

# DISASTER RISK REDUCTION IN BRAZIL: AN INNOVATIVE APPROACH FOR EARLY WARNING SYSTEM – THE CEMADEN EXPERIENCE

## PH-US-UNCTAD HARNESSING STI FOR DRR WORKSHOP

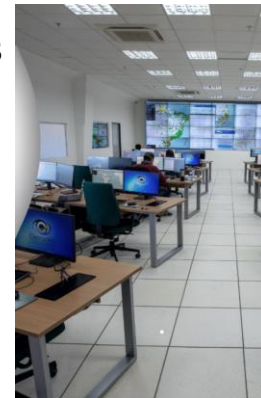
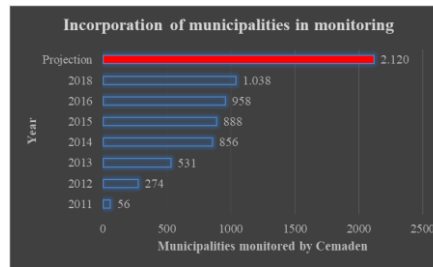
Manila, Feb 29 – March 01, 2024



## MISSION OF CEMADEN/MCTI IN THE MANAGEMENT AND DISASTER RISK REDUCTION

CEMADEN, a Research Unit of the Regimental Structure of the Ministry of Science, Technology and Innovation – MCTI, has established a climate-related disaster early warning system, adopting the scientific, technological and innovation capacity to continually improve the early warning for the national territory. For this, use a **hydro-geo-meteorological monitoring networks and modeling technologies and forecasts** to anticipate, as efficiently and effectively as possible, the impacts of natural disasters on society, infrastructure and the environment.

CEMADEN also **monitors** and predicts the impacts on various sectors of **water scarcity and severe droughts** for the whole country.



CEMADEN is the only Center in Brazil dedicated to carrying out **research on natural disaster governance and risk reduction and applying it towards operational early warning systems (alerts).**

In fact, by means of combining observational and research capacities in meteorology, hydrology and geology, as well in social sciences and communication, the Center aims to **develop state-of-the-art technologies for monitoring and forecasting conditions that may lead to climate-and weather-related natural disasters.**

Risk monitoring and forecasting and the operational work needed to assess risk follow the main premises of the **Sendai Framework for Disaster Risk Reduction (UNDRR).**



# Situation Room: The “core” of CEMADEN



Meteorology Experts

Geoscience Experts

Hydrology Experts

Natural Disaster  
(Social) Experts

00h-06h

06h-12h

12h-18h

18h-00h

Work  
shifts

- ✓ **1038** municipalities monitored in all regions of Brazil (> **8 million people** living in geohydrological risk areas)
- ✓ More than 25.000 early warnings has been sent to the Civil Defenses since December 2011 (48% landslide-related warnings)
- ✓ Monitoring 24h per day, 7 days per week (never stopped working)

I - monitoring, diagnosing and evaluating the **impacts of droughts on strategic activities** for Brazil;

II - advising government institutions and decision makers about the **diagnosis, future scenarios and assessment of impacts associated with weather and climate extremes**;

III - contributing to the development of a **policy of interaction with society** including **education, communication and mobilization strategies for risk management and reduction of vulnerabilities to disasters**;

IV - contributing to the **expansion of the environmental monitoring network** in Brazil, based on the development of systems oriented to the use of modern, **low-cost, flexible, reliable and scalable technologies**.





# CEMADEN CONTRIBUTION TO THE DEVELOPMENT OF THE PERCEPTION OF CLIMATE-RELATED DISASTERS AND RISK REDUCTION

Environmental monitoring and applied research directed to natural disasters monitoring and sustainable development

## Axis 1

Monitoring and early warning

## Axis 2

Environmental monitoring/  
Socio Demographic observations

## Axis 3

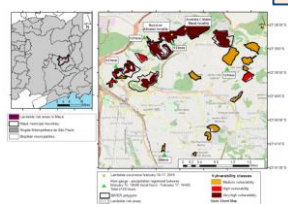
Research and products that provide information for public policies and decision making

## Axis 4

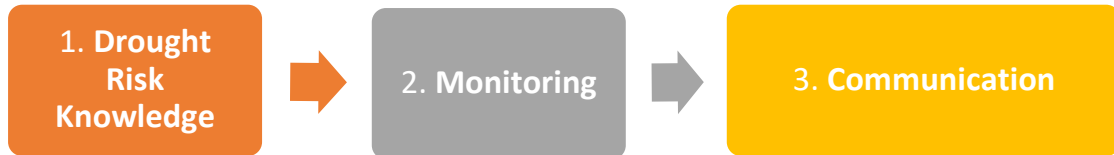
Education – Network of Schools and communities for disaster prevention and risk reduction

## Axis 5

Strategic national and International partnerships



# RESEARCH AND MONITORING IN DISASTERS RELATED TO DROUGHT

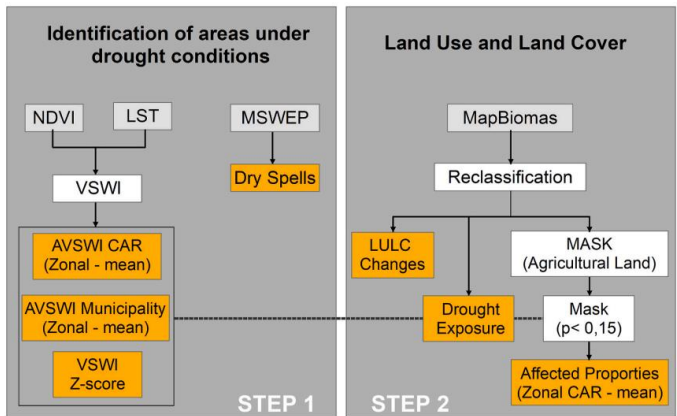
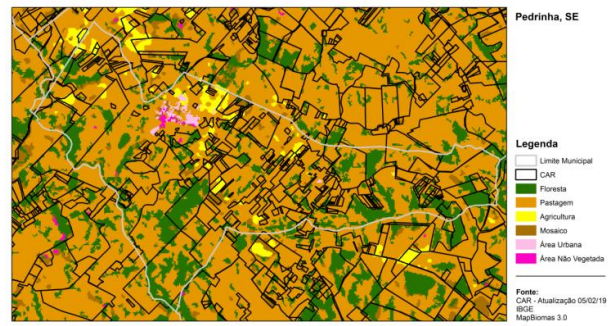


## 1. INTERDISCIPLINARY RESEARCH: KNOWLEDGE OF DROUGHT-RELATED DISASTER RISK

- ✓ Sub-Seasonal to Seasonal Prediction of Weather Extremes
- ✓ Agrometeorology in Extreme Events and Natural Disasters
- ✓ Drought impacts and wildfires in Amazonia
- ✓ Modeling and monitoring: Water scarcity
- ✓ Developments for Monitoring and Management of Critical Hydrological Events in Brazil
- ✓ Drought Risk Management in Brazil

# DROUGHT IMPACT ASSESSMENT

Monthly IDI+ rural properties polygons +  
land use mask: Estimation of rural properties  
affected by Drought by size



	2012 (km <sup>2</sup> )	2013 (km <sup>2</sup> )	2014 (km <sup>2</sup> )	2015 (km <sup>2</sup> )	2016 (km <sup>2</sup> )	2017 (km <sup>2</sup> )
■ Micro	44,610 (9,233)	36,285 (7,415)	22,735 (6,259)	64,324 (11,726)	34,716 (7,597)	54,603 (10,523)
■ Semi-Small	10,586 (14,614)	8,273 (11,569)	8,797 (12,613)	12,526 (16,490)	9,422 (12,930)	11,728 (15,639)
■ Medium	3,344 (16,199)	2,742 (13,243)	3,166 (15,367)	3,560 (16,896)	3,115 (14,965)	3,521 (16,741)
■ Large	1,062 (29,579)	965 (27,356)	1,060 (29,941)	1,099 (29,941)	1,031 (28,798)	1,088 (29,771)



New approach for drought assessment: A case study in the northern region of Minas Gerais

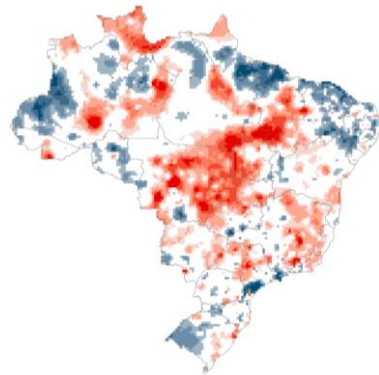
Lidiane Cristina Costa, Ana Paula Martins do Amaral Cunha, Líana O. Anderson,

Fig. 2. Flowchart of the proposed method.

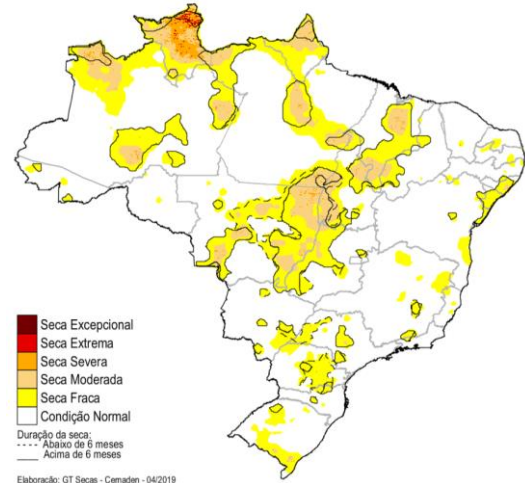
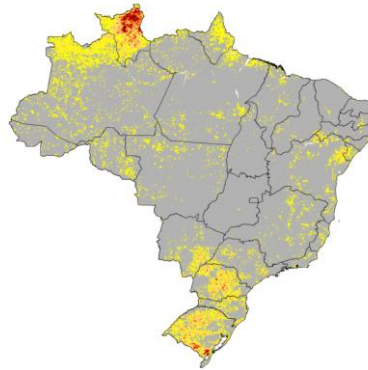


# Research and Monitoring: Integrated Drought Index (IDI)

SPI – 3, 6 or 12 months



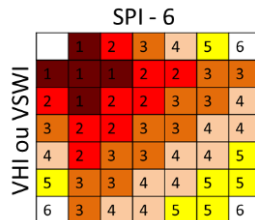
VSWI or VHI



Elaboração: GT Secas - Cemaden - 04/2019

SPI	VHI	Drought Classification
> -0.5	> 40	Normal
-0.5 to -0.8	30 to 40	Abnormally Dry
-0.8 to -1.3	20 to 30	Moderate Drought
-1.3 to -1.6	12 to 20	Severe Drought
-1.6 to -2.0	6 to 12	Extreme Drought
> -2.0	< 6	Exceptional Drought

- an integrated tool for estimating the impact of drought
- It incorporates meteorological and agricultural drought characteristics



## APPLIED RESEARCH ON DROUGHT RISK MITIGATION

Identification of municipalities affected → Water distribution by water tanker truck to the rural population affected by drought.



Federal Government Action



RESEARCH

MONITORING

COMUNICACION

ACTION

# 3. Communication of Disaster Risks Related to Droughts



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Publicado em 21/02/2024 13h58 | Atualizado em 21/02/2024 14h13

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Carrossel

A. ÍNDICE INTEGRADO DE SECA (IIS3): JANEIRO/2024 (Média municipal)



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Publicado em 16/02/2024 14h57

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Risco de Seca na Agricultura Familiar

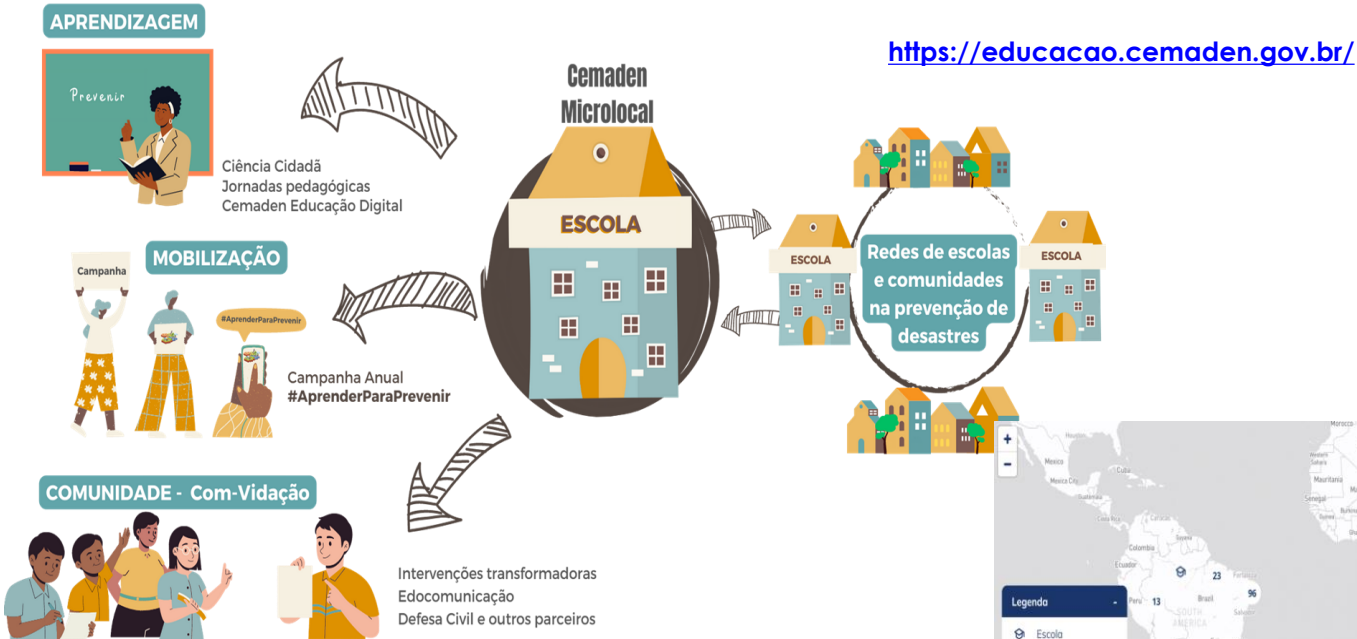
ÍNDICE INTEGRADO DE SECA PARA AGRICULTURA

Products available in a Interactive Map in

<http://mapasecas.cemaden.gov.br/>

# CEMADEN EDUCATION PROGRAM: Network of schools and communities in disaster prevention

It mobilizes young people and communities to build knowledge, reflect and act to prevent disaster risks



Recognized by UNFCCC - Education and Training: Good Practices.

[http://unfccc.int/cooperation and support/education and outreach/education and training/items/8992.php](http://unfccc.int/cooperation%20and%20support/education%20and%20outreach/education%20and%20training/items/8992.php)

# CEMADEN

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<https://www.gov.br/cemaden/pt-br>

<https://educacao.cemaden.gov.br/>

