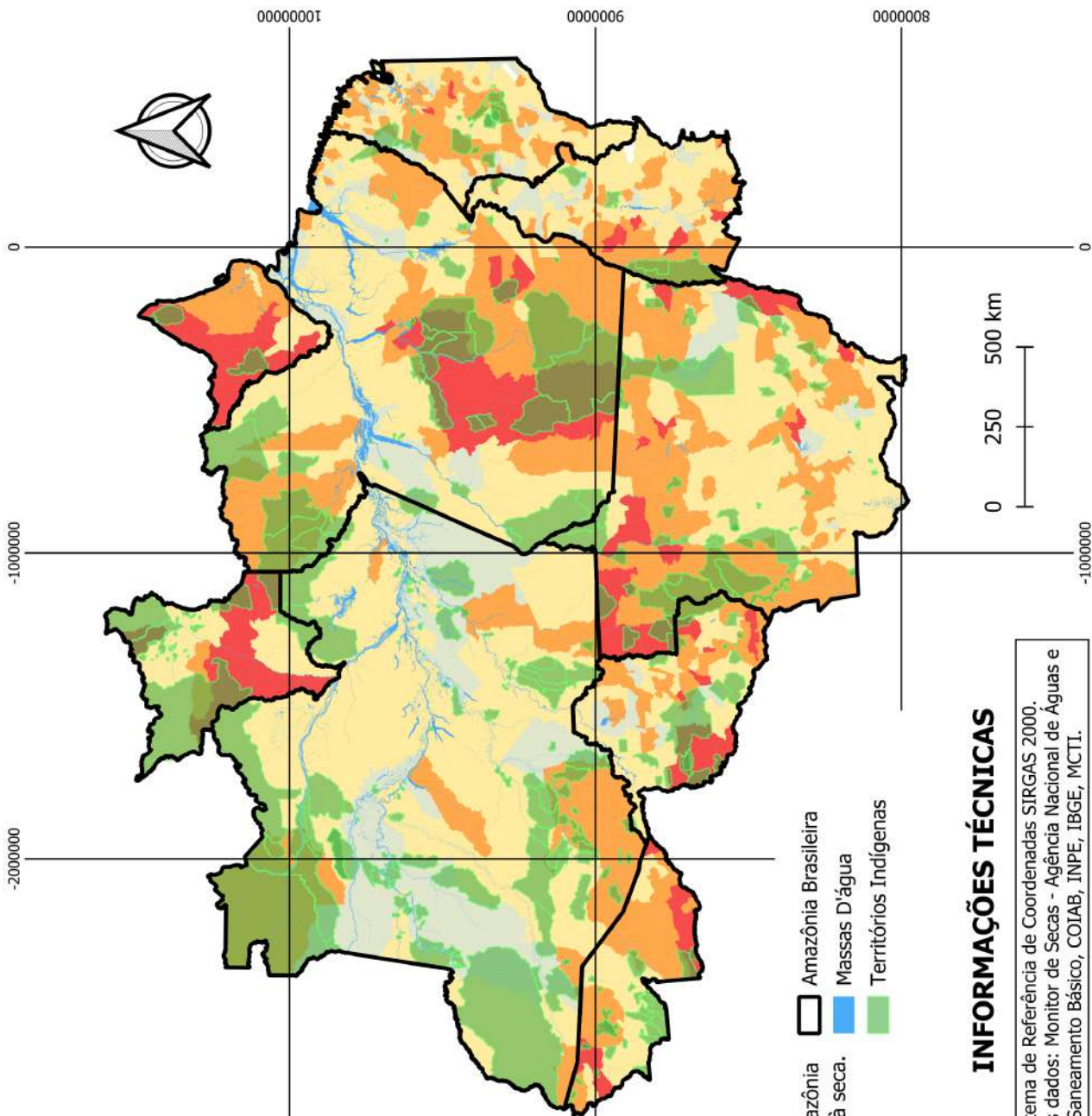


LEGENDA

- Alto
- Baixo
- Medio
- Muito alto
- Muito baixo

Índice de Vulnerabilidade dos Municípios da Amazônia aos efeitos das Mudanças Climáticas. Destaque à seca.

- Amazônia Brasileira
- Massas D'água
- Territórios Indígenas



INFORMAÇÕES TÉCNICAS

Sistema de Referência de Coordenadas SIRGAS 2000.
Fonte dos dados: Monitor de Secas - Agência Nacional de Águas e Saneamento Básico, COIAB, INPE, IBGE, MCTI.

Figure 7. Drought Vulnerability Map: Index of municipalities in the Brazilian Amazon vulnerable to the effects of climate change. Prepared by GEMTI.

The mapped vulnerability index, along with the Climate Exposure and Threat indices, forms the umbrella index of Climate Impact Risk from Drought, all of which belong to the strategic sector of Impacts on Water Resources in the Adapta Brasil System. In this way, the vulnerability index is also composed of the sensitivity and adaptive capacity indices, as follows:

Sensitivity Index

Thematic indicators

Supply and demand of water resources

- I. Surface water unavailability
- II. Quantitative surface water balance
- III. Water demand for multiple uses

Limited access and inefficiency in water use in the public supply system.

- IV. Population not served by the water supply network
- V. Water losses in the supply system
- VI. Average per capita water consumption
- VII. Population isolation due to distance from water bodies and roads

Risks to environmental health

- VIII. Occurrence of diseases related to inadequate environmental sanitation
- IX. Water quality for multiple uses

Adaptive Capacity Index

Thematic indicators

Planning and risk management for water resources

- X. Level of participation in basin committees
- XI. Level of implementation and coordination of the municipal basic sanitation plan
- XII. Adherence to the Resilient Cities program
- XIII. Programs or actions for drought impact prevention
- XIV. Per capita investment in adaptation policies and infrastructure for environmental protection

Water supply and storage capacity

- XV. Water storage and reservation
- XVI. Alternatives to water supply

Household socioeconomic capacity

- XVII. Household income not compromised by water charges
- XVIII. Households with per capita income higher than two minimum wages

Indigenous Territories located in municipalities highly vulnerable to climate change in relation to drought

Acre State

Indigenous Territory	Indigenous Peoples	Municipality
Campinas/Katukina	Katukina	Cruzeiro do Sul
Jaminawa do Igarapé Preto	Yaminawa	Cruzeiro do Sul
Mamoadate	Manchineri e Yaminawa	Assis Brasil
Cabeceira do Rio Acre	Yaminawa	Assis Brasil

Table 9. Indigenous Territories in Acre state located in municipalities classified as most vulnerable to the effects of Climate Change related to drought (a total of 4 Indigenous Territories).

Roraima state

Indigenous Territory	Indigenous Peoples	Municipality
Yanomami	Yanomami	Iracema
Raposa Serra do Sol	Taulipáng, Makuxí, Ingarikó, Wapichana	Pacaraima
São Marcos - RR	Makuxí e Wapichana	Pacaraima
Wai Wai	Mawayána	Caroebe e Caracara
Jacamim	Jaricuna e Wapichana	Caracara
Trombetas/Mapuera	Katuena, Xereu, Wai Wai, Tunayana, Sikiyana, Hixkaryána, Karafawyana, Waimiri Atroari and Isolated peoples.	Caroebe e São João da Baliza

Table 10. Indigenous Territories in Roraima state located in municipalities classified as most vulnerable to the effects of Climate Change related to drought (a total of 6 Indigenous Territories).

Pará state

Indigenous Territory	Indigenous Peoples	Municipality
Xikrin do Rio Catete	Kayapó	Parauapebas e Água Azul do Norte
Menkragnoti	Kayapó	Altamira
Baú	Kayapó	Altamira

Panará	Panará	Altamira
Kuruáya	Kuruáya	Altamira
Xipaya	Xipaya e Kuruáya	Altamira
Cachoeira Seca	Arara do Pará	Altamira
Arara	Arara do Pará	Altamira
Kararaô	Kayapó	Altamira
Araweté Igarapé Ipixuna	Araweté	Altamira
Koatinemo	Asurini do Xingu	Altamira
Ituna/Itatá (restrição de uso)	Isolated peoples	Altamira
Trincheira Bacajá	Araweté e Asurini do Xingu	Altamira
Arara da Volta Grande do Xingu	Arara do Pará	Senador José Porfírio

Table 11. Indigenous Territories in Pará state located in municipalities classified as most vulnerable to the effects of Climate Change related to drought (a total of 14 Indigenous Territories).

Rondônia State

Indigenous Territory	Indigenous Peoples	Municipality
Igarapé Lage	Pakaa Nova	Guajará Mirim
Pakaa Nova	Pakaa Nova	Guajará Mirim
Rio Negro Ocaia	Pakaa Nova	Guajará Mirim
Uru-Eu-Wau-Wau	Uru-Eu-Wau-Wau	Guajará Mirim
Sagarana	Pakaa Nova	Guajará Mirim
Rio Guaporé	Makuráp	Guajará Mirim
Roosevelt	Cinta Larga	Espigão D' oeste

Table 12. Indigenous Territories in Rondônia state located in municipalities classified as most vulnerable to the effects of Climate Change related to drought (a total of 7 Indigenous Territories).

Amapá State

Indigenous Territory	Indigenous Peoples	Municipality
Waiãpi	Waiãpi	Laranjal do Jari e Pedra Branca do Amapari
Uaçá	Karipuna	Oiapoque
Galibi	Galibi do Oiapoque	Oiapoque
Jumina	Karipuna e Galibi do Oiapoque	Oiapoque

Table 13. Indigenous Territories in Amapá state located in municipalities classified as most vulnerable to the effects of Climate Change related to drought (a total of 4 Indigenous Territories).

Mato Grosso State

Indigenous Territory	Indigenous Peoples	Municipality
Kawahiva do Rio Pardo	Isolated peoples	Colniza
Arara do Rio Branco	Arara do Rio Branco and Isolated peoples	Colniza
Piripkura (restrição de uso)	Isolated peoples	Colniza e Rondolândia
Sete de Setembro	Suruí de Rondônia	Rondolândia
Zoró	Zoró	Rondolândia
Roosevelt	Cinta Larga	Rondolândia
Wedezé	Xavante	Cocalinho
Tapirapé/Karajá	Tapirapé/Karajá	Luciara
São Domingos - MT	Karajá	Luciara
Cacique Fontoura	Karajá	Luciara
Krenrehé	Krenák	Luciara

Table 14. Indigenous Territories in Mato Grosso state located in municipalities classified as most vulnerable to the effects of Climate Change related to drought (a total of 11 Indigenous Territories).

Tocantins State

Indigenous Territory	Indigenous Peoples	Municipality
Apinayé	Apinayé	Cachoeirinha

Table 15. Indigenous Land in Tocantins state located in a municipality classified as most vulnerable to the effects of Climate Change related to drought (a total of 1 Indigenous Land).

A total of 47 Indigenous territories are located in municipalities with high vulnerability to climate change related to extreme drought processes. Among the affected peoples, 5 are isolated Indigenous peoples. In summary, these territories are experiencing a situation of very high vulnerability in terms of sensitivity to drought and the adaptive capacity of the territories. In other words, the vulnerability index brings together a set of indicators that reveal the basic conditions for coping with these extremes, such as water availability, water balance, water demand, population isolation, levels of coordination, water storage technologies, socioeconomic data, and others.



4 . Wildfires

There has been a decrease in deforestation and fires in municipalities with historical records of devastation, given the current administration's efforts to combat illegal logging and fires. However, in 2024, there has been an **increase in heat hotspots, exacerbated by the extreme drought** affecting large parts of the Brazilian Amazon, causing **new areas to burn**, including more preserved parts of the forest that are now more vulnerable to fire. This worsening drought has led to a **36% increase in wildfires in the Amazon**, according to the Amazon Environmental Research Institute (IPAM), from 2022 to 2023. The indicated **heat hotspots** are areas detected by satellites **where the temperature exceeds 47°C**, potentially indicating the presence of fires or burning areas. Given the increasing occurrence of extremes and fires in Brazil, **all heat hotspots are considered potential indicators of burning areas.**

In 2023, the worst drought in 125 years was recorded, and the trend for the remainder of 2024 is the worsening of this drought, surpassing the historical record of 2023. This has resulted in a **78% increase in forest fires in 2024**. According to the Oswaldo Cruz Foundation (Fiocruz) and the World Wildlife Fund (WWF) Brazil (2021), the wildfires in the Amazon were responsible for an increase in hospital admissions for respiratory problems from 2010 to 2020 in the states with the highest number of heat hotspots: Pará, Mato Grosso, Rondônia, Amazonas, and Acre.

The health care costs resulting from the wildfires amounted to nearly R\$1 billion in public funds during this period. The research also indicates that the combination of the COVID-19 pandemic with forest fires in the Amazon may have worsened the health situation of the population in the Brazilian Amazon as a whole, as pollutants from the fires can cause a persistent inflammatory response, increasing the risk of infection by viruses that affect the respiratory tract.

In Amazonas state, between 2010 and 2020, about 80% of hospital admissions for respiratory diseases were related to high concentrations of smoke containing respirable and inhalable particles. In Pará, 68% were related, as well as 70% in Mato Grosso and Rondônia states, demonstrating a widespread and gradual process of worsening illness among populations as a consequence of wildfires and air pollution.

According to the maps prepared from May to August 2024, the wildfires have been increasing in scale each month, affecting different states in the Amazon, with a significant rise in August. The data used were provided by the BDQueimadas program, part of the National Institute for Space Research (INPE).

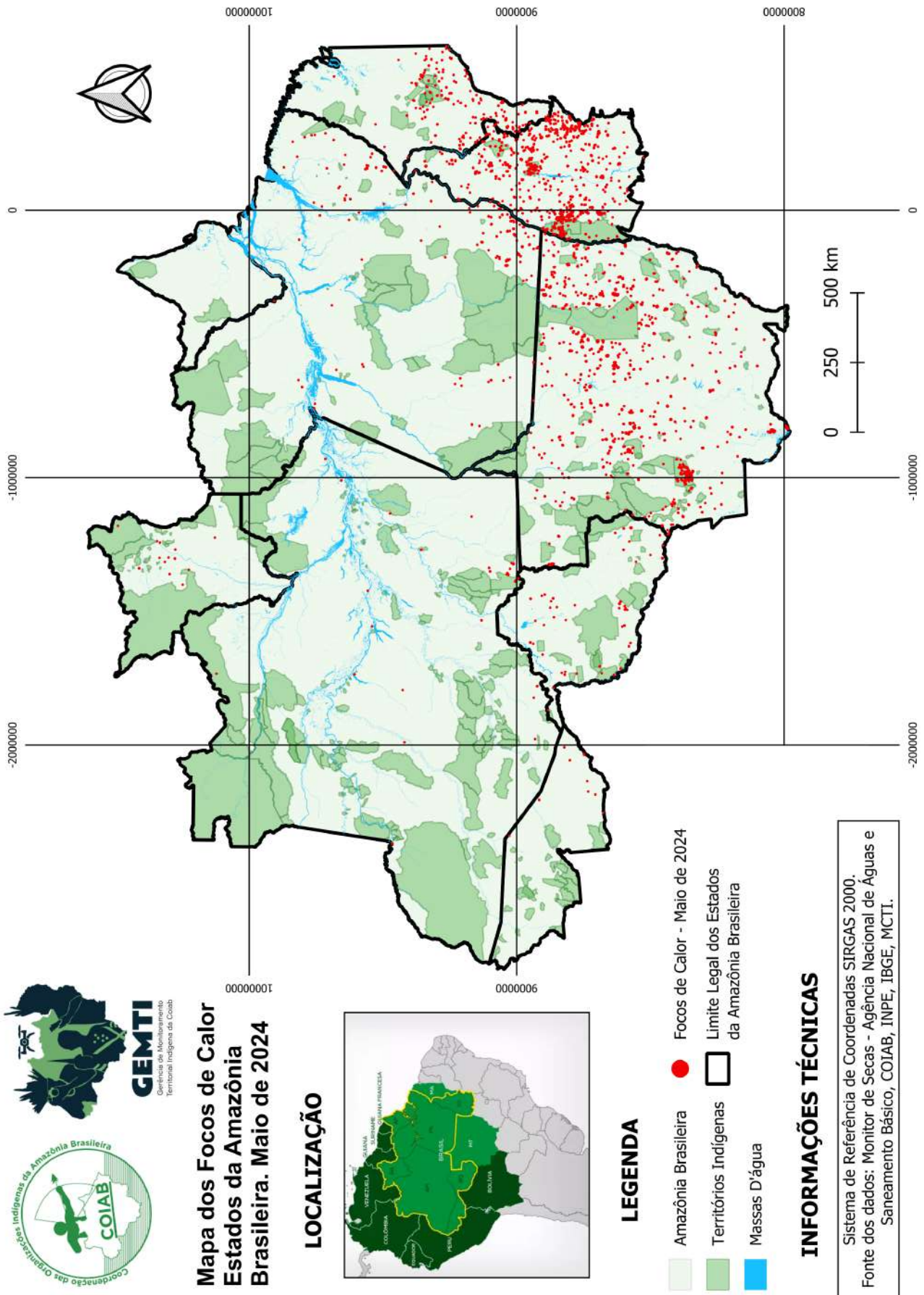


Figure 8. Map of heat hotspots in May 2024. Prepared by GEMTI.

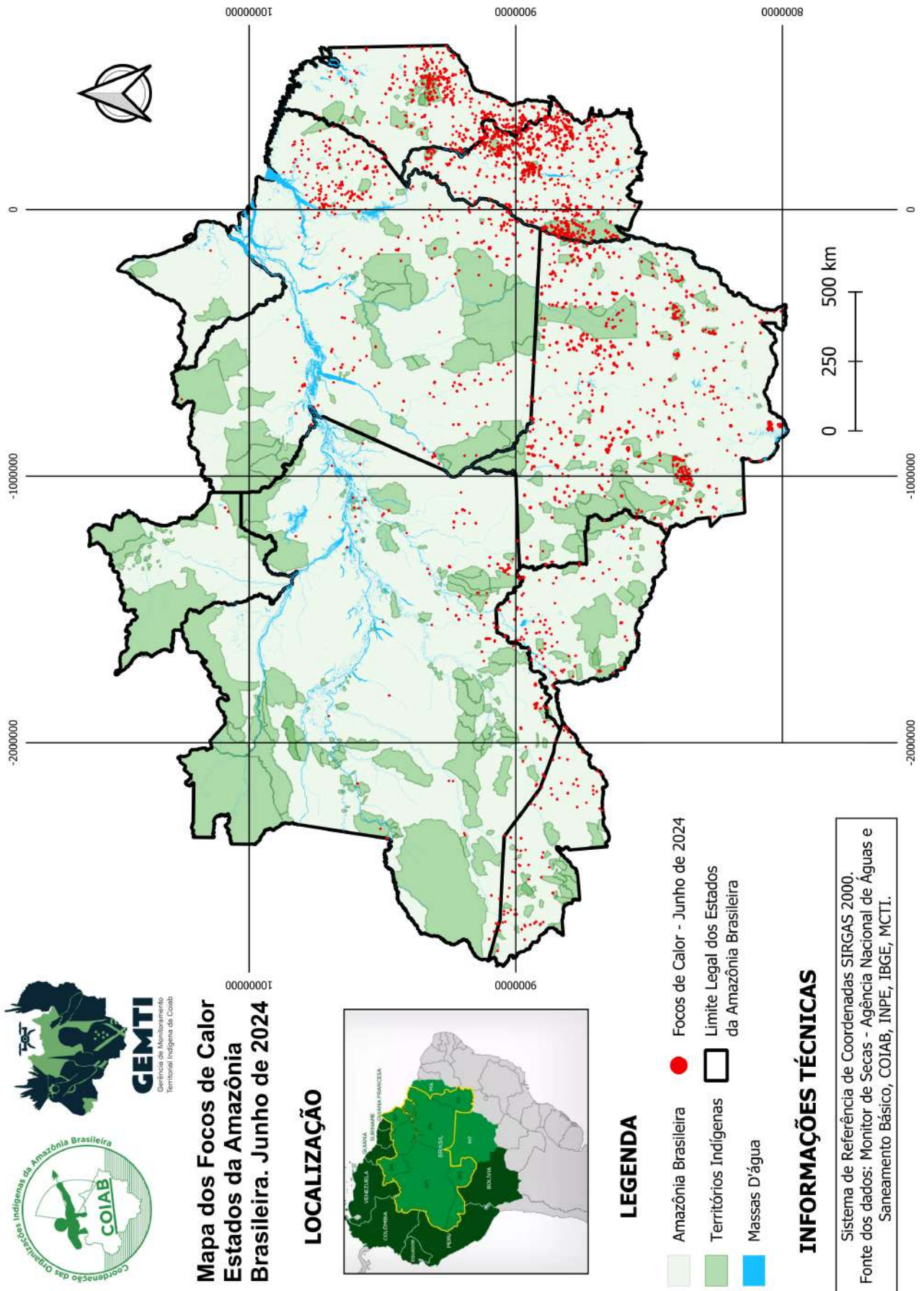


Figure 9. Map of heat hotspots in June 2024. Prepared by GEMTI.



July 2024

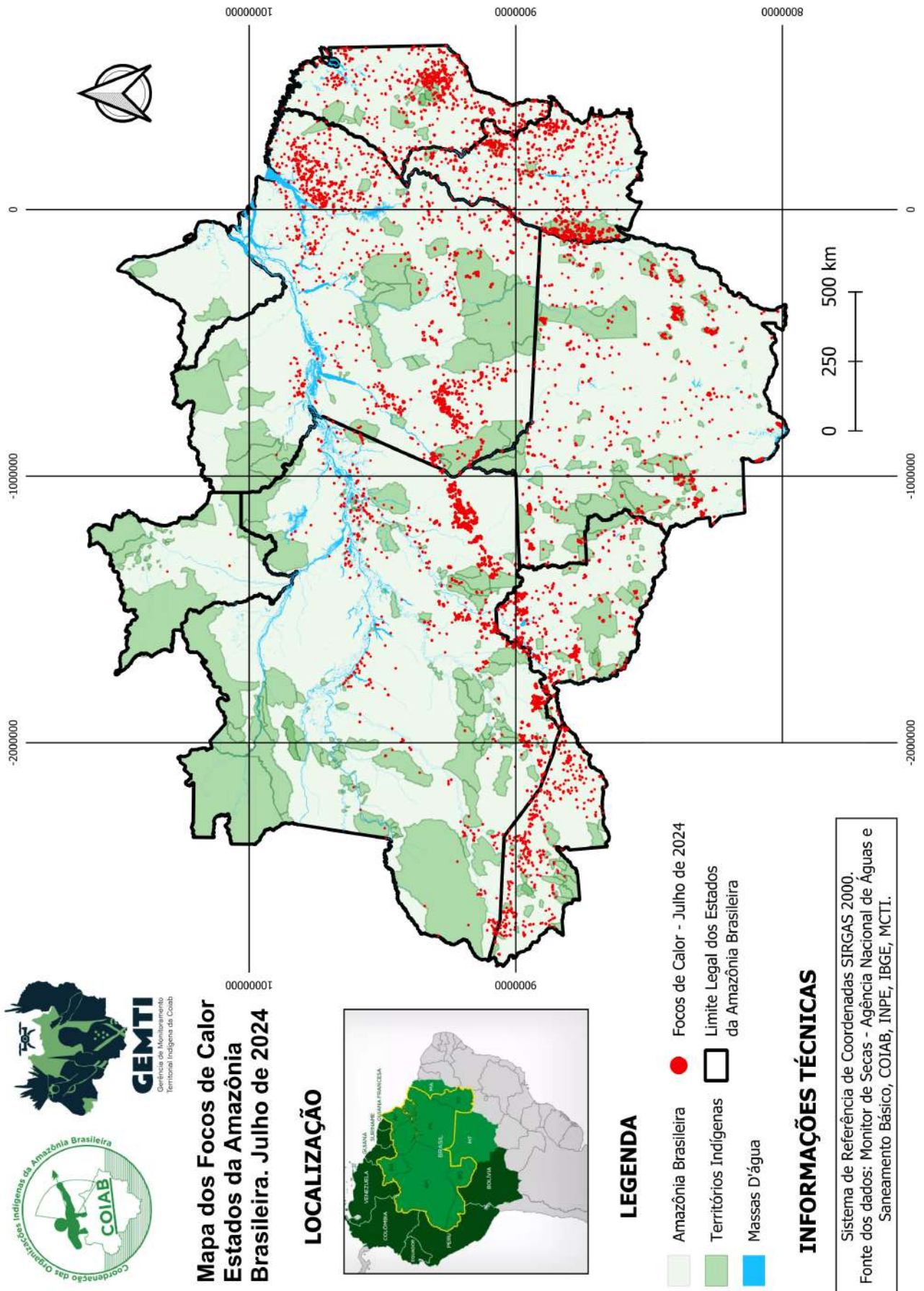


Figure 10. Map of heat hotspots in July 2024. Prepared by GEMTI.

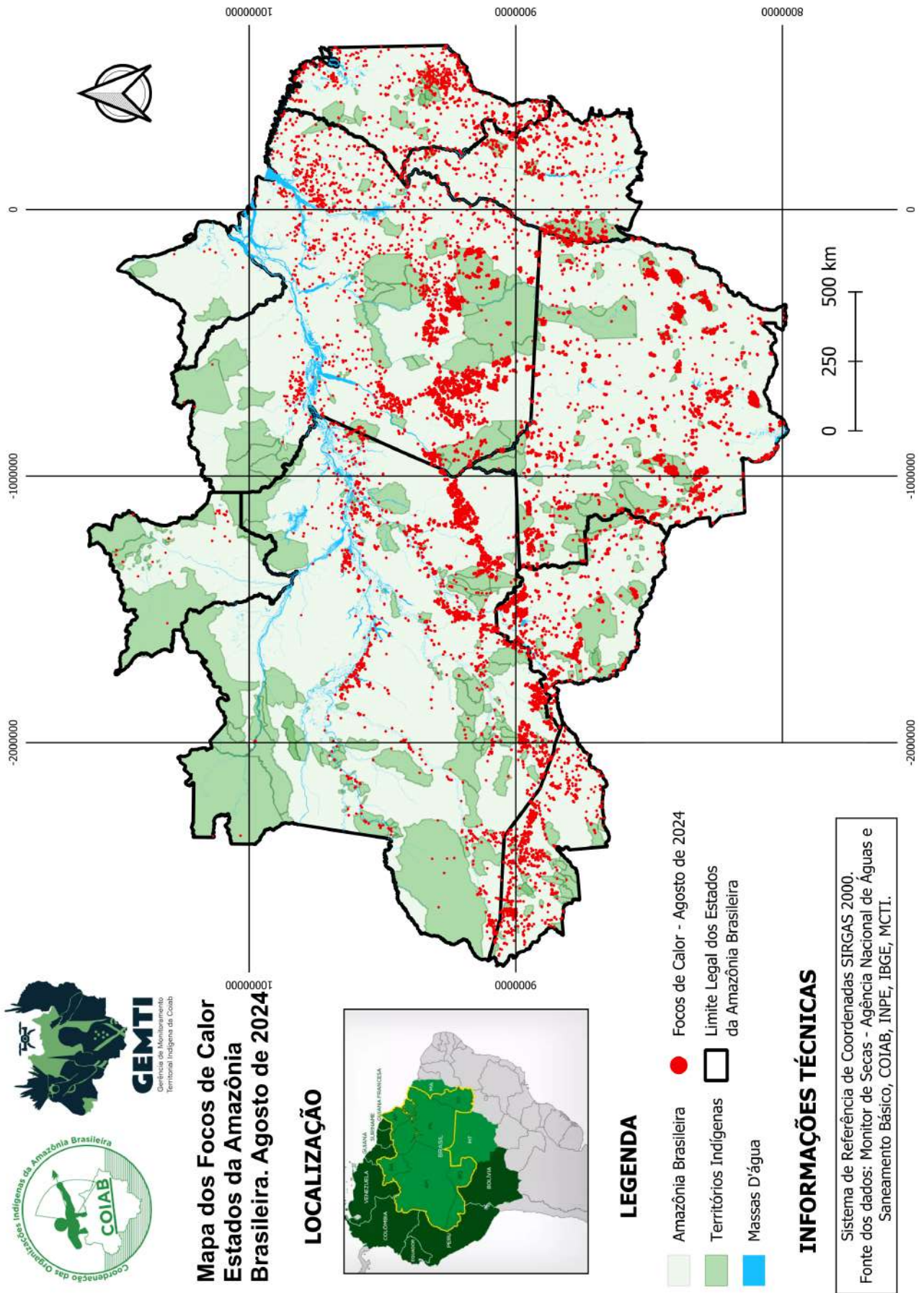


Figure 11. Map of heat hotspots in August 2024. Prepared by GEMTI.

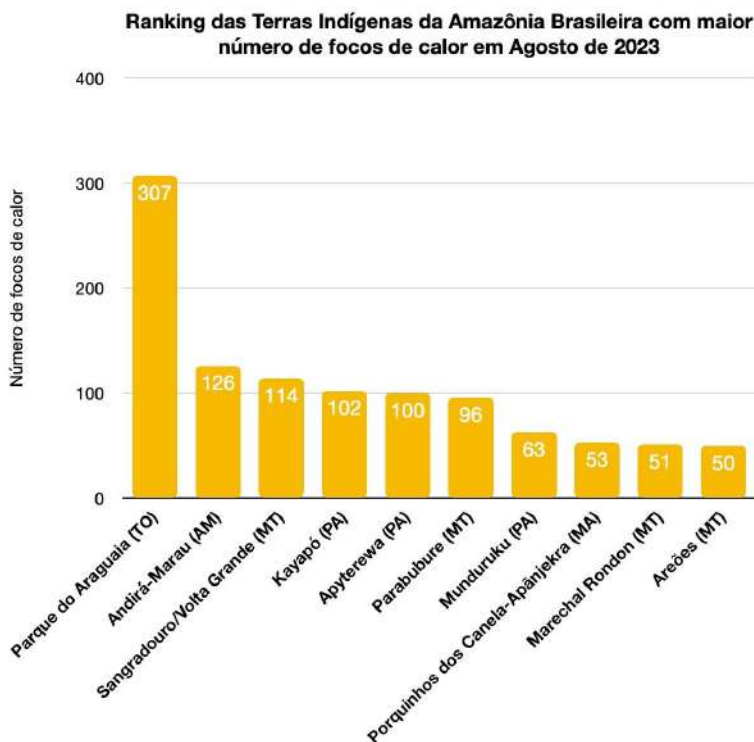
Degradation and deforestation make the forest more vulnerable and flammable. Therefore, the current context of extreme drought has increased the likelihood that landscapes will become fuel for large illegal fires, burning new areas within the forests and regions that have lost their moisture during the extreme drought of 2023 and 2024.

In the deforestation process, there is a great availability of ignition sources for fires, such as all the leftover organic matter like branches, leaves, and trunks, which provide fuel for the large increase in heat hotspots. We've observed the appearance of a particular type of fire in the Amazon to complete this deforestation work by burning the remaining organic matter, creating a link between the rise in deforestation and the increase in heat hotspots.

However, even with a 20% decrease in deforestation in the Amazon in 2023, and a 38% decrease in the same phenomenon in the first half of 2024 compared to the same period the previous year, the extreme drought has created various fire-prone scenarios, causing the number of wildfires to increase progressively despite the reduction in deforestation (INPE, 2024).

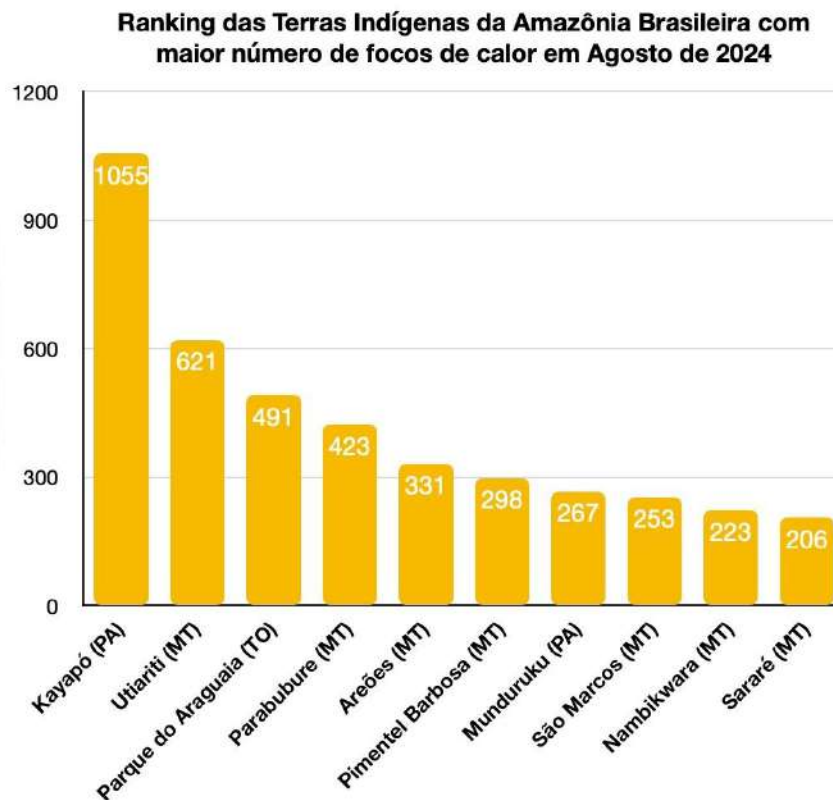
In August 2024 alone, fires covered 2.5 million hectares, an area approaching the size of Alagoas state, according to the Laboratory for Environmental Satellite Applications (LASA - UFRJ). With 68,000 fire hotspots across the country in August, **the Brazilian Amazon alone accounted for 50,000 hotspots, representing 73% of all wildfires in August 2024.** This signals a 139% increase compared to the same period in 2023, when 20,000 hotspots were recorded (INPE, 2024).

The states leading the ranking of heat hotspots from January to August 2024 are: Mato Grosso with 29% of the total hotspots, Pará with 27%, and Amazonas with 21% of the total heat hotspots. To provide a basis for comparison, the data on heat hotspots in Indigenous Territories is presented for August 2023, August 2024, and the entire period of 2024.



Graph 1. Ranking of Indigenous Territories in the Brazilian Amazon with the highest number of heat hotspots in August 2023. Prepared by GEMTI.

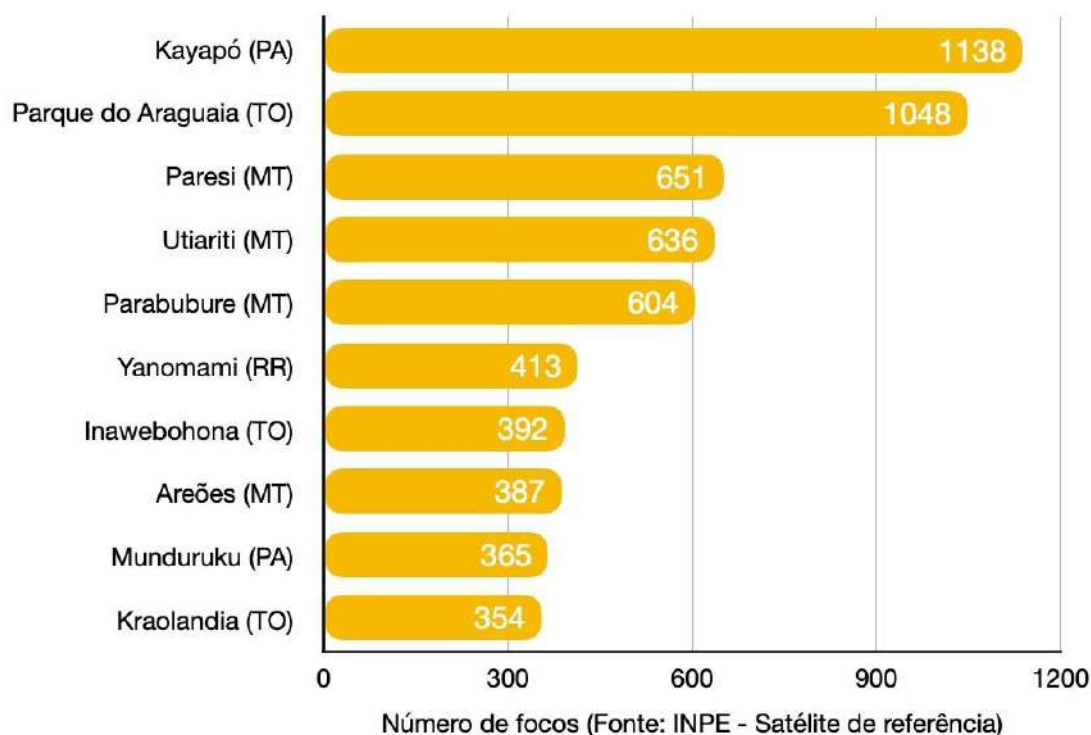
Regarding the Indigenous territories that had the highest number of heat hotspots in August 2023, a **wider distribution of fires can be observed across different states in the Brazilian Amazon**, covering the following territories: 4 territories in Mato Grosso, namely Sangradouro/Volta Grande, Parabubure, Marechal Rondon, and Areões; 3 territories in Pará, namely Kayapó, Apyterewa, and Munduruku; one territory in Tocantins, namely Parque do Araguaia, which recorded the highest number of heat hotspots in Indigenous Territories, with an impressive 307 recorded; one territory in Amazonas, namely Andirá-Marau; and finally, one territory in Maranhão, namely Porquinhos dos Canela-Apãnjekra.



Graph II. Ranking of Indigenous Territories in the Brazilian Amazon with the highest number of heat hotspots in August 2024. Prepared by GEMTI.

The Indigenous territories that recorded the highest number of heat hotspots in **August 2024** reveal a **greater concentration of wildfires within the Indigenous territories of Mato Grosso**, drawing attention to the state, which accounts for seven of the 10 territories in the ranking. Together, these territories recorded 2,355 heat hotspots in August 2024. The highlighted areas include: 7 territories in Mato Grosso, namely Utiariti, Parabubure, Areões, Pimentel Barbosa, São Marcos, Nambikwara, and Sararé; 2 territories in Pará, namely Kayapó and Munduruku, which together recorded 1,322 heat hotspots, with TI Kayapó leading by a wide margin with 1,055 hotspots recorded in its territory alone; and finally, one territory in Tocantins, namely Parque do Araguaia, with 491 hotspots.

Ranking das Terras Indígenas da Amazônia Brasileira com maior número de focos de calor em 2024 (Jan-Ago)



Graph III. Ranking of Indigenous Territories in the Brazilian Amazon with the highest number of heat hotspots January to August 2024. Prepared by GEMTI.

Regarding the Indigenous territories that recorded the highest number of heat hotspots throughout 2024, the following territories topped the list: 4 territories in Mato Grosso, namely Paresi, Utiariti, Parabubure, and Areões, together totaling 2,278 heat hotspots, led by Paresi with 651 hotspots; 3 territories in Tocantins, namely Parque do Araguaia, Inawebohona, and Kraolândia, registering a combined total of 1,794 hotspots, led by TI Parque do Araguaia with 1,048 hotspots; as well as 2 territories in Pará, namely Kayapó and Munduruku, together accounting for 1,503 heat hotspots, with TI Kayapó leading the entire 2024 ranking with 1,138 hotspots in its territory alone; and finally, one territory in the state of Roraima, the Yanomami, with 413 heat hotspots.

Maintaining the trend of wildfire hotspots in Indigenous territories in August 2023 and August 2024, as well as the continuation of heat hotspots throughout the available historical series for 2024 (January to August), the following territories stand out:

- **Parabubure and Areões Indigenous Territories in Mato Grosso state**, which appear in the heat hotspot rankings for August 2023, August 2024, and the overall 2024 ranking, covering the historical series from January to August. In August 2024, there was a 340% increase in TI Parabubure and a 562% increase in TI Areões compared to the same period of the previous year;
- **Kayapó and Munduruku Indigenous Territories in Pará state**, which respectively show a 934% and 323% increase in heat hotspots in August, compared to the same period in 2023;
- **Parque do Araguaia Indigenous Territory in Tocantins state**, which is represented in the heat hotspot rankings across all analysis periods, demonstrating a recurring vulnerability and showing a 59% increase in heat hotspots compared to the same period in August 2023.

5 . River Levels

Monitoring of River Levels in the Brazilian Amazon. River Levels Below the Historical Minimum for July



Figure 12. Map of river levels below the historical minimum for July. Source: SipamHidro - Integrated Hydrometeorological Monitoring and Alert System (Censipam)

Amazonas State

Station	Last Measurement	Historical Low for this Month	Historical High for this Month	Percentage below Historical Low for this Month
Estirão do Repouso	2,28	3,09	3,14	26%
Tabatinga	0,04	0,08	9,66	50%
Gavião	16,38	18,14	18,19	10%
Tefé - Missões	1,64	3,02	14,95	45%
Boca do Acre	2,73	3,42	6,57	20%
Humaitá	9,25	10,19	16,98	9%
Carreiro	8,56	12,79	12,89	33%
Itacoatiara	7,36	10,64	22,62	31%
Base Alalaú	38,49	39,24	39,37	2%

Table 16. Nine channels and rivers in Amazonas state that are below the historical minimum for July.

Roraima State

Station	Last Measurement	Historical Low for this Month	Historical High for this Month	Percentage below Historical Low for this Month
Maracá	5,39	7,29	7,38	26%
Fazenda Paraíso	6,14	9,65	10,17	36%

Table 17. Two channels and rivers in Roraima state that are below the historical minimum for July.

Acre State

Station	Last Measurement	Mínima do Mês	Máxima do Mês	Porcentagem abaixo da mínima
Ponte de Tarauacá	2,35	3	7,85	22%
Sena Madureira	0,38	0,62	4,82	39%
Espalha (Seringal Belo Horizonte)	0,3	0,35	0,36	14%
Brasília / Epitaciolândia	0,72	0,79	0,81	9%
Palácio de Castro	1,83	2,06	2,07	11%

Table 18. Five channels and rivers in Acre state that are below the historical minimum for July.

Rondônia State

Station	Last Measurement	Historical Low for this Month	Historical High for this Month	Percentage below Historical Low for this Month
Morada Nova Jusante	7,86	8,67	8,71	9%
Ji-Paraná	6,11	6,14	6,99	0,5%
Porto Velho	1,37	1,88	10,04	27%
Pimenta Bueno	3,45	3,64	4,54	5%
Pedras Negras	2,25	2,40	5,30	6%
PCH Santa Luzia D' oeste Rio Branco	403,89	404,01	404,04	0,2%

Table 19. Six channels and rivers in Rondônia state that are below the historical minimum for July.

Mato Grosso State

Station	Last Measurement	Historical Low for this Month	Historical High for this Month	Percentage below Historical Low for this Month
Cáceres	0,39	0,58	0,61	33%
Santo Antônio do Leverger	2,24	2,27	2,27	1,5%
Rondonópolis	0,97	1	1,02	3%
Aruanã	1,08	1,29	1,31	16%
PCH Cabeça de Boi Montante 2	2,3	2,41	2,43	4%

Table 20. Five channels and rivers in Mato Grosso state that are below the historical minimum for July.

Tocantins State

Station	Last Measurement	Historical Low for this Month	Historical High for this Month	Percentage below Historical Low for this Month
Araguacema	2,22	2,42	2,44	8%
Fazenda Dois Rios	1,41	1,62	1,67	13%
Barreira do Pequi	0,87	0,98	0,99	11%
Peixe Angical Fazenda Barreiro	6,75	7,30	7,36	7%
UHE Peixe Angical Fazenda Visão de Santana	2,88	2,94	2,96	2%

Barra de Palmas	2,91	3,26	3,31	11%
UHE São Salvador Rio Cana Brava	2,09	2,15	2,19	3%

Table 21. Eight channels and rivers in Tocantins state that are below the historical minimum for July.

Maranhão State

Station	Last Measurement	Historical Low for this Month	Historical High for this Month	Porcentagem abaixo da mínima
Cantanhede	2,33	2,52	2,53	7%
Coroatá	1,19	1,31	1,34	9%
Caxias	1	1,05	1,07	33%
UHE Estreito Montante I	5,4	5,50	5,55	2%

Table 22. Four channels and rivers in Maranhão state that are below the historical minimum for July.

Pará State

Station	Last Measurement	Historical Low for this Month	Historical High for this Month	Percentage below Historical Low for this Month
Estirão Da Angélica	3,57	4,35	4,47	18%
Almeirim	3,15	3,90	5,36	19%
UHE Curuá-una Rio Mojú	2,63	2,72	2,73	3%
UHE Santo Antônio do Jari Chafariz de Cima	6,06	6,49	6,51	7%
Laranjal do Jari	4,29	4,64	5,57	8%
UHE Belo Monte Jusante	3,8	4,10	4,44	7%
UHE Belo Monte do Bacajá	4,66	4,83	4,84	4%
Cafezal	2,36	2,67	2,69	12%
Boa Vista do Gurupi	2,61	2,84	4,94	8%

Table 23. Nine channels and rivers in Pará state that are below the historical minimum for July.



Amapá State

Station	Last Measurement	Historical Low for this Month	Historical High for this Month	Percentage below Historical Low for this Month
UHE Cachoeira Caldeirão Rio Amapari II	3,26	4,29	4,34	24%
UHE Cachoeira Caldeirão Montante II	5,21	5,56	5,62	6%

Table 24. Two channels and rivers in Amapá state that are below the historical minimum for July.

During July, 50 channels or rivers were identified with levels below the previously recorded minimum for the month. In general, Amazonas state has the highest percentage of rivers below the historical minimum for July, with the difference between the last recorded river level and the lowest previously observed for the period reaching up to 50%. States like Roraima and Acre also show river levels below the recorded minimum by up to 30%.

It is worth highlighting the critical levels of the following hydrological stations in Amazonas state: a) Estirão do Repouso (AM) with the last river measurement at 2.28, where the lowest minimum previously recorded for the period was 3.09, representing a 26% drop in the river level; b) Tefé - Missões (AM), with the last measurement at 1.64 vs. the lowest minimum previously recorded at 3.02, representing a 45% drop in the river level; c) Carreiro (AM) with the last measurement at 8.56 vs. the lowest minimum previously recorded at 12.79, showing a 33% drop in the river level; d) Tabatinga (AM) with the last measurement at 0.04 and the lowest minimum previously recorded at 0.08, presenting a 50% drop in river levels that are already in a critical situation; e) Itacoatiara (AM) with the last measurement at 7.36 vs. the lowest minimum previously recorded at 10.64, indicating a 31% drop in the river level.

Regarding the other states, the following stations stand out: f) Sena Madureira (AC) with the last measurement at 0.38 vs. the lowest minimum previously recorded for this period at 0.62, showing a 39% drop; g) Porto Velho (RO) with the last measurement at 1.37 vs. the lowest minimum previously recorded at 1.88, indicating a 37% drop in the river level; and h) Cáceres (MT), with the last measurement at 0.39 vs. the lowest minimum previously recorded at 0.58, indicating a 33% drop in the river level.

6 . Conclusion

In the present circumstances of worsening and record-breaking climate extremes, Indigenous peoples are on the front lines when it comes to the most affected vulnerable territories. The classification of droughts, the climate change vulnerability index, as well as minimum river levels and wildfires, are the key indicators used to analyze the context of extreme drought in the Brazilian Amazon. This dataset reveals heightened water stress and very high vulnerability to climate events caused by the extreme drought spreading throughout the Amazon.

The Indigenous Territorial Monitoring Management of Coiab understands that the main strategy for addressing adaptation and mitigation of the effects of climate change is the strengthening of the demarcation of Indigenous territories, a cause that is considered the mother of all struggles within the Indigenous movement. To create a horizon of resilience in the face of climate extremes, it is necessary to consistently demarcate and protect Indigenous territories, conservation units, and public forests, which means strategies from defending already demarcated territories to advancing the demarcation of territories currently under study as well as in self-demarcation processes. Ensuring the protection of these territories is an investment in the climate resilience of the country and the Amazon as a whole.

Along with the central strategy of demarcation, it is also crucial to strengthen our Indigenous relatives who carry out monitoring and defense work in the territories, particularly supporting the Indigenous volunteer and federal brigades, as well as the autonomous teams and groups protecting the Indigenous lands. This ancestral care ensures that Indigenous territories are better preserved than the surrounding areas, highlighting the role of Indigenous lands as a barrier to degradation, deforestation, and wildfires.

Finally, Coiab, through the Indigenous Territorial Monitoring Management, has been building and consolidating a qualified land surveillance network for the Amazon—a living, collective organism for the defense of territories, led by Indigenous peoples. The roles of both the Indigenous Monitoring Agent (AMI) and the Indigenous Environmental Agent (AAI) need to be recognized and strengthened so that we can advance the strategic capacity building of communities, a key action for preserving Indigenous territories, which serve as the main line of defense in promoting global climate resilience.



Theoretical Framework



I. Agência Nacional das águas e Saneamento Básico - ANA. Monitor de Secas do Brasil. Meses de julho de 2023 e de maio a julho de 2024.

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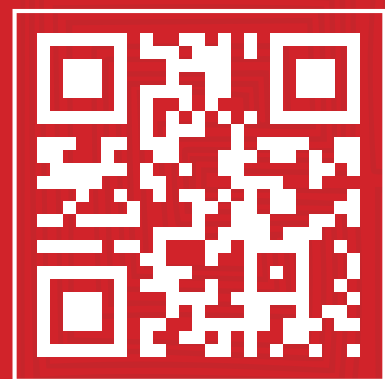


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