



MINISTÉRIO DA
CIÊNCIA, TECNOLOGIA,
INOVAÇÕES E COMUNICAÇÕES



Mesa Redonda:

Novos Problemas, Novos olhares

Liana O. Anderson

liana.anderson@cemaden.gov.br

<http://www.liana-anderson.org>



MINISTÉRIO DA
CIÊNCIA, TECNOLOGIA,
INOVAÇÕES E COMUNICAÇÕES



Mesa Redonda:

Novos Problemas, Novos olhares

- 1. Pontos de reflexao**
- 2. Projeto Piloto: estado do Acre**
3. Melhoria no sistema de alerta de risco de incendios

a Amazonia



Torre LBA – Sinop
Liana 2003



a Amazonia



Torre LBA – Sinop
Liana 2003



Extremos na Amazonia



sign in become a supporter subscribe search

October 2005

theguardian

home UK world sport football opinion culture business lifestyle fashion environment tech travel

home > environment climate change wildlife energy pollution

Environment

Amazon dries out as worst ever drought hits rainforest

- Drop in water level affects towns dependent on river
- Crisis blamed on Gulf coast hurricanes

Large parts of the [Amazon rainforest](#) are at their driest in living memory, a direct consequence, scientists say, of the severe hurricane season off the US Gulf coast.

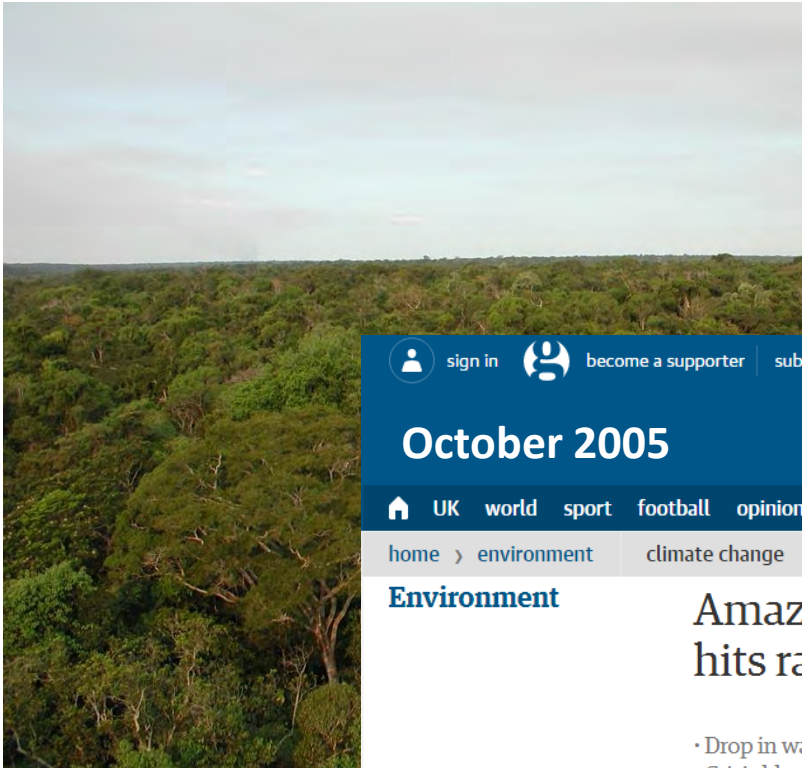
Rainfall has been significantly below average this year along the Rio Solimoes and the Rio Madeira, two of the major Brazilian tributaries that flow into the Amazon, causing water levels to drop to record lows. Rivers and lakes are drying up, revealing huge sandbanks and making navigation difficult for boats. Since many towns are only accessible by river, medicine, food and fuel are running out in some communities.

Alex Bellos in Manaus

@alexbellos

Saturday 1 October 2005 02.44 BST

Extremos na Amazonia



BBC Sign in News Sport Weather Shop Earth Travel

NEWS October, 2010

Home Video World UK Business Tech Science Magazine Entertainment & More

World Africa Asia Australia Europe Latin America Middle East US & Canada

Severe drought afflicts Brazilian Amazon

23 October 2010 | Latin America & Caribbean

Facebook Twitter WhatsApp Email Share

sign in become a supporter subscribe

October 2005

UK world sport football opinion

home > environment climate change

Environment

Alex Bellos in Manaus

@alexbellos

Saturday 1 October 2005 02.44 BST

The Brazilian government has announced \$13.5m (£8.6m) in emergency aid for Amazon regions hit by the worst drought in decades.



The money will fund water pumping and purification, as well as food deliveries to towns cut off by the drop in river levels.

The Brazilian air force has already flown 500 tonnes of supplies to areas that usually depend on water transport.

- Drop in wa
- Crisis blam

The River Amazon at Manaus has fallen to its lowest level since 1963. Large parts of the [Amazon rainforest](#) are at their driest in living memory, a direct consequence, scientists say, of the severe hurricane season off the US Gulf coast.

Rainfall has been significantly below average this year along the Rio Solimoes and the Rio Madeira, two of the major Brazilian tributaries that flow into the Amazon, causing water levels to drop to record lows. Rivers and lakes are drying up, revealing huge sandbanks and making navigation difficult for boats. Since many towns are only accessible by river, medicine, food and fuel are running out in some communities.

Extremos na Amazonia



BBC Sign in News Sport Weather Shop Earth Travel

NEWS October, 2010

Home Video World UK Business Tech Science Magazine Entertainment & Culture

World Africa Asia Australia Europe Latin America Middle East US & Canada

Severe drought afflicts Brazilian Amazon

23 October 2010 | Latin America & Caribbean

Facebook Twitter WhatsApp Email Share

sign in become a supporter subscribe

October 2005

UK world sport football opinion

home > environment climate change

Environment

Amazon hits record low

The Brazilian government has announced \$13.5m (£8.6m) in emergency aid for Amazon regions hit by the worst drought in decades.



Some rivers are at their lowest level in decades

The money will fund water pumping and purification, as well as food deliveries to towns cut off by the drop in river levels.

Air force has already been used to deliver supplies to areas that usually depend on water transport.

Water levels in the Amazon at Manaus has fallen to its lowest level since 1963. The rainforest are at their driest in living memory, a direct result of the severe hurricane season off the US Gulf coast.

Water levels are currently below average this year along the Rio Solimoes and other major Brazilian tributaries that flow into the Amazon, helping to record lows. Rivers and lakes are drying up, and making navigation difficult for boats. Since many people rely on the river, medicine, food and fuel are running out in

MailOnline

October 2015



Home News U.S. Sport TV&Showbiz Australia Femall Health Science Money Video Travel Fashion Finder

Latest Headlines News World News Arts Headlines France Pictures Most read Wires Discounts Log in

The Amazon drained forest: Incredible pictures show devastating effect of drought ravishing Brazil in area's worst dry spell for 100 years

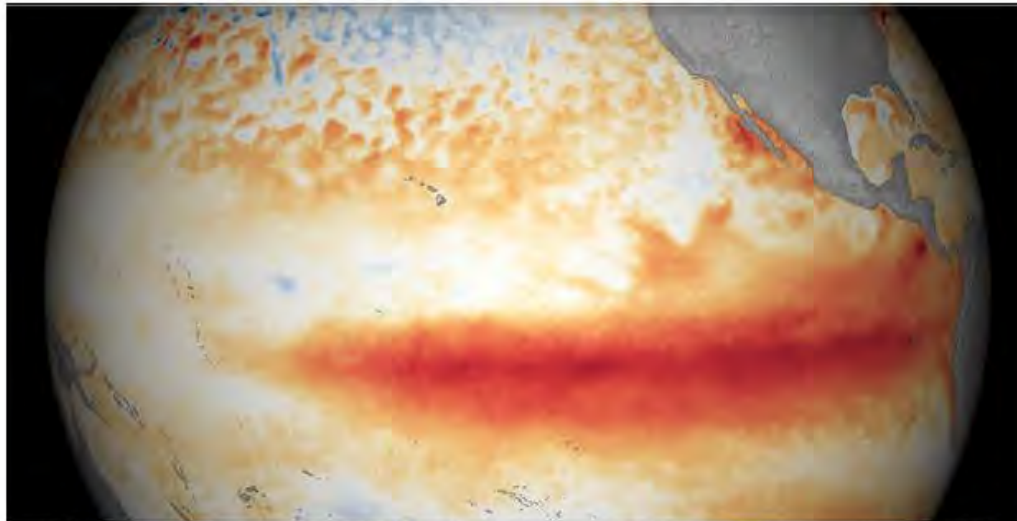
- Brazil's Amazonian rainforest has suffered its worst drought in 100 years, leaving many key lakes dried out
- Whole communities in the Amazonian regions of the country have been left struggling without water
- Boats have been left stranded in the Puaquequarauna lake, due the low levels of the Rio Negro

Extremos na Amazonia

CBS/AP February 18, 2016, 4:04 PM

Fevereiro, 2016

"Godzilla" El Niño enters a new phase



January 2016 compared to 1981-2010 Difference from average temperature (°F) Climate.gov/NNVL Data: Geo-Polar SST

This image shows satellite sea surface temperature departure for the month of January 2016. Areas in red or orange indicate an average monthly sea surface temperature above its 1981-2010 average. **DAN PISUT/NOAA/NNVL**

68 Comments / Share / Tweet / Stumble / Email

Meteorologists see signs that this winter's "Godzilla" El Niño is weakening ever so slightly, but they caution months will pass before people in the Americas will feel it.

The Amazon show in area

- Brazil's Amazonian rainforest has suffered its worst drought in 100 years, leaving many key lakes dried out
- Whole communities in the Amazonian regions of the country have been left struggling without water
- Boats have been left stranded in the Puaquequarauna lake, due the low levels of the Rio Negro

By TOM WYKE FOR MAILONLINE PUBLISHED: 01:31 BST, 25 October 2015 | UPDATED: 05:34 BST, 25 October 2015

Sign in News Sport Weather Shop Earth Travel

October, 2010 World UK Business Tech Science Magazine Entertainment &

Asia Australia Europe Latin America Middle East US & Canada

Drought afflicts Brazilian Amazon

Latin America & Caribbean f t w Share

Government has 5m (£8.6m) in or Amazon regions drought in



Some rivers are at their lowest level in decades

and water pumping is well as food s cut off by the drop

force has already of supplies to areas that usually depend on water transport.

n at Manaus has fallen to its lowest level since 1963. iforest are at their driest in living memory, a direct the severe hurricane season off the US Gulf coast.

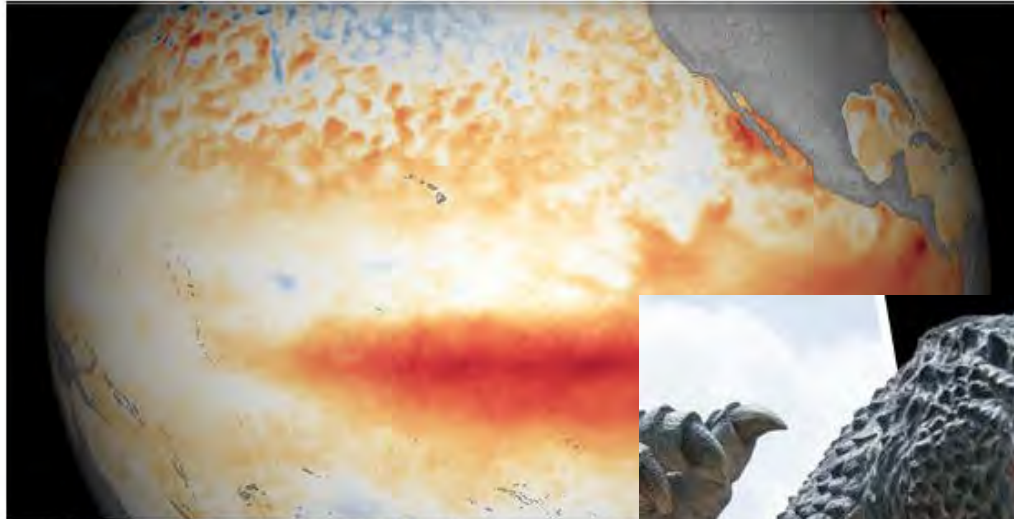
below average this year along the Rio Solimoes and major Brazilian tributaries that flow into the Amazon, record lows. Rivers and lakes are drying up, making navigation difficult for boats. Since many ver, medicine, food and fuel are running out in

Extremos na Amazonia

CBS/AP February 18, 2016, 4:04 PM

Fevereiro, 2016

"Godzilla" El Niño enters a new phase



January 2016 compared to 1981-2010

Difference from average temperature

This image shows satellite sea surface temperature departure for the month of January 2016 compared to the average monthly sea surface temperature above its PISUT/NOAA/NNVL

68 Comments / Share / Tweet / Stumble

Meteorologists see signs that this winter's "Godzilla" El Niño is entering a new phase, but they caution months will pass before peaking.

- Brazil's Amazonian rainforest has suffered its worst drought in 100 years, and...
- Whole communities in the Amazonian regions of the country have been left...
- Boats have been left stranded in the Puaquequarauna lake, due the low level...

By TOM WYKE FOR MAILONLINE

PUBLISHED: 01:31 BST, 25 October 2015 | UPDATED: 05:34 BST, 25 October 2015

Sign in

News

Sport

Weather

Shop

Earth

Travel

October, 2010

World

UK

Business

Tech

Science

Magazine

Entertainment & Lifestyle

Asia

Australia

Europe

Latin America

Middle East

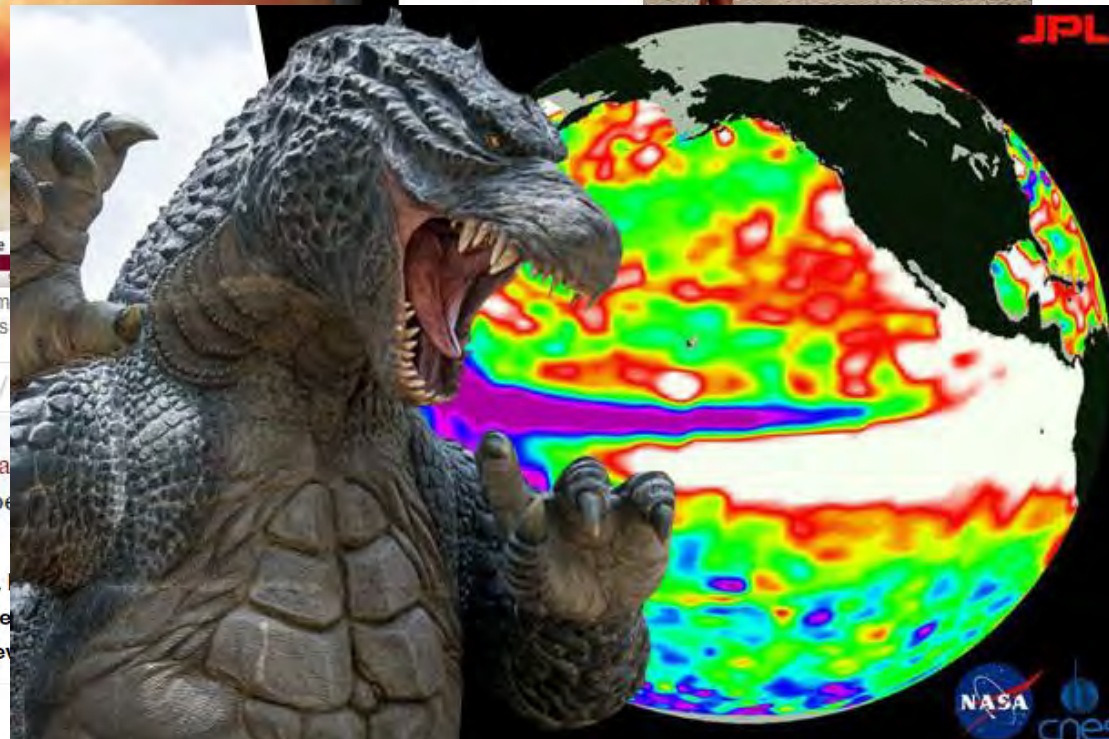
US & Canada

Drought afflicts Brazilian Amazon

Latin America & Caribbean



Government has spent 5m (£8.6m) in aid for Amazon regions drought in



Secas extremas e incêndios florestais

theguardian

home UK world sport football opinion culture business lifestyle fashion environment tech travel

home > environment > climate change wildlife energy pollution

Climate change

Climate Consensus - the 97%

New research finds that global warming is intensifying wildfires

A new study finds a human fingerprint in growing California wildfire risks

John Abraham

Thursday 3 December 2015 11.00 GMT



Comments 27

Save for later



ÚLTIMAS

1 semana atrás Conheça o Parque Estadual Serra do Aracá no Amazonas e seu único funcionário

CIDADES

Incêndios florestais da última estação seca ainda impactam comunidades da região de Barcelos (AM)

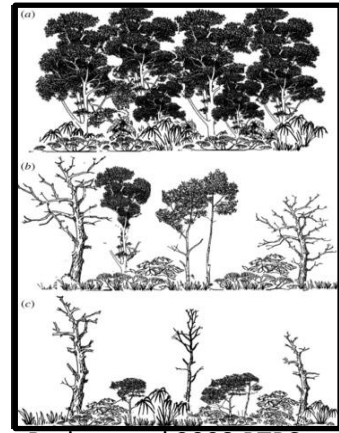
em 2 nov 2016



Sr. Clarindo de Jesus, liderança indígena, benzedor e agricultor fala dos impactos que o fogo causou à pequena agricultura|Aloísio Cabalzar-ISA

“Peguei rabeta (canoa com motor fluvial) e subi, são duas horas, fica no paraná abaixo do Rio Quiuini. Aí cheguei lá e vi minha roça queimando, mas não pude salvar porque a fumaça, e o calor do sol, e o fogo, e o chão não deixavam aproximar. Fiquei olhando, aquela fumaça não deixava eu me aproximar. Aquela fumaceira era total.

Incendios florestais na Amazonia



Barlow et al 2008 PTRS

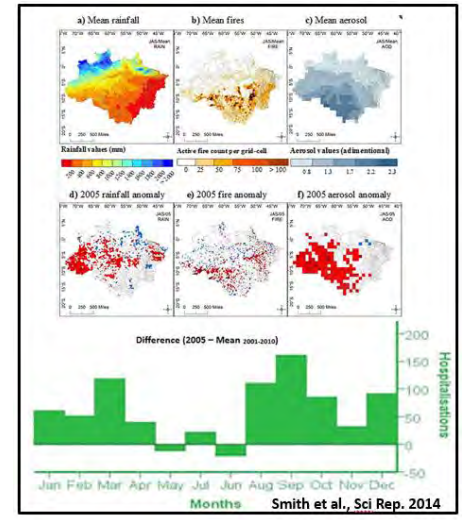
structure



Barlow et al 2008 PTRS

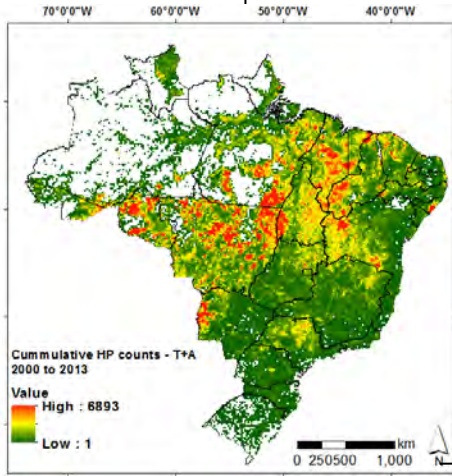
biodiversity

Impacts on Health



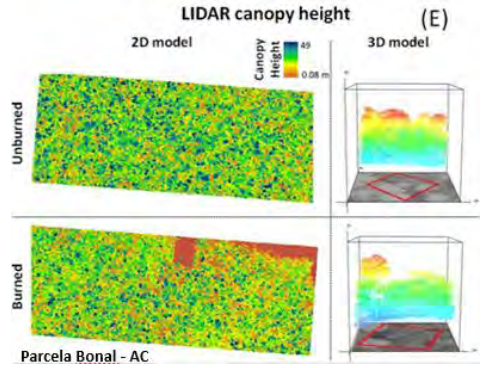
Smith et al., Sci Rep. 2014

Impacts on Forests

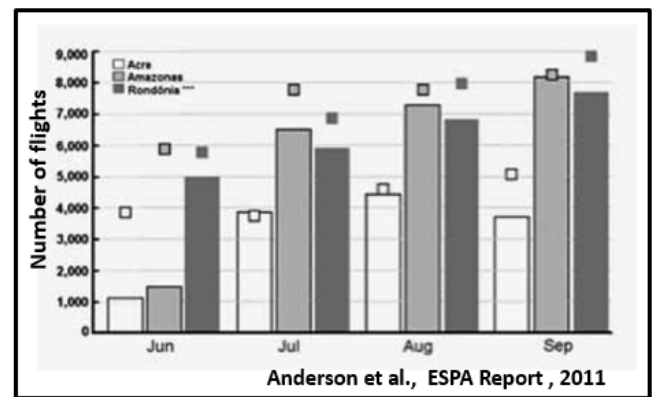


Cumulative HP counts - T+A 2000 to 2013
Value High : 6893 Low : 1

Infrastructure and productive lands



C stocks



Anderson et al., ESPA Report, 2011

Impacts on transport

Extremos na Amazonia

Necessidade de uma visao integrada entre sociedade e ecossistemas no contexto de desastres

GLOBAL FOREST WATCH

Outubro de 2015

UPDATES

NEWS ROUNDUP

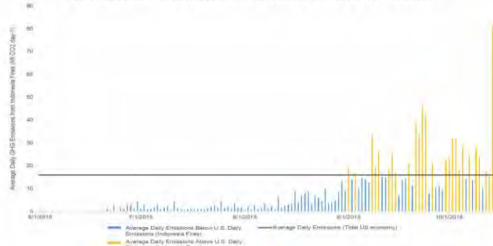
FEATURED POSTS

MAP

Indonesia's Fire Outbreaks Producing More Daily Emissions than Entire U.S. Economy

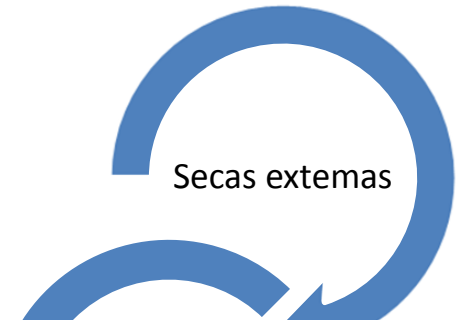
October 16, 2015

DAILY EMISSIONS FROM INDONESIA FIRES EXCEED THOSE OF U.S. ECONOMY

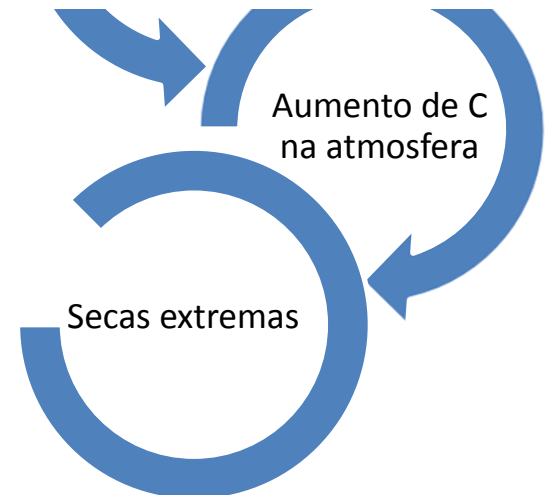


SOURCE: GLOBAL FIRE EMISSIONS DATABASE and CAIT

WORLD RESOURCES INSTITUTE



Diminui a absorcao de C pela floresta +
aumenta a mortalidade de arvores +
susceptibilidade a incendios floretais



Pontos para refletir

PERDA DE PADROES TEMPORAIS

(o risco e a ameaca estao mudando)

NOVOS RECORDES DE CHEIAS E SECAS

(as vulnerabilidades estao mudando)

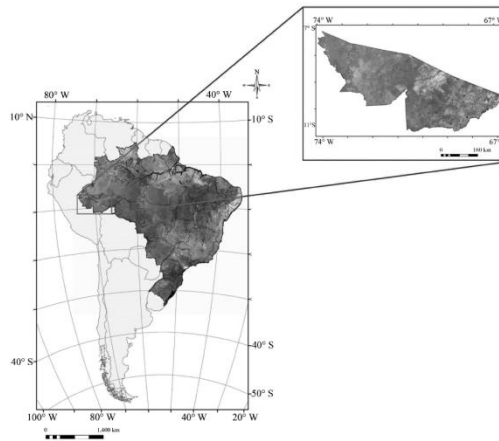
NOVOS DESAFIOS, NOVOS DESASTRES

(nao temos historicos, precisamos inovar)



Early warning system in the Context of Acre state pilot project

Climate projections indicates the increase in intensity and frequency of extremes. This is already a reality in Acre.



Early warning system - UNISRD

risk knowledge

technical
monitoring and
warning service

communication
and dissemination
of warnings

community
response
capability

"You will have hundreds of millions of dollars in estimated damages from extreme events in Acre."

1. **2005: Forest fires in Acre:** >330.000 ha. Fine as an indicator of loss of environmental services – **USD 100 million of impoverishment**
2. **2006: Flooding in Rio Branco:** ~ USD 15 million dollars of damages.
3. **2009: Flooding in Rio Branco:** ~USD 15 mi.
4. **2010: Flooding in Rio Branco:** ~USD 15 mi.
5. **2010: Forest fires in Acre:** 70.000 ha. ~USD 35 mi of impoverishment
6. **2011: Flooding in Rio Branco:** ~USD 20 mi.
7. **2012: Flooding in Rio Branco:** ~ USD 110 mi; **120,000** persons affected.
8. **2013: Flooding in Rio Branco:** ~USD 10 mi; 13,500 persons affected.
9. **2014: Flooding in Rio Branco:** ~USD 15 mi;
10. **2014: Flooding of the Madeira River:** ~USD 400 mi. Damage to Acre economy.
11. **2015: Flooding in Acre River Basin:** 100-200? Mi, **120,000+** persons affected.

2016

Incêndios florestais
Menor nível de rio registrado

2015

9 Municípios atingidos
130.765 Pessoas atingidas
Maior nível de rio registrado

2010

Incêndios florestais
70 mil hectares

2014

Crise do Madeira, Acre isolado
22 Municípios atingidos

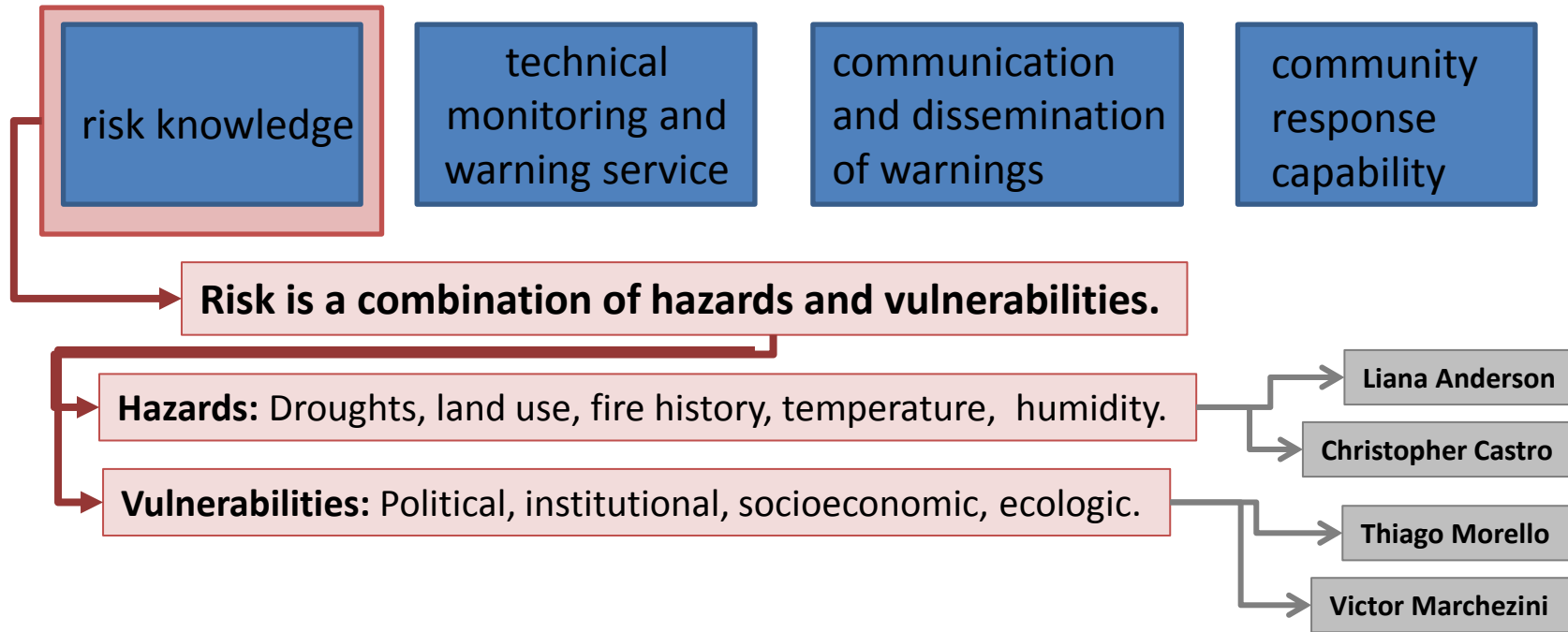
2012

10 Municípios atingidos
143.096 Pessoas atingidas

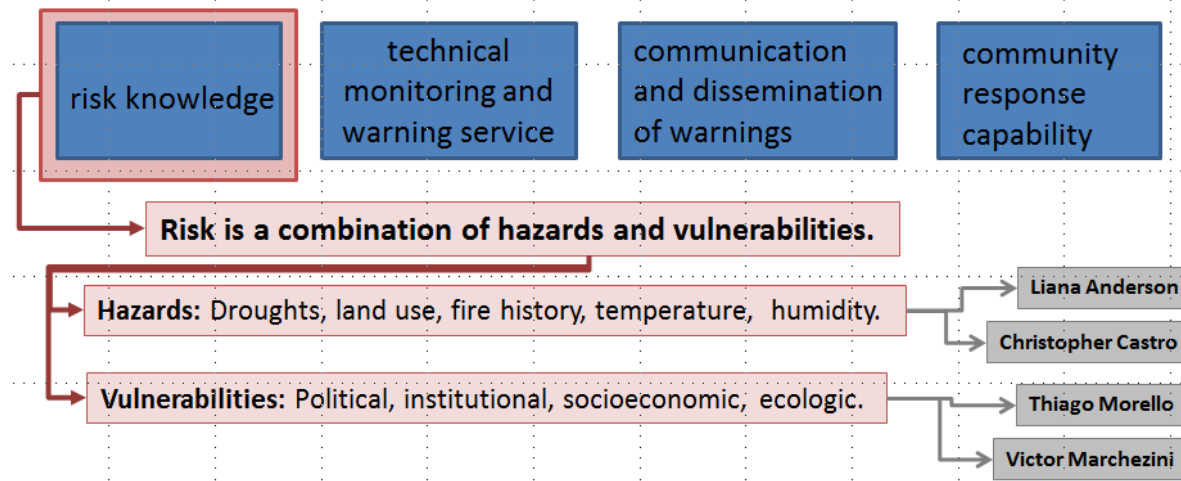
2005

Incêndios florestais: 6.500km² of burned areas
Aumento de 260% em doenças respiratórias

Early warning system in the Context of Acre state pilot project



Early warning system in the Context of Acre state pilot project



How to prioritize actions?

		Impact		
		Low	Medium	High
Probability	High	low	medium	high
	Medium	low	medium	medium
	Low	low	low	low

Impacts assessment:

- Health:** increase in T and humidity, smoke/aerosols, water quality;
- Agriculture:** small-large landowners, forest products (brazil nuts, açai);
- Forest fires:** carbon stock and carbon emission;
- Fish production:** small and large producers, business sector;
- Water quality and availability:** Rio Branco.

Liana ,
Christopher
Thiago,
Victor,
Conrado
Marcio
IMC/AC
SEMA/AC
UFAC

Early warning system in the Context of Acre state pilot project

risk knowledge

technical monitoring and warning service

communication and dissemination of warnings

community response capability

Were are monitoring

Sala de situacao –IMC-Acre

Cemaden
Centro Nacional de Monitoramento e Alertas de Desastres Naturais

O Cemaden Rede Observacional Monitoramento Pesquisa Programas e Projetos

Capa » Monitoramento » Panorama hídrico no estado do Acre: diagnóstico, perspectivas e impactos potenciais relacionados à situação de seca 24/10/2016

PANORAMA HÍDRICO NO ESTADO DO ACRE: DIAGNÓSTICO, PERSPECTIVAS E IMPACTOS POTENCIAIS RELACIONADOS À SITUAÇÃO DE SECA 24/10/2016

- Liana Anderson
- Christopher Castro
- Ana Paula
- Conrado
- Seluchi
- Sheila
- Marcio



Early warning system in the Context of Acre state pilot project

risk knowledge

technical monitoring and warning service

communication and dissemination of warnings

community response capability

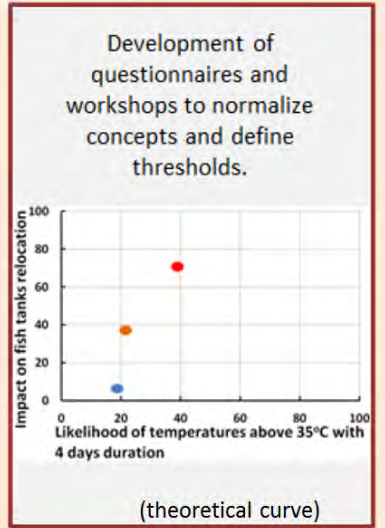


Stakeholder consultation: Phase 1.



Stakeholder consultation: Phase 2, 3.

Construction of a matrix of impact of the event and likelihood of its occurrence.



Early warning system in the Context of Acre state pilot project

risk knowledge

technical monitoring and warning service

communication and dissemination of warnings

community response capability

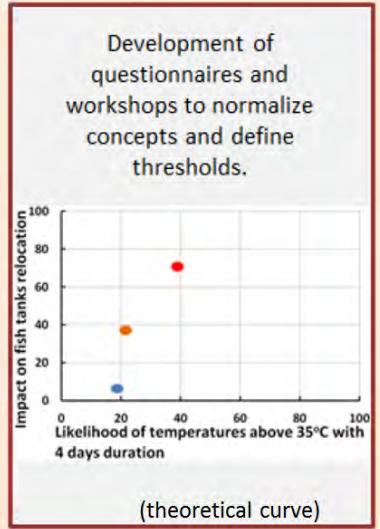
Sound scientific basis for predicting and forecasting hazards **IMPACTS & COSTS.**

Stakeholder consultation: Phase 1.



Stakeholder consultation: Phase 2, 3.

Construction of a matrix of impact of the event and likelihood of its occurrence.



Early warning system in the Context of Acre state pilot project

risk knowledge

technical monitoring and warning service

communication and dissemination of warnings

community response capability

Warnings must reach those at risk.
We need a multi-hazard approach.
We need a multi-impact approach

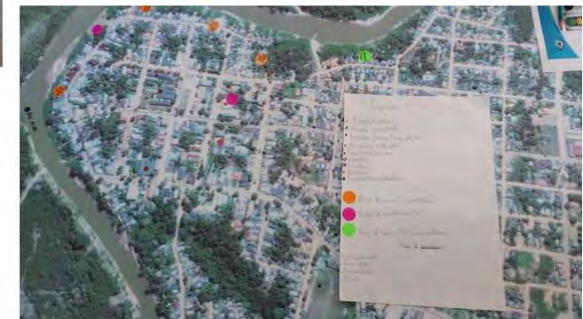
PROJETO  COMUNIDADES RESILIENTES



REDE DE ESCOLAS E COMUNIDADES NA PREVENÇÃO DE DESASTRES AMBIENTAIS



Workshop: Comunidades resilientes, 2016



Early warning system in the Context of Acre state pilot project

risk knowledge

technical monitoring and warning service

communication and dissemination of warnings

community response capability

Build national, regional, local and community response capabilities. Education and preparedness programs play a key role.



Rachel Trabjer

Vera Reis

Alan Pimentel

Debora Olivato

CIDADE	Tempo (°C)		Vento (km/h)		DIREÇÃO	CONDIÇÃO DE TEMPO
	MAX/MIN	UR (%)	VEL.	DIR.		
Rio Branco	30/14	62	21	SSE		Parcialmente Nublado - Sol entre poucas nuvens. Parcialmente Nublado - Sol entre poucas nuvens.
Xapuri	29/13	62	22	SSE		Parcialmente Nublado - Sol entre poucas nuvens.

Docentes:
 Adriana Evelyn Albuquerque Mesquita
 Aline Ferreira da Silva
 Juíscio Maria Souza da Silva
 Marcelino Freitas Nogueira Junior
 Sarah da Silva Andrade

Docentes:
 Edílzio Siqueira de Almeida Amorim
 Quêmele Braga de Amorim Almeida



Pontos para refletir

PERDA DE PADROES TEMPORAIS

(o risco e a ameaca estao mudando)

NOVOS RECORDES DE CHEIAS E SECAS

(as vulnerabilidades estao mudando)

NOVOS DESAFIOS, NOVOS DESASTRES

(nao temos historicos, precisamos inovar)

NAO E SUFICIENTE OLHAR PARA TRAS – TEMOS QUE OLHAR PARA OS LADOS

(integracao entre areas das ciencias, troca de experiencias entre regioes e sociedade)

E NECESSARIO DESCENTRALIZAR, CRIAR PARCERIAS E SER COLABORATIVO

(confiar, desburocratizar e sistematizar)



Fire on Starry Night
Ronald Guerin

Liana O. Anderson

liana.anderson@cemaden.gov.br

<http://www.liana-anderson.org>

Workshop BRAHVE – Sao Jose dos Campos, 6-8 Junho de 2017

1. Supporting the State operational room: Fire risk

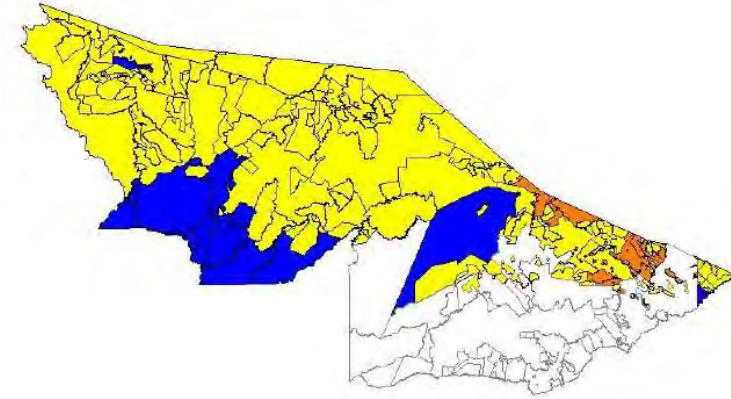
Pilot project: Acre State

$$B = 0,05H - 0,1(T - 27)$$

B = índice de Angstron

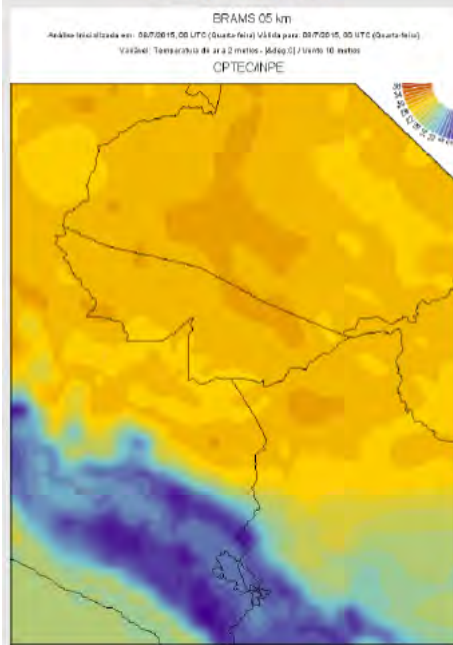
H = umidade relativa do ar em %

T = temperatura do ar em °C

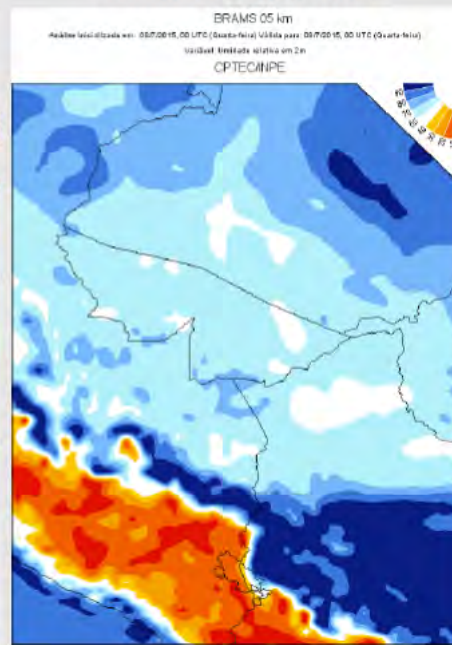


Dados: Sistema Regional de Modelagem Atmosférica BRAMS
5x5 Km

Temperatura



Umidade Relativa



Processamento
TerraMA²

NÍVEL DE ALERTA

VALOR RISCO	ALERTA
3	Observação
2,5	Atenção
2	Alerta
1,5	Alerta Máximo

RESULTADOS

Envio de notificação por e-mail;
Mapas de Risco;
Acesso informação internet

*Sistema automático

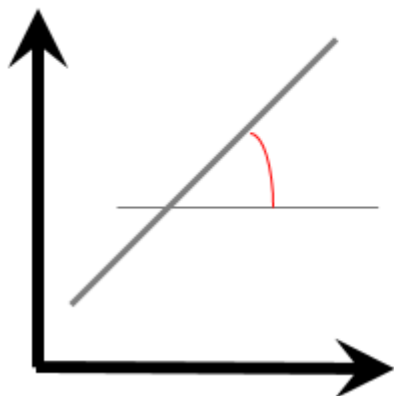
*Funcionamento 24h

Courtesy: Alan Pimentel

1. Supporting the State operational room: Fire risk

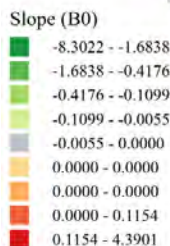
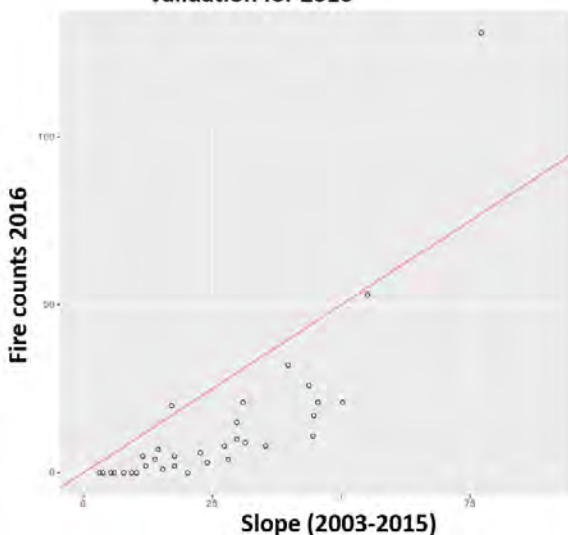
Pilot project: Acre State

From 100% weather/climate fire risk to 100% anthropic proxy for risk



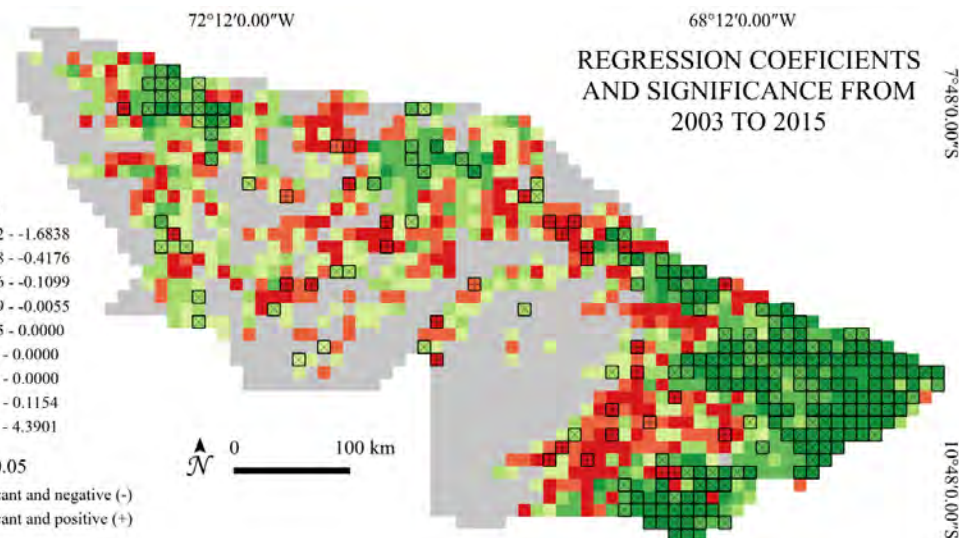
Análise de tendência: se a região vem queimando ao longo dos anos e progressivamente aumentando a queima, ela irá ter maior probabilidade de queimar no futuro.

Validation for 2016



p-value < 0.05

- ☒ Significant and negative (-)
- ☒ Significant and positive (+)



As áreas com tendência positiva entre 2003 e 2015 apresentaram mais focos de calor em 2016

1. Supporting the State operational room: Fire risk

Pilot project: Acre State

