

# Adaptation to Climate Change

MINISTRY OF ENVIRONMENT  
PORTFOLIO  
RESULTS 2013 TO 2016

**SUMMARY**

**ASSESSING VULNERABILITIES**

VULNERABILITY TO NATURAL DISASTERS RELATED TO DROUGHTS.....4

ADAPTATION TO CLIMATE CHANGE AND FOOD SECURITY.....7

LOCAL SCALE INDEX FOR SOCIAL VULNERABILITY ASSESSMENT  
TO CLIMATE CHANGE IN BRAZIL .....10

IMPACTS OF CLIMATE CHANGE ON BRAZILIAN BIOMES.....15

**PLANNING ADAPTATION**

NATIONAL ADAPTATION PLAN TO CLIMATE CHANGE.....21

**PROMOTING ADAPTATION**

ECONOMY-WIDE ADAPTATION TO CLIMATE CHANGE.....25

HOW TO INTEGRATE ECOSYSTEM-BASED ADAPTATION APPROACH  
(EbA) IN PUBLIC POLICIES?.....29

ADAPTACLIMA - ADAPTATION TO CLIMATE CHANGE  
KNOWLEDG PLATFORM.....32

IPACC II - CLIMATE RISK MANAGEMENT AND PUBLIC INVESTMENT.....33

# Assessing Vulnerabilities

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# VULNERABILITY TO NATURAL DISASTERS RELATED TO DROUGHTS

This assessment is part of a study coordinated by the Ministry of Environment in partnership with the WWF and the Ministry of National Integration, regarding vulnerability analysis to drought applied to Brazilian municipalities in the context of climate change. This study encompasses the elaboration of a composite index that integrates climatic, socio-economic and physical-environmental variables, incorporating projected changes in selected climatic parameters to the period of 2011-2040.

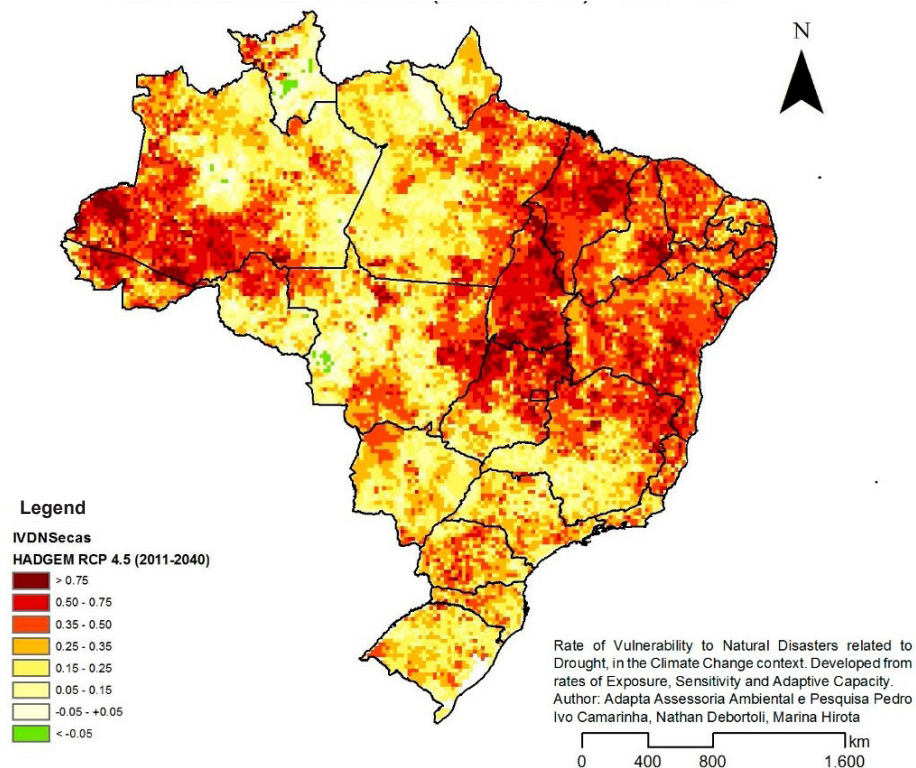
The main objectives of the study are:

- Provide information to society and the government on projected changes in climatic variables and its potential impacts on droughts in the country;
- Produce basic information to guide the development and revision of public policies and initiatives related to the theme.

# VULNERABILITY TO NATURAL DISASTERS RELATED TO DROUGHTS

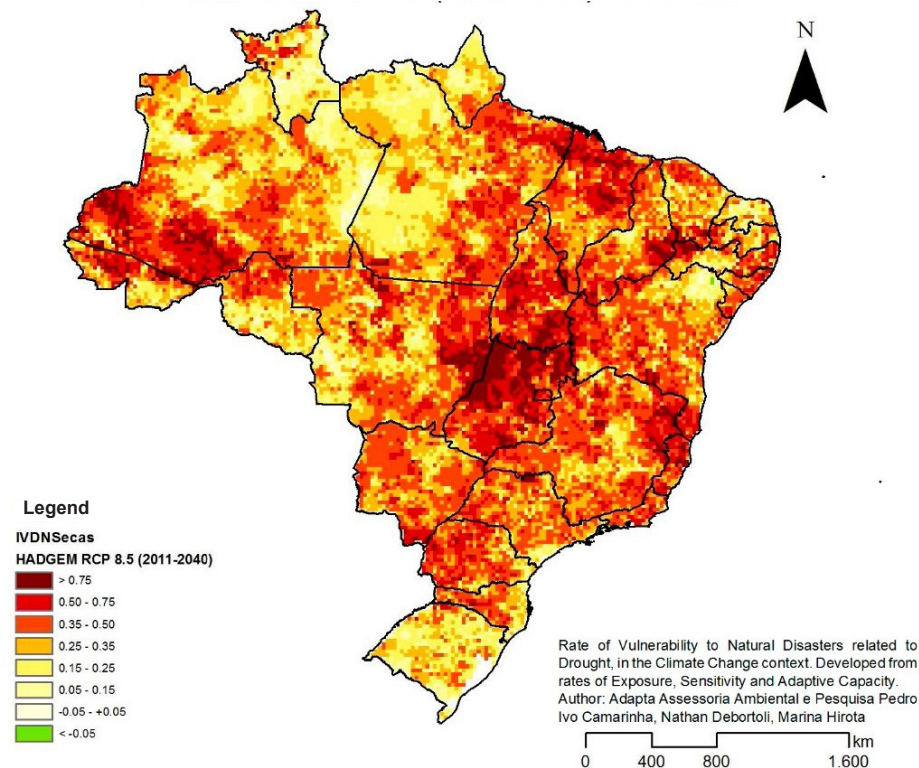
Map of Vulnerability to Natural Disasters of Droughts  
In the context of climate change

Eta 20km HadGEM / 2011-2040 / RCP 4.5



Map of Vulnerability to Natural Disasters of Droughts  
In the context of climate change

Eta 20km HadGEM /2011-2040/ RCP 8.5



$$IVDNS = \left( \frac{EXP + SENS}{2} \right) \times \left[ \frac{(0.5 + (1 - CA))}{2} \right]$$

IVDNS= Index of vulnerability to natural disasters of droughts

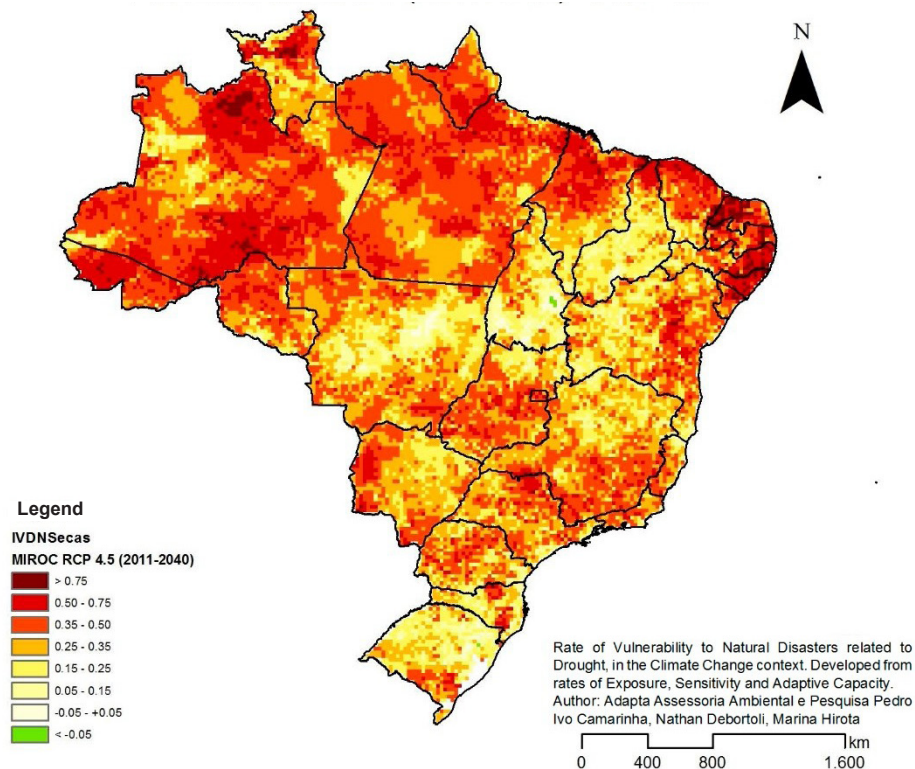
EXP= Exposure Sub-Index

SENS= Sensitivity Sub-Index

CA= Adaptation Capacity Sub-Index

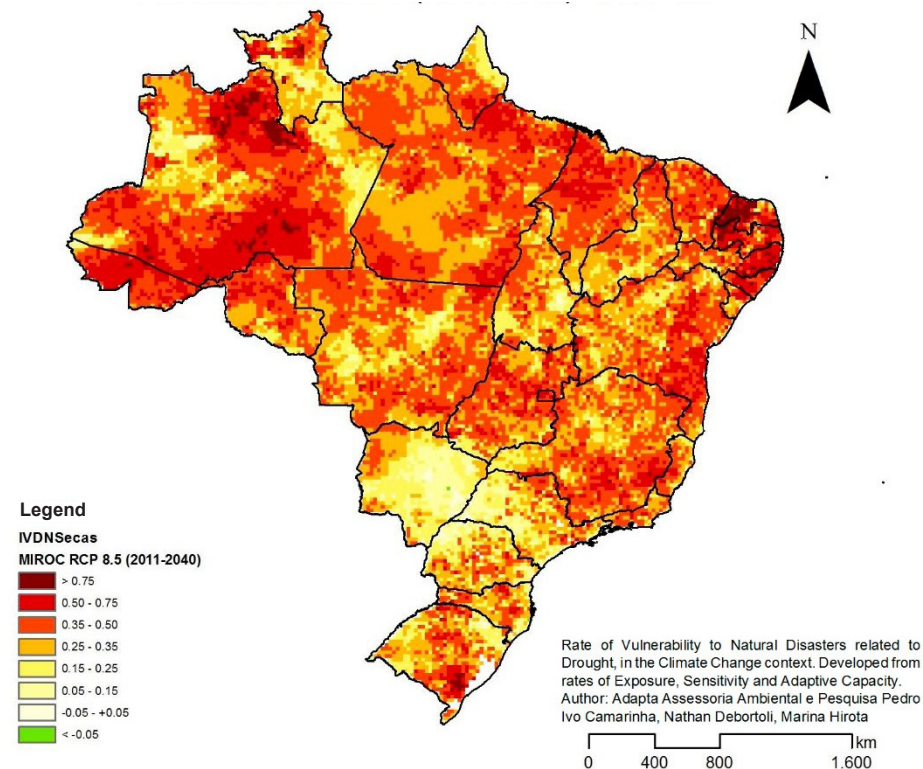
# Map of Vulnerability to Natural Disasters of Droughts In the climate change context

Eta 20km MIROC 5 (2011-2040) RCP 4.5



# Map of Vulnerability to Natural Disasters of Droughts In the climate change context

Eta 20km MIROC 5 (2011-2040) RCP 8.5



More information on the  
Project:

[www.mma.gov.br/clima/  
adaptacao/projetos](http://www.mma.gov.br/clima/adaptacao/projetos)





# ADAPTATION TO CLIMATE CHANGE AND FOOD SECURITY

This study was developed in 2015 to provide technical information for the Food and Nutritional Security sectoral strategy of the National Adaptation Plan. The study uses available data and information on food security and climate change impacts to project future vulnerability of food security in Brazil. The results of this project may subsidize other public policies, such as the National Plan for Food and Nutritional Security.

# ADAPTATION TO CLIMATE CHANGE AND FOOD SECURITY

Table: Vulnerability of food security to climatic change by State (2071-2100).

STATE	IA	IDHM	Cese 3: SCVI+IA
ACRE	65,52	0,577	0,15
ALAGOAS	48,93	0,565	0,523
AMAPA	50,15	0,647	0,057
AMAZONAS	40,36	0,548	0,057
BAHIA	55,79	0,592	0,578
CEARA	61,28	0,615	0,437
DISTRITO FEDERAL	27,40	0,82	0,683
ESPÍRITO SANTO	32,22	0,694	0,43
GOIAS	37,86	0,692	0,48
MARANHÃO	73,51	0,58	0,415
MATO GROSSO	36,51	0,68	0,196
MATO GROSSO DO SUL	29,41	0,689	0,207
MINAS GERAIS	35,82	0,672	0,589
PARÁ	59,39	0,596	0,154
PARAÍBA	58,96	0,594	0,45
PARANÁ	28,50	0,696	0,24
PERNAMBUCO	56,09	0,598	0,484
PIAUI	68,23	0,576	0,38
RIO DE JANEIRO	31,77	0,711	0,34
RIO GRANDE DO NORTE	64,74	0,619	0,426
RIO GRANDE DO SUL	3,73	0,705	0,096
RONDÔNIA	32,30	0,658	0,264
RORAIMA	73,83	0,593	0,044
SANTA CATARINA	18,51	0,723	0,111
SÃO PAULO	27,31	0,74	0,419
SERGIPE	29,67	0,586	0,498
TOCANTINS	52,14	0,639	0,336

## LEGEND:

**IA:** Level Food Insecurity

**IDHM:** Municipal Human Development Index

**SCVI:** Socio-Climate Vulnerability Index

Source: (PNUD et al., 2013, the authors).

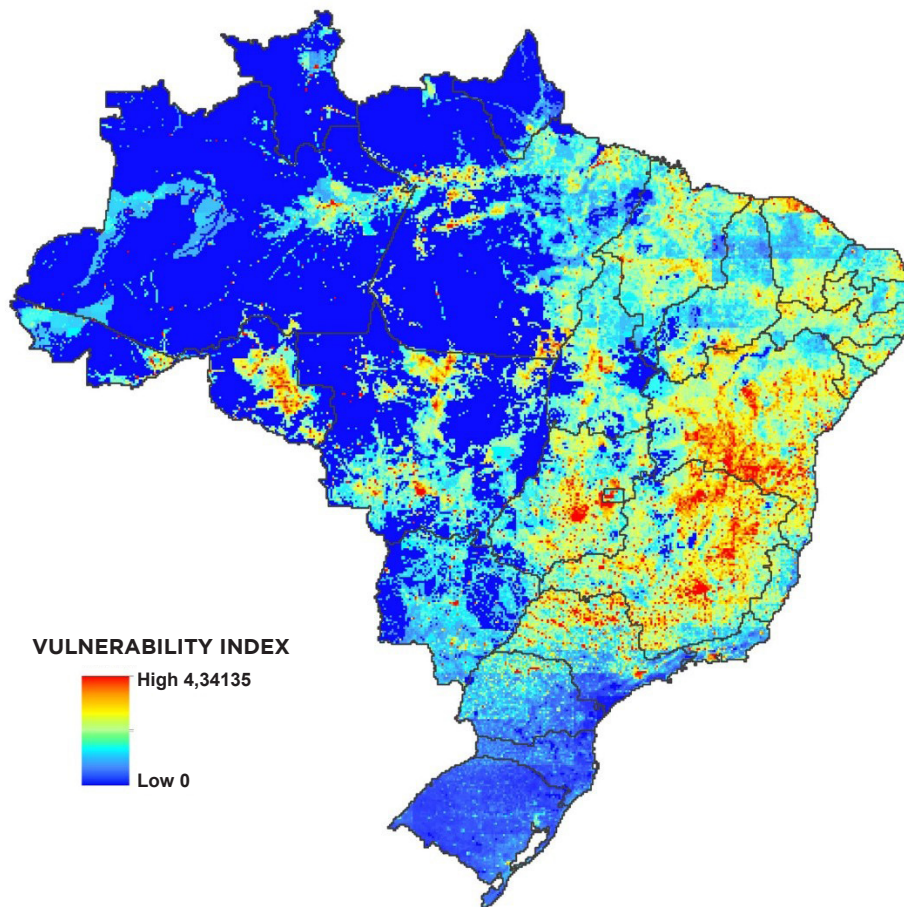


## MAP

of vulnerability of food security to climate change

More information on the Project:

[www.mma.gov.br/clima/adaptacao/projetos](http://www.mma.gov.br/clima/adaptacao/projetos)



The map shows the vulnerability of food security in Brazil in the climate change context.

The index of food security vulnerability encompasses:  $V = (RCCI, \text{population density, IDHM, IA})$  where RCCI is the Regional Climate Change Index; IDHM is the Municipal Human Development Index; and IA is the Food Insecurity Index of the PNAD survey.

# LOCAL SCALE INDEX FOR SOCIAL VULNERABILITY ASSESSMENT TO CLIMATE CHANGE IN BRAZIL

This project was created in 2014, in a partnership with Oswaldo Cruz Foundation (FIOCRUZ) and the financial support of “Fundo Clima” (Brazilian Climate Fund). The project aims to develop a social vulnerability index at the municipal scale to assess exposure, sensitivity and adaptive capacity of the population to the impacts of climate change, generating information at the local level, to support public policies.

Six States were chosen, representing each biome. These are namely: Espírito Santo, Pernambuco, Amazonas, Maranhão, Paraná and Mato Grosso do Sul.

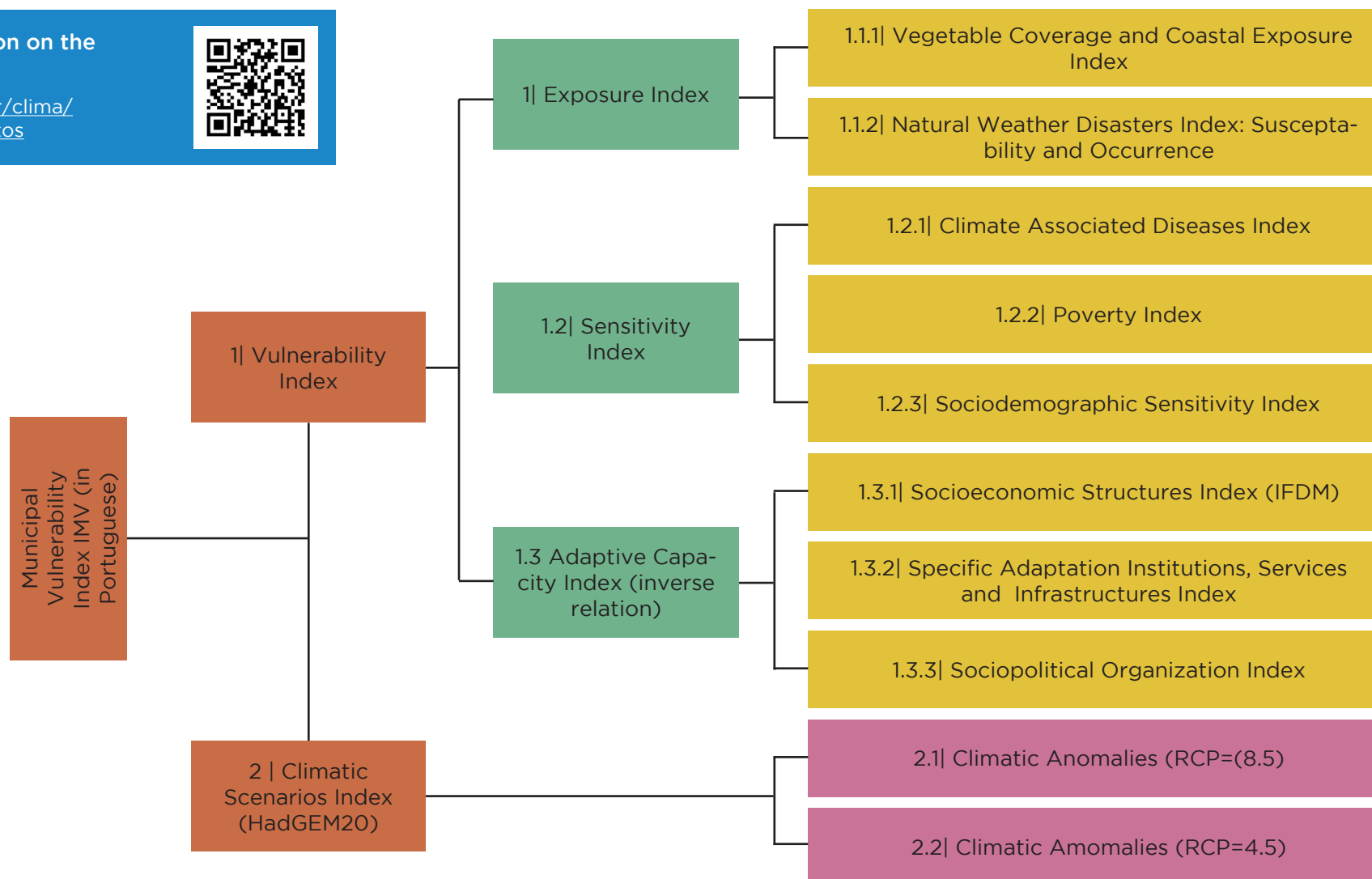
The activities developed by the project are divided into three stages: the first comprises the preparation and discussion of the index proposal; the second includes technical visits to the States to gather local information; and the third step includes the submission of results in the States and the training of State government staff in the use of the software (SisVuClima), designed to provide automatic calculation of the composite index.

Two States have already completed the three steps (Pernambuco and Espírito Santo). Currently, the activities are underway in the Amazonas and Paraná States, and in 2017 will be held in Maranhão and Mato Grosso do Sul.

## LOCAL SCALE INDEX FOR SOCIAL VULNERABILITY ASSESSMENT TO CLIMATE CHANGE IN BRAZIL

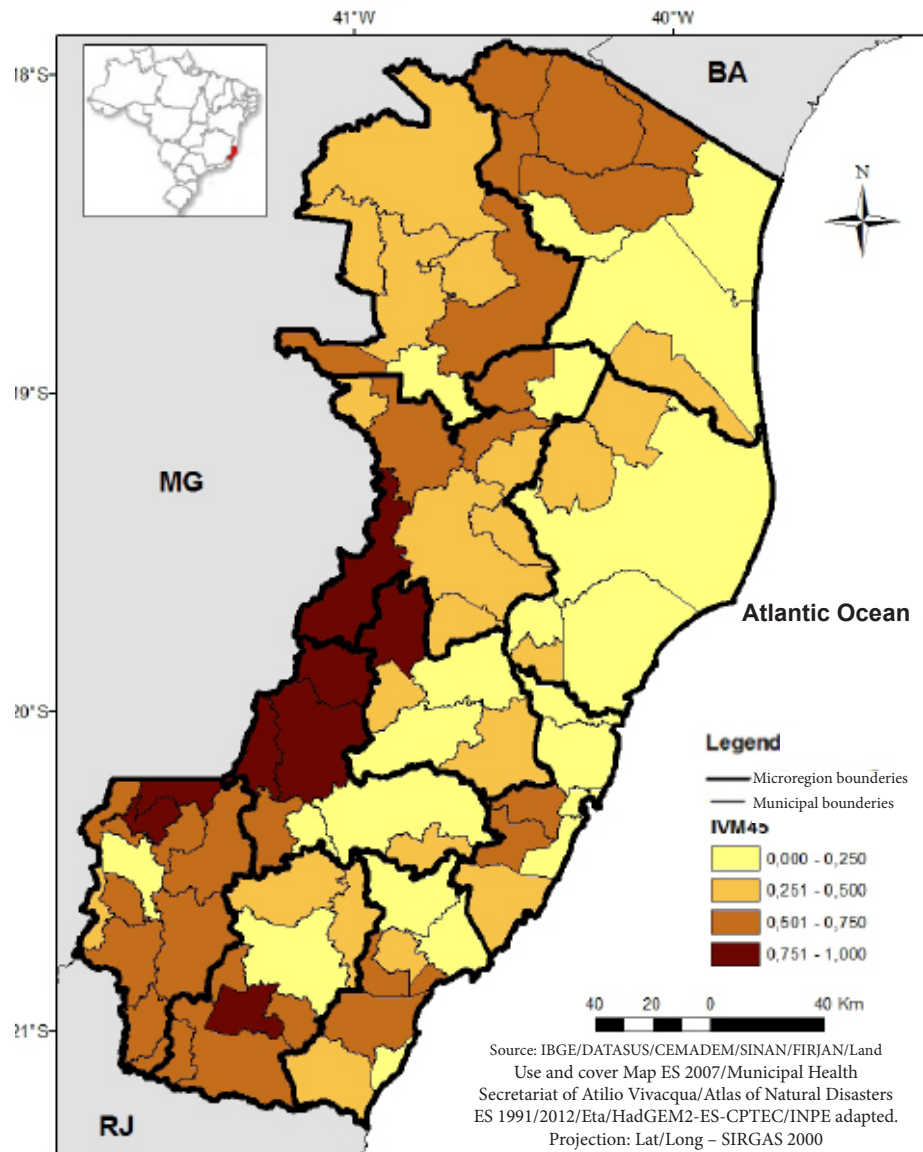
More information on the Project:

[www.mma.gov.br/clima/adaptacao/projetos](http://www.mma.gov.br/clima/adaptacao/projetos)



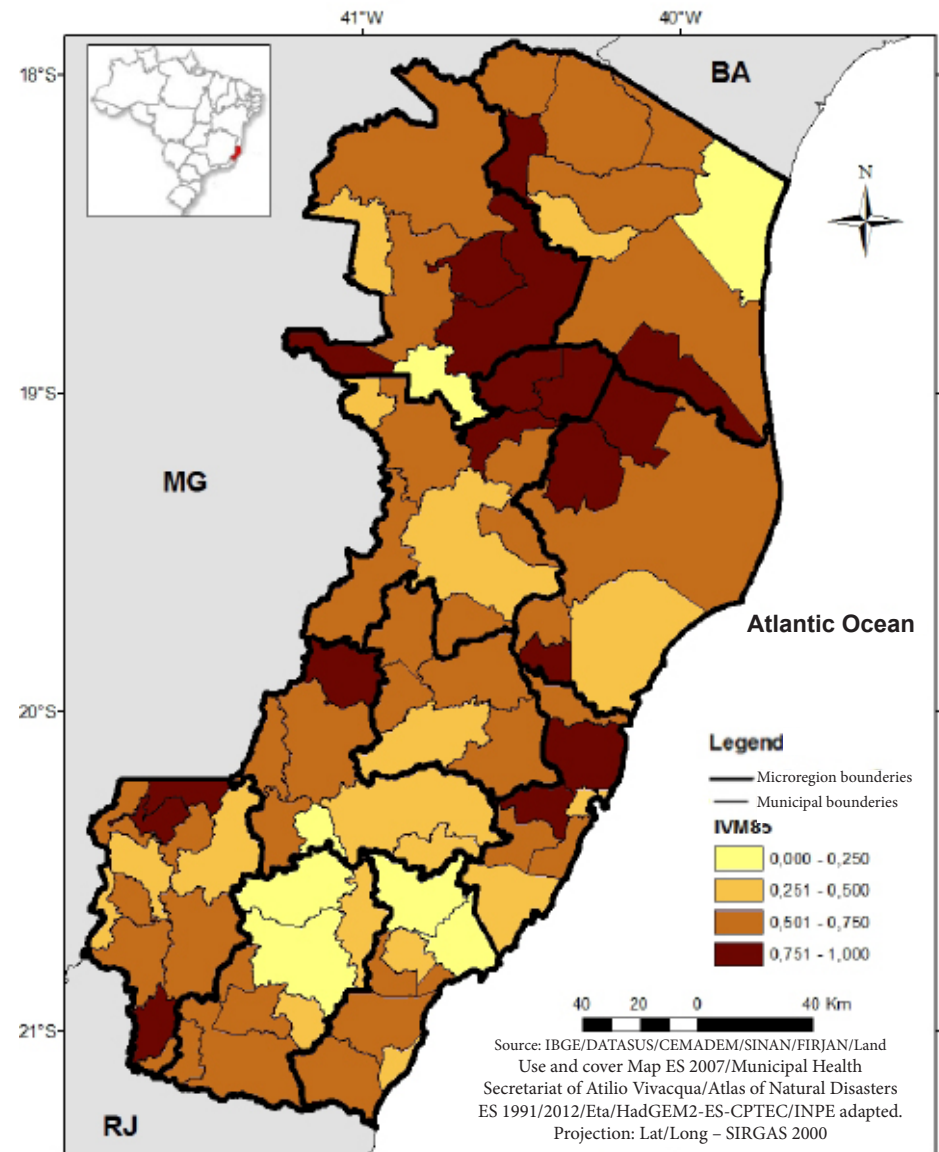
# Index of Municipal Vulnerability RCP 4.5 (IVM45)

Espírito Santo State 2015

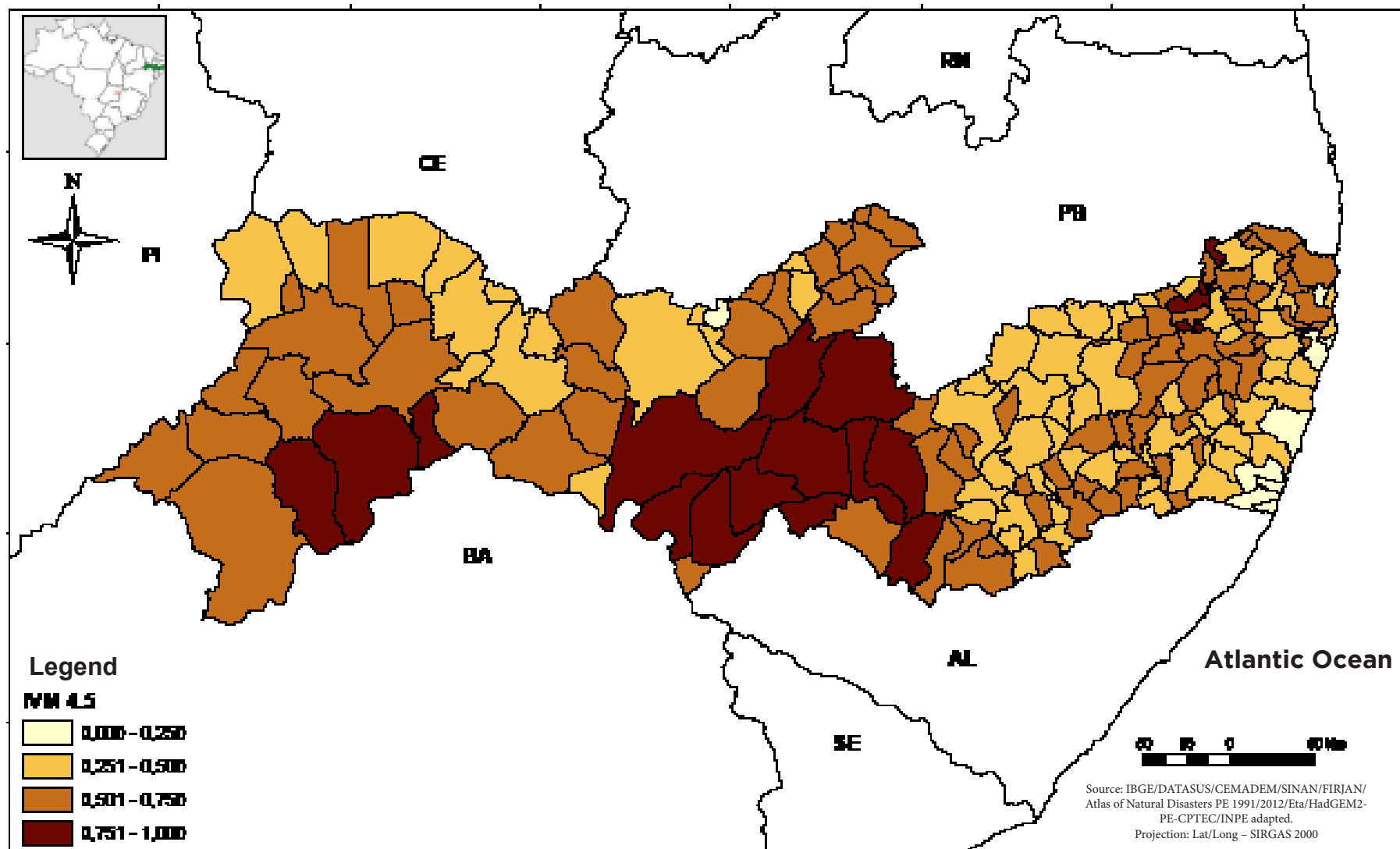


# Index of Municipal Vulnerability RCP 8.5 (IVM85)

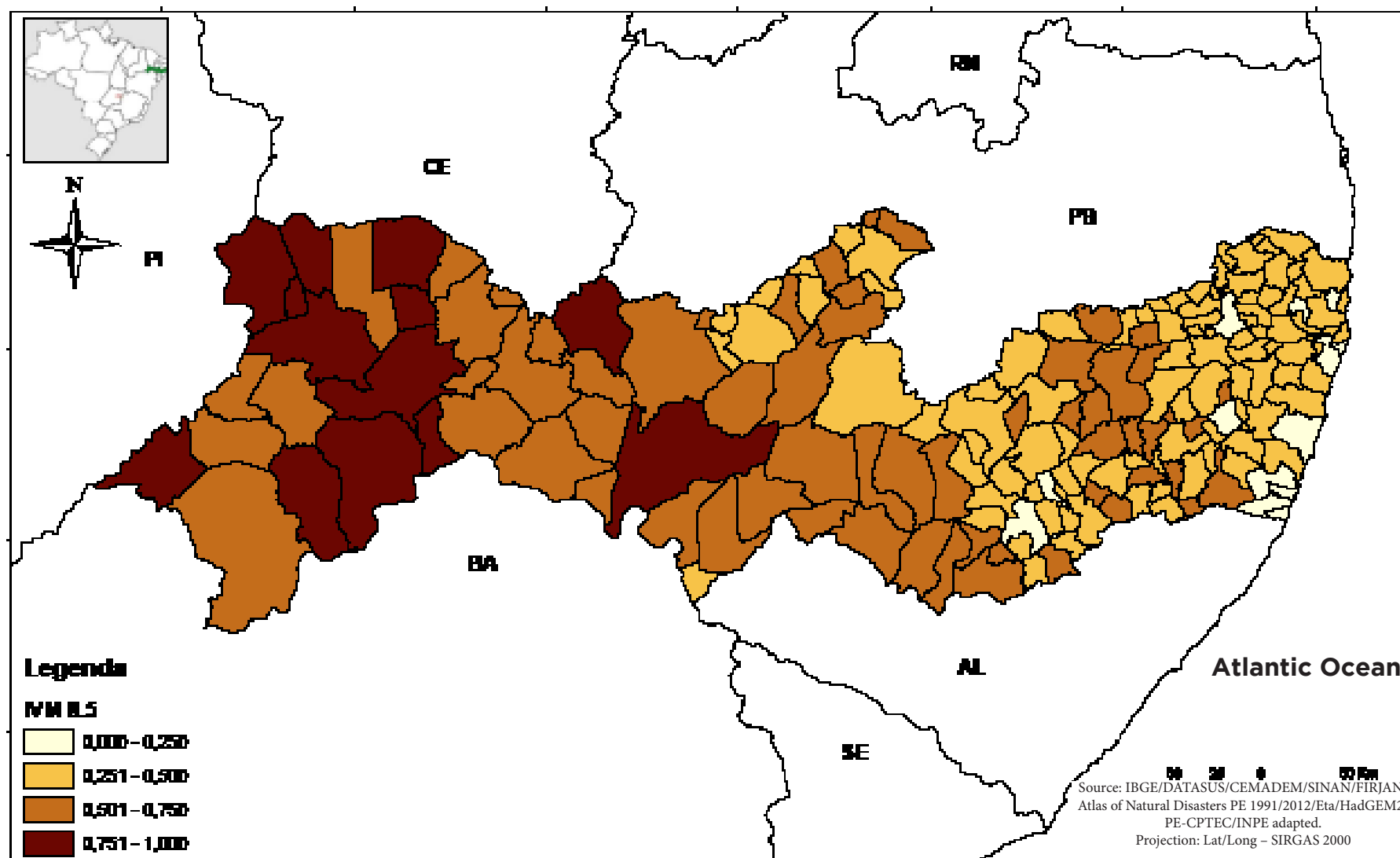
Espírito Santo State 2015



## Index of Municipal Vulnerability - RCP 4.5 (IVM45) - Pernambuco State 2015



## Index of Municipal Vulnerability - RCP 8.5 (IVM45) - Pernambuco State 2015



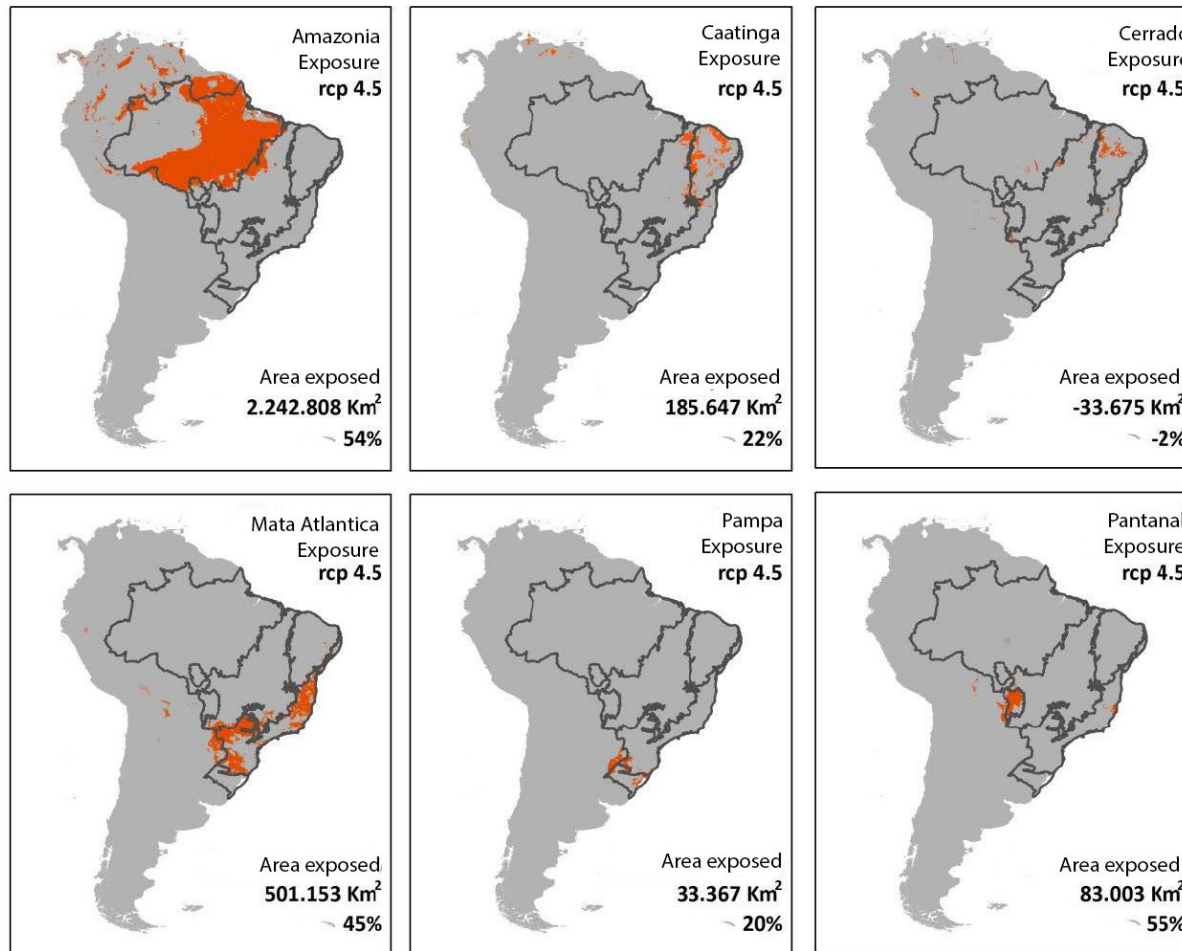
\*These results are under review considering specifically land were processing data.

# IMPACTS OF CLIMATE CHANGE ON BRAZILIAN BIOMES

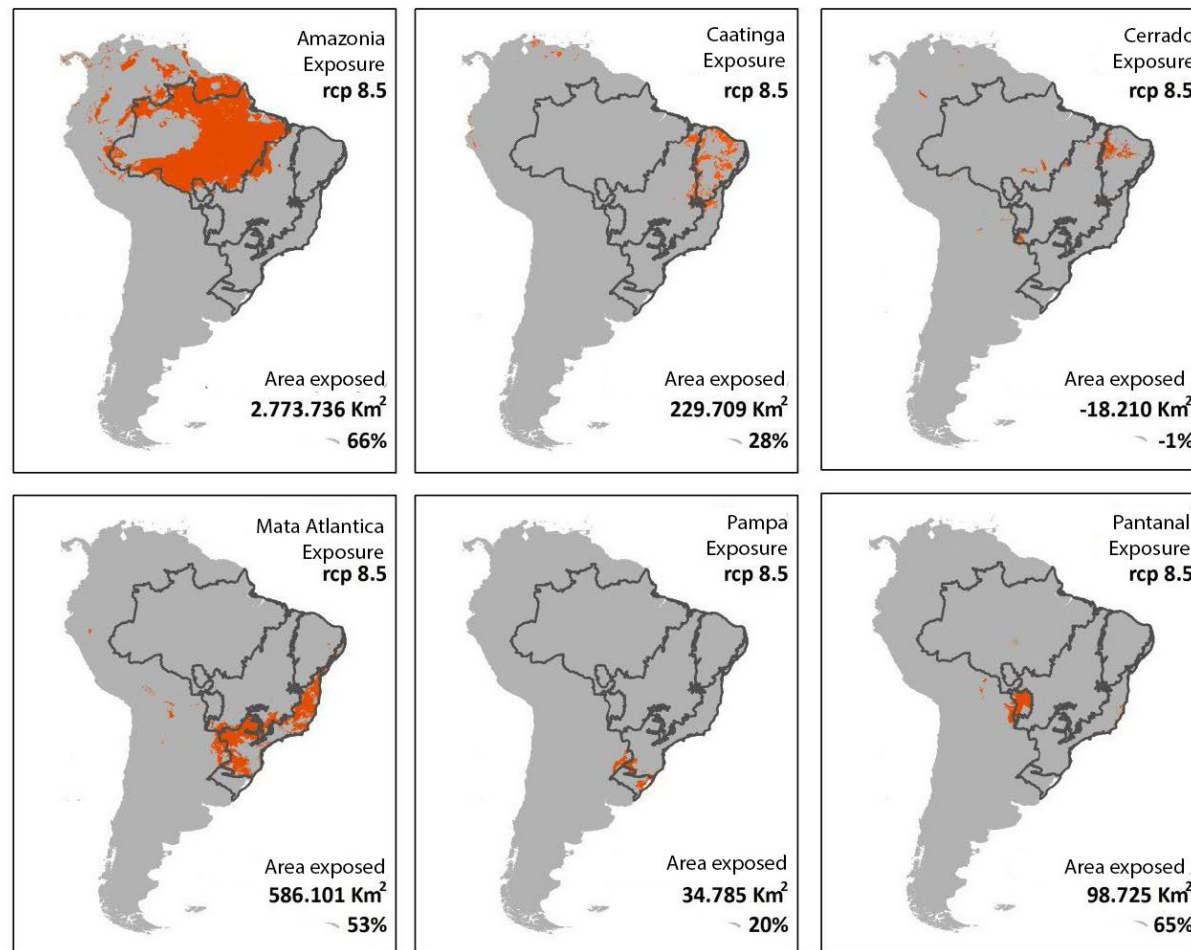
This project identifies the most relevant parameters for the analysis of climate change impacts on biodiversity in biomes and in other appropriate phytophysiological areas. Maps of Brazilian biome were elaborated based on climatic stress for 2050, considering two RCP scenarios (Representative Concentration Pathways): RCP 4.5 and 8.5, using the HadGEM2 model.



Map of areas under climatic stress (exposure), considering the differences in the distribution of climatic niches of Brazilian biomes in 2000 and in 2050, based on HadGEM2-ES model in the RCP4.5 projections of greenhouse gases concentration.



Map of areas under climatic stress (exposure), considering the differences in the distribution of climatic niches of Brazilian biomes in 2000 and in 2050, based on HadGEM2-ES model in the RCP8.5 projections of greenhouse gases concentration.



Areas under climatic stress (exposure), considering the differences in the distribution of climatic niches (CN) of Brazilian biomes in 2000 and 2050, based on HadGEM2-ES model in two projections of greenhouse gases concentration (RCP4.5 and RCP8.5).

		Amazonia	Caatinga	Cerrado	Mata Atlântica	Pampa	Pantanal
	Official biome area (km²)	4,176,762	826,512	2,039,374	1,105,845	170,088	151,314
	CN distribution area in 2000	3,817,033	764,314	1,935,910	929,838	159,157	149,073
RCP 4.5	CN distribution area in 2050	1,574,225	578,667	1,969,585	428,685	125,790	66,070
	Area under stress (2000-2050)	2,242,808	185,647	-33,675	501,153	33,367	83,003
	Percentage under stress in 2050	54%	22%	-2%	45%	20%	55%
RCP 8.5	CN distribution area in 2050	1,043,297	534,605	1,954,120	343,737	124,372	50,348
	Area under stress (2000-2050)	2,773,736	229,709	-18,210	586,101	34,785	98,725
	Percentage under stress in 2050	66%	28%	-1%	53%	20%	65%

Key areas for biodiversity based on the number of rare species by biomes (GIULIETTI et al. 2009) and angiosperm species, endemic species and percentage of endemic species per biome (JBRJ 2016).

	Amazonia	Caatinga	Cerrado	Mata Atlântica	Pampa	Pantanal
Total area of the biome (in millions of km <sup>2</sup> )	4,18	0,83	2,04	1,11	0,17	0,15
Key area for biodiversity (%)	8%	24%	21%	32%	12%	25%
Angiosperm species	12,160	4,853	12,385	15,466	1,839	1,354
Endemic Angiosperm species	7,904	1,003	4,878	8,588	465	168
Endemic Angiosperms (%)	65%	21%	39%	56%	25%	12%

# Planning Adaptation

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# NATIONAL ADAPTATION PLAN TO CLIMATE CHANGE

The National Adaptation Plan was established in May 2016, and represents an instrument to promote the reduction of national vulnerability to climate change and conduct the management of the risk associated with climate change.

The National Adaptation Plan encompasses 11 sectors: agriculture, water resources, food and nutritional security, biodiversity, cities, disasters risk management, industry and mining, infrastructure, vulnerable populations, health and coastal zones. Each sector presents an adaptation strategy which assess the country's exposure to current and future impacts of climate change based on climatic parameters projections, the identification and analysis of vulnerability to these potential impacts and the definition of actions and policies that promote adaptation towards each sector.



## BRAZIL AND THE CLIMATE CHANGE

How to promote the management and reduction of climatic risk



- Support the increment and dissemination of scientific, technical and traditional knowledge supporting the production, management and dissemination of information on climatic risk, and the development of measures for government bodies and general society;
- Promote the coordination and cooperation among government agencies for the management of climatic risk, through participative processes with society, aimed at the continuous improvement of actions for climate risk management;
- Support the assessment and prioritization of adaptation measures oriented to the reduction of the risk associated with climate change.

More information:

[www.mma.gov.br/clima/adaptacao/  
plano-nacional-de-adaptacao](http://www.mma.gov.br/clima/adaptacao/plano-nacional-de-adaptacao)







# Promoting Adaptation

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# ECONOMY-WIDE ADAPTATION TO CLIMATE CHANGE

This project was developed through a partnership between the Ministry of Environment, FGV-GVCES, British Embassy and UKCIP (UK Climate Impacts Programme). The objective of this project is to support the customization to Brazil's reality of a tool to guide the process of adaptation to climate change in the private sector. It also involved the development of a tool for civil society organizations, to guide the preparation of adaptation strategies to climate change. From the private sector, participated in this project, organizations members of the Enterprises for Climate - EPC and the Climate Observatory.

In September 2015 the results of the work developed with the private sector were released: the tool to guide the process of adaptation to climate change in the private sector, the tool for implementation of this cycle and a toolkit to support the engagement.

In February 2016 the products of the work developed with civil society organizations were released: the web site of the project with the results and a downloadable tool, the tool to guide the elaboration of adaptation strategies by civil society, and the Climate Game: how climate change may affect the civil society organizations?

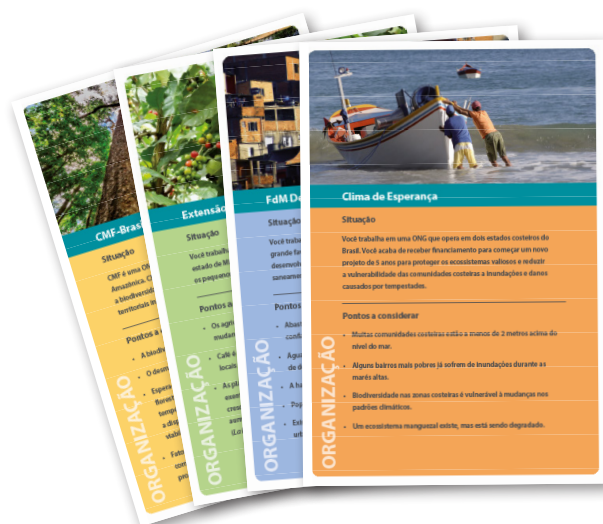
# HOW CLIMATE CHANGE IMPACTS PROJECTS OF YOUR NGO?

## CLIMATE GAME

Let's start thinking about this?

1º

Choose and NGO profile



2º

Analyse and prioritize the risks



3º

How can your role be affected or how can you contribute?



More information on the project:

[www.gvces.com.br/projeto-adaptacao-a-mudanca-do-clima-no-brasil](http://www.gvces.com.br/projeto-adaptacao-a-mudanca-do-clima-no-brasil)



KNOW HOW TO

Plan Adaptation actions



Get to know the methodological cycle



Apply the tool in your NGO

1. Panorama do Projeto	2.	3.	4.	5.	6.	7.	8.	9.
D20								
1								
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Tool developed in the Microsoft Excel platform

## ADAPTATION PLAN TO BUSINESS: HOW TO CONSTRUCT?

### CLIMATE AND YOUR BUSINESS Have you thought about this

Use the methodological cycle and the tool in your company

#### 1. DIAGNOSIS

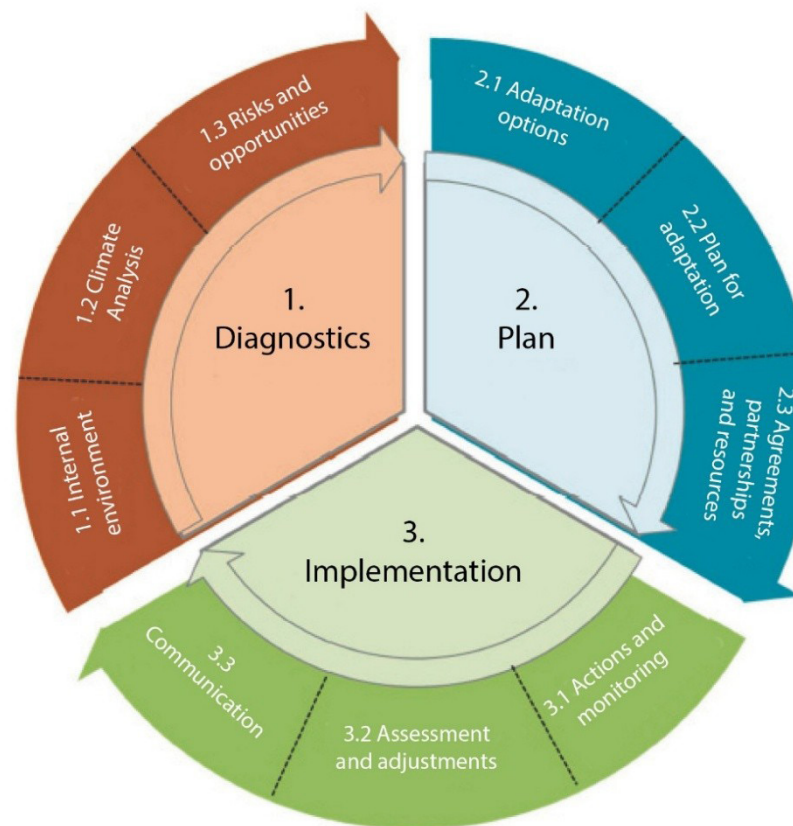
Asses risks and opportunities

#### 2. PLAN

Set out with technical staff adaptation options and develop a plan of action

#### 3. IMPLEMENTATION

Implement, monitor and inform your results



More information on the project:

<http://adaptacao.gvces.com.br/#nav-adaptacao>



# HOW TO INTEGRATE ECOSYSTEM-BASED ADAPTATION APPROACH (ABE IN PORTUGUESE) IN PUBLIC POLICIES?

This activity is part of the Project “ Biodiversity and Climate Change in Mata Atlantica Biome”, developed through the partnership between the Brazilian and German Ministries of Environment, with the technical cooperation of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

Ecosystem based Adaptation Approach was developed within the framework of the Convention on Biological Diversity (CBD), and objectives to disseminate the consideration and use of biodiversity and ecosystem services as part of a strategy to help people adapt to the adverse effects of climate change and promote natural carbon sinks for mitigating greenhouse effect gases.

Most part of the project is based on training activities developed for the identification, prioritization and implementation adaptation measures in three regions of mosaics for Conservation Units of the Mata Atlantica biome.



# HOW TO INTEGRATE ECOSYSTEM-BASED ADAPTATION APPROACH (ABE IN PORTUGUESE) IN PUBLIC POLICIES?



Interactive course “Consideration of Adaptation to Climate Change and Ecosystem Approaches in public policies” based on The Harvard Case Method



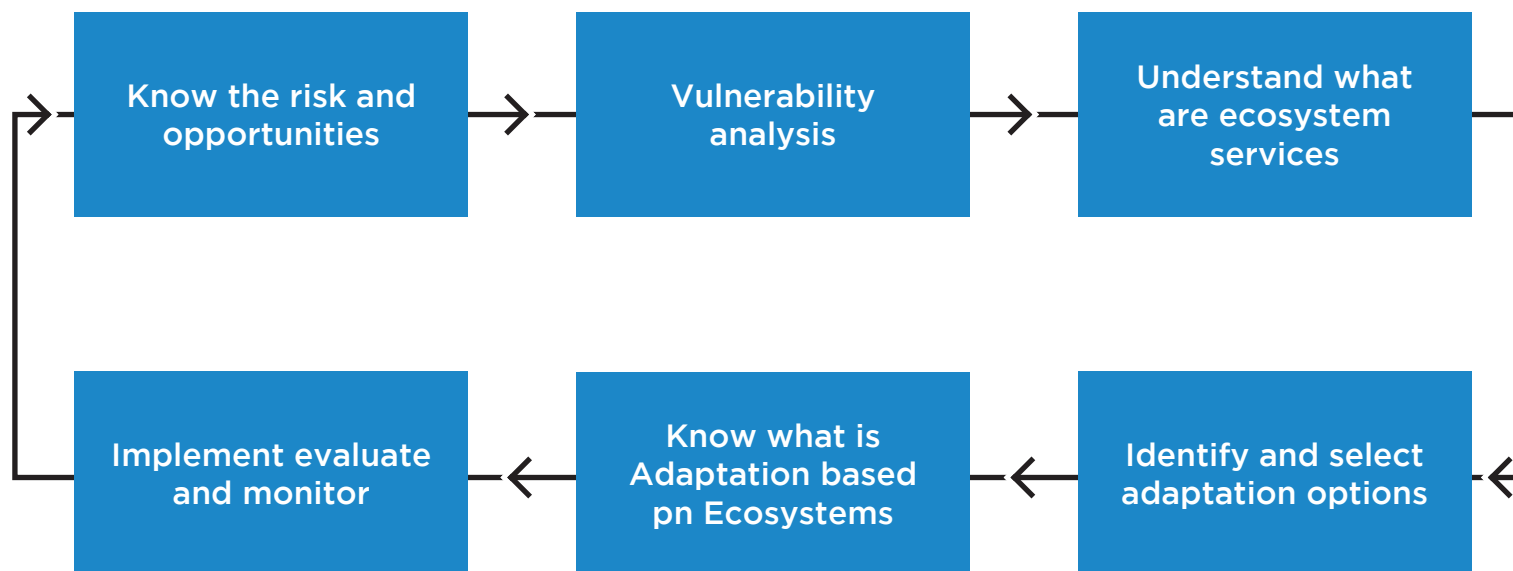
More information on the project:

[www.mma.gov.br/clima/adaptacao/projetos](http://www.mma.gov.br/clima/adaptacao/projetos)



Course methodology





# ADAPTACLIMA - ADAPTATION TO CLIMATE CHANGE KNOWLEDGE PLATFORM

This project is developed through a partnership between the Ministry of Environment, British Council, Getulio Vargas Foundation and the International Institute for Environment and Development, and has as one of its objectives the development of a knowledge platform on adaptation to climate change in Brazil.

The main result will be to build an open, democratic and flexible space to facilitate cooperation, co-creation of knowledge and training of the various actors involved with the topic, increase synergies, facilitate partnerships, which will give promptness to the implementation of measures for tackling the impacts of climate change in Brazil.

This tool will support the implementation of the National Adaptation Plan to Climate Change.



# IPACC II - CLIMATE RISK MANAGEMENT AND PUBLIC INVESTMENT

The IPACC II Project - Public Investment and Adaptation to Climate Change in Latin America - is the result of a cooperation between Brazil, Peru and Colombia. The project will be developed between May 2015 and June 2019, funded by the BMUB of Germany and offered by the Deutsche Gesellschaft für Internationale Zusammenarbeit, responsible for the financial execution.

The main objective of the Project is to promote, within the framework of the technical and political bodies of the Ministries of Economy, Finance and Planning in Peru, Brazil and Colombia, the consideration of the risk associated with climate change and adaptation options in the planning and decision-making processes for public investments.

