

# **Impacts, vulnerability and management of the Amazonian coastal zone**

**Prof. Dr. Claudio Szlafsztein**

Federal University of Pará

Center of Environment

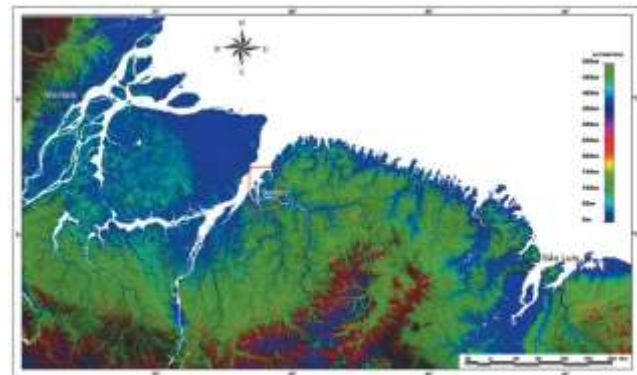
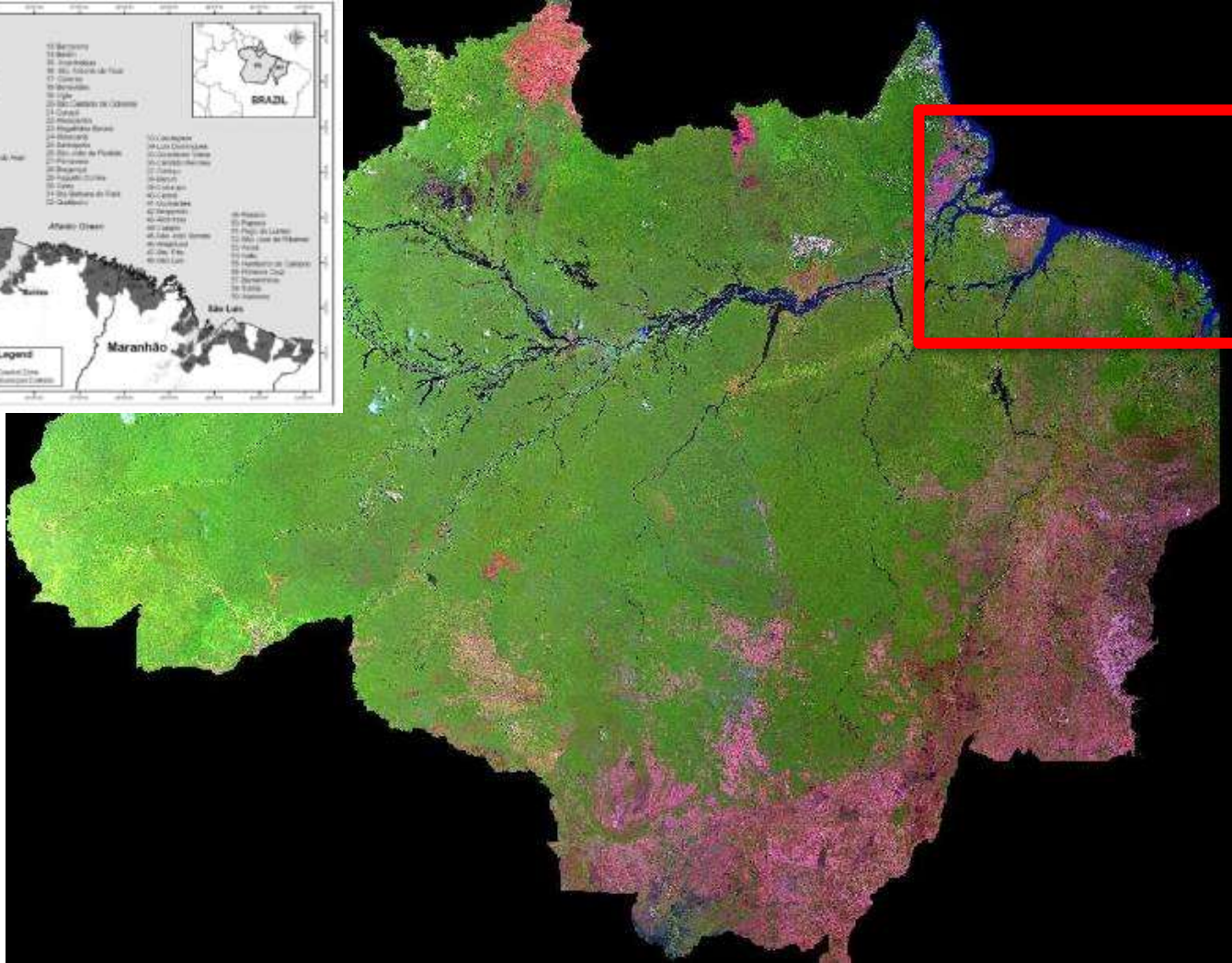
[iosele@ufpa.br](mailto:iosele@ufpa.br)

# Brazilian Oceanographic Territory

The map illustrates the Brazilian Oceanographic Territory. It features a light blue area representing the Exclusive Economic Area (ZEE) extending 200 nautical miles from the coast. A darker blue area along the coast represents the Coastal Zone, extending 12 nautical miles. The word 'Brasil' is written on the left side of the map. A callout box at the top left provides details about the ZEE, and another callout box at the bottom right provides details about the Coastal Zone. A specific point on the coast is labeled 'Fernando de Noronha' with a distance of '370km' from the mainland. Another distance of '22km' is marked near the top left coast.

**EXCLUSIVE ECONOMIC AREA**  
200 nautical miles /3,5  
millions Km<sup>2</sup>

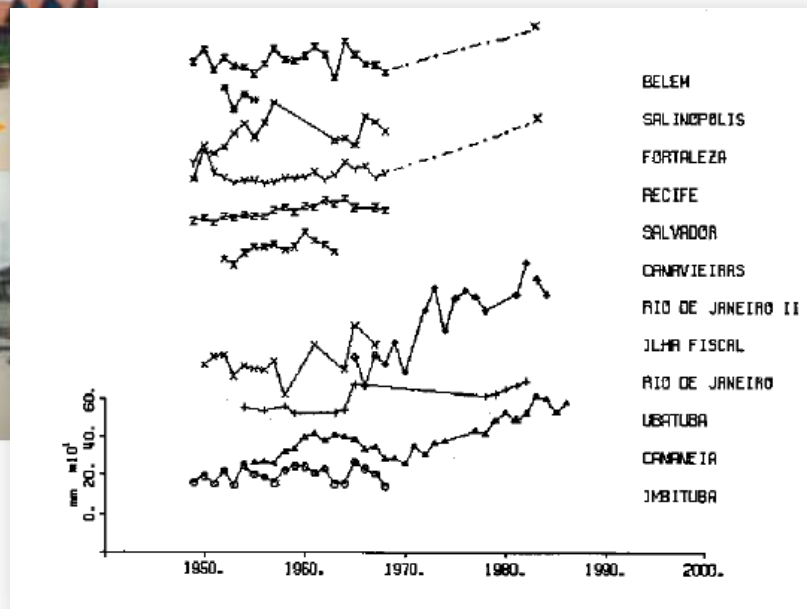
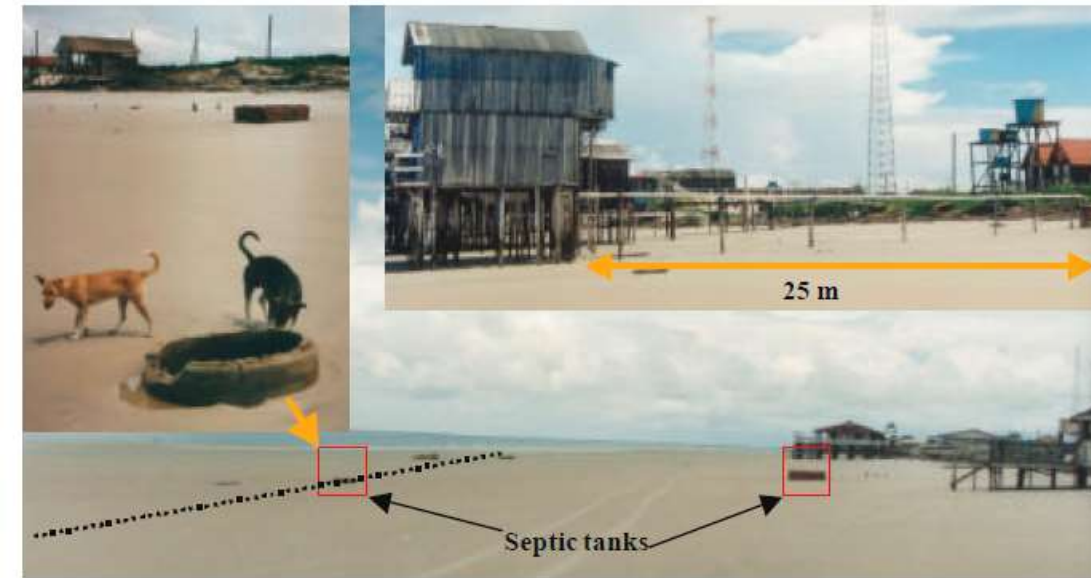
**COASTAL ZONE**  
Coastal Municipalities + Territorial Sea (12  
Nautical Miles)  
More than 7000 km coastline  
17 States, 13 capital cities, 395 municipalities  
45 millions inhabitants (25% total population)



- 35% of the 7,400 km Brazilian coastline
- States of Amapá (57,858 km<sup>2</sup>), Pará (43,659 km<sup>2</sup>), and Maranhão (66,790 km<sup>2</sup>).
- Highly energetic zone, with large sedimentary mobility, influenced by discharge of the Amazon River and the ocean hydrodynamic factors, in particular the semidiurnal macro tides (4 to 12 m).
- low relief (0–80 m), a broad coastal plain (i.e., up to 70 km in width) and an extended adjacent continental shelf (i.e., about 330 km wide).
- The Amazon River divides the coastline into two segments (North, smooth platform; South, irregular “ria” coast).
- Both segments are characterized by a fringe of muddy sediment covered by mangroves (Largest in the Brazilian coast and one of the largest in the world).
- Large areas that are difficult to access and/or are still sparsely inhabited by traditional populations; yet, it is also home to the notable presence of metropolitan regions of Macapá-Santana, Belém, and São Luis; 4 million inhabitants.
- The fast and disordered urbanization process highlights the presence of a social segregation, inducing a large portion of population to occupy risk prone areas and places where precarious infrastructure and public services often exist.
- Wide range of socioeconomic activities: community-based agriculture, fishing, extractivism, small scale tourism, heavy industry (i.e., steel production), and larger port complexes.
- Preservation and conservation policies for regional sensitive ecosystems and traditional populations, achieved by the implementation of several conservation units.









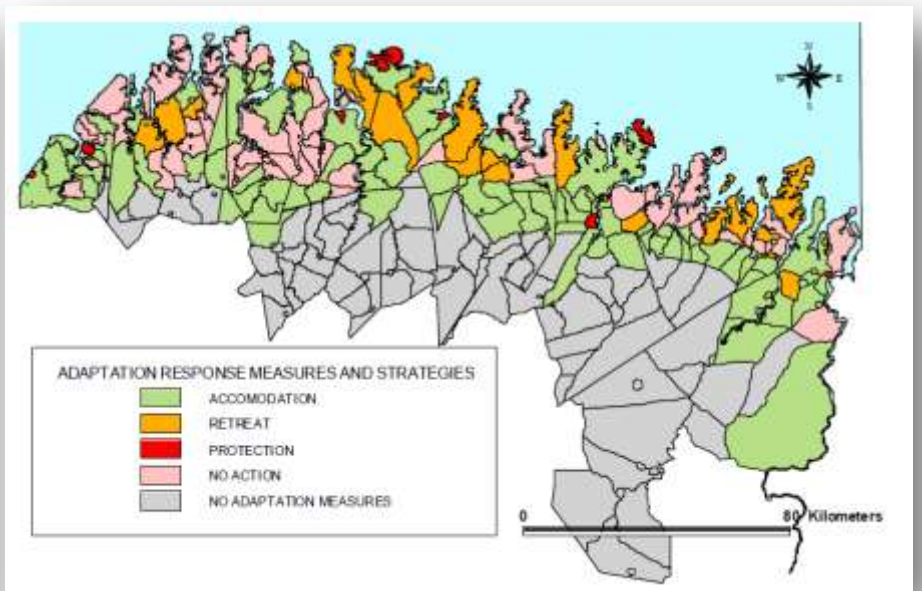
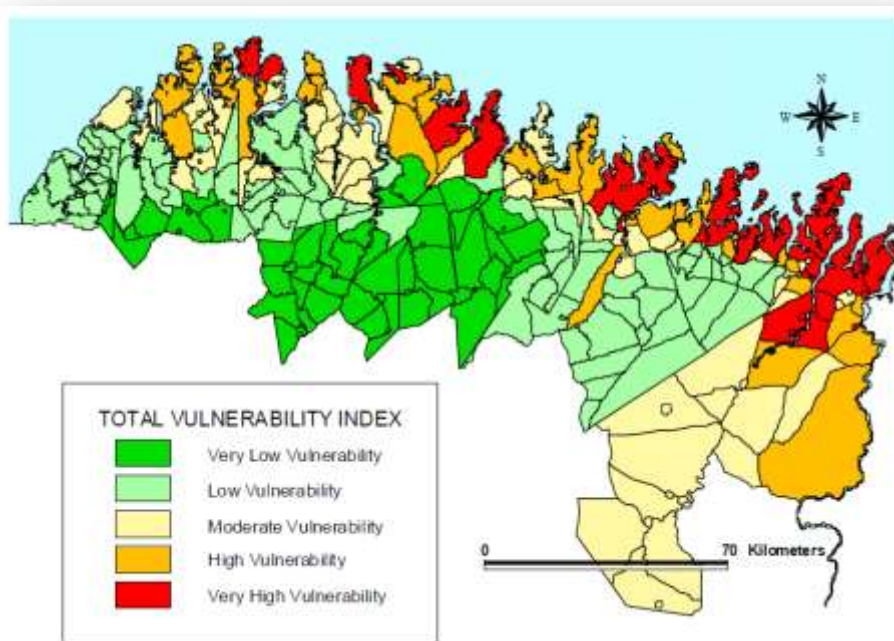
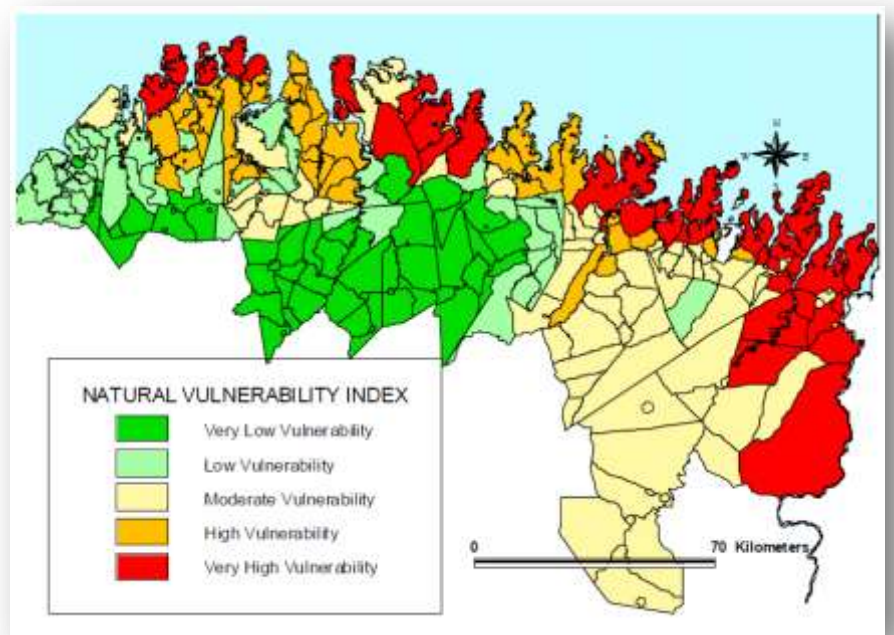
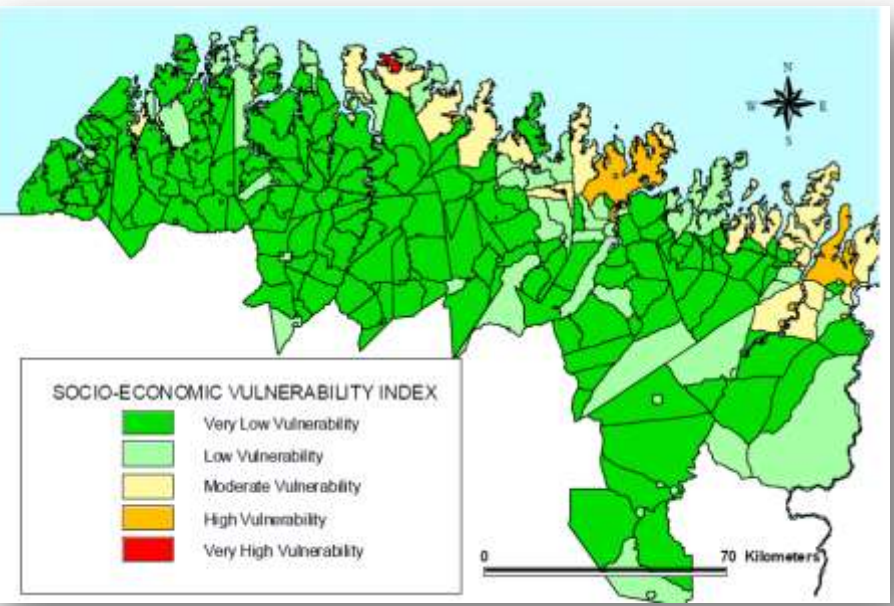
# A GIS-based vulnerability assessment of coastal natural hazards, state of Pará, Brazil

Claudio Szlafsztein · Horst Sterr

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**Abstract** Studies carried out in the NE coastal zone of the State of Pará (Brazil) have recorded, in the last 25 years, numerous evidence of natural impacts of the flooding and erosion processes. As a consequence, diverse strategic measures of population adaptation have been implemented but with limited success. Therefore, in order to support the Coastal Zone Management Program of Pará, this study aims to assess the vulnerability of the coastal zone to natural hazards.

	Variables
Socio-economic vulnerability	Total population affected (flood); Non-local Population affected (flood); Children affected (flood) and elderly affected (flood).
	Population Density
	Non-local Population, Children, Elderly
	Total population 2000; Municipal Budget 2000; Poverty.
Natural Vulnerability	Coastline length, Flooding area; Protection measures, emergency relief historic cases; total length of fluvial system.
	Coastal features
	Continentality; coastline complexity; proportion of flooding area; drainage density; split ratio.







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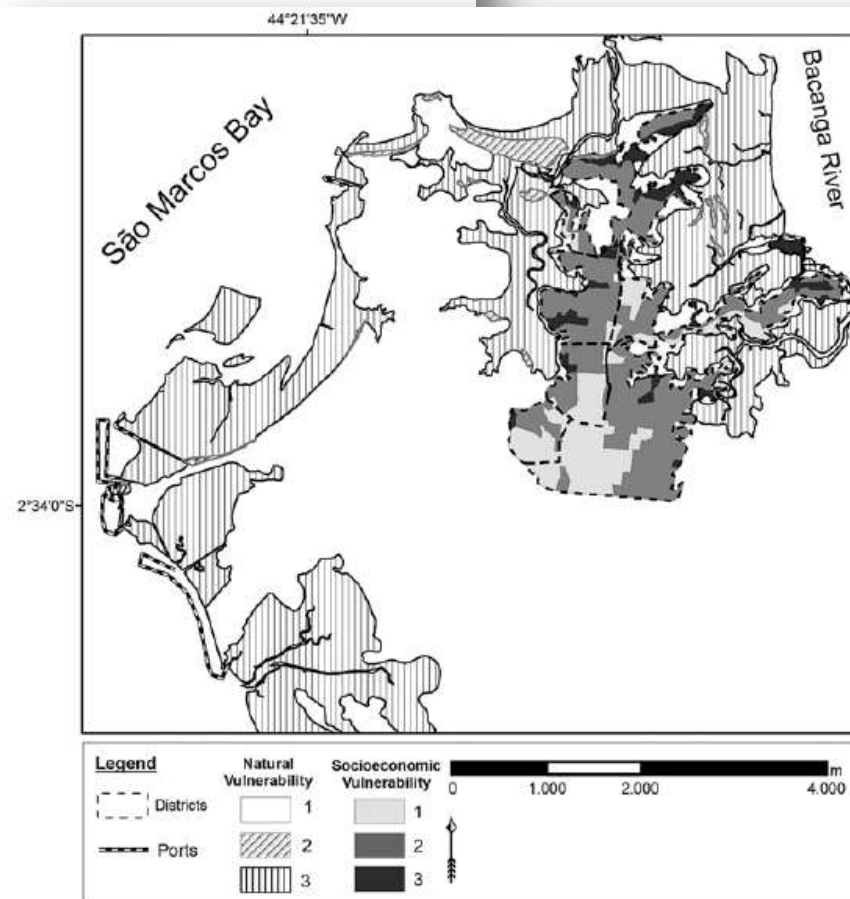
## A socioeconomic and natural vulnerability index for oil spills in an Amazonian harbor: A case study using GIS and remote sensing

Milena Marília Nogueira de Andrade<sup>a,\*</sup>, Claudio Fabian Szlafsztein<sup>b</sup>, Pedro Walfir M. Souza-Filho<sup>a</sup>, Adrilayne dos Reis Araújo<sup>c</sup>, Monique Kelly Tavares Gomes<sup>c</sup>

<sup>a</sup>Universidade Federal do Pará, Instituto de Geociências, Laboratório de Análises de Imagens do Trópico Úmido, Rua Augusto Corrêa 1, Caixa-Postal: 8608 Belém, Pará, Brazil

<sup>b</sup>Universidade Federal do Pará, Núcleo de Meio Ambiente, Rua Augusto Corrêa 1, CEP: 66075-900, Belém, Pará, Brazil

<sup>c</sup>Universidade Federal do Pará, Instituto de Ciências Exatas e Naturais, Rua Augusto Corrêa 1, Campus da UFPA, CEP: 66075-900, Belém, Pará, Brazil



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*Baltimore, MD, USA  
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**SEA LEVEL RISE IN NORTH BRAZIL: IMPACTS AND RESPONSE MEASURES FOR COASTAL PROTECTION**

*Claudio F. Szlafsztain  
Department of Geology, University Federal of Pará, Brazil*

*Ruben J. Lara  
Center of Marine Tropical Ecology, Bremen University, Germany*

Coastal area	Morphology	Part of the cliff protected	Monetary funds	Element Protected	Type of protection measures	Materials employed		Position	Buttress	Localities
Sea	Sea cliff	Complete slope	Public	Roads and sea walk roads	Sea wall	Concrete	Armed	Vertical	No	Sainas (1)
							Stones and mortar	Sloping	Yes	Sainas (2)
			Private	Buildings	Sea wall	Concrete	Armed	Vertical	Yes	Atalaia (3)
							Stones and mortar	Sloping	No	Atalaia
							Stones and mortar	Sloping	No	Maruda (4)
		Wood and local-area stones				Mocooca (5)				
		Base	Public	Roads sea walk roads	Sea wall	Concrete	Armed	Vertical	Yes	Sainas
							Stones and mortar	Sloping	No	Sainas
				Cement bags			Maruda (6)			
				Groins	Cement bags		Sainas (7)			
	Revetments			Non-local area stones	With steel net		Sainas			
				Without steel net		Sainas (8)				
	Houses		Revetments	Local-area stones	With steel net	Sainas (9)				
	Private		Houses	Sea wall	Concrete	Stones and mortar	Vertical	No	Maruda	
						Wood and local-area stones	Vertical	No	Atalaia	
		Local-area Stones				Vertical	No	Maruda (10)		
		Wood and cement bags						Atalaia (11)		
	Natural	Houses		Local-area stones			Sainas Atalaia			
	Dunes	Private	Buildings on pillars	Sea wall	Wood			Ajunatoua (12)		
					Wood and local-area stones			Atalaia (13)		
Cement bags							Crapim			
Estuarine	River cliff	Complete Slope	Public	Roads sea walk roads	Sea wall	Concrete	Stones and mortar	Vertical	Yes	Prabas
							Armed	Vertical	Yes	Boa Vista (14)
							No	Calezal (15)		
		Base	Public	Roads sea walk roads	Sea wall	Concrete	Stones and mortar	Vertical	No	Maracana
									Yes	Maracana
			Natural	Roads sea walk roads		Local-area Stones			Boa Vista	
No cliff	t	Public	Roads sea walk roads	Sea wall	Concrete	Armed	Vertical	No	Vigia	
						Stones	Vertical	Yes	Vigia	





# Development projects for small rural communities in the Brazilian Amazon region as potential strategies and practices of climate change adaptation

Claudio Fabian Szlafstein

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**Abstract** Climate scenarios for the Amazon region indicate a temperature increase and a precipitation decrease, affecting social and economic activities. This study analyzes the impact of development projects on the adaptation of small rural communities in the Brazilian Amazon region. The study is based on a survey of 110 small rural communities in the Brazilian Amazon region. The results show that the most common practices and strategies of climate change adaptation are related to agricultural production, social networks, and financial and governmental management. The most common subgroups are related to income diversification, education, training, and research in the communities, and public environmental awareness campaigns.

Practices and strategies of climate change adaptation		Project									
		74 C	1 C	4 C	34 C	56 C	96 C	4 P	7 P	22 P	
Group	Subgroup										
	n										
	Income Diversification										
Strengthening of social networks	Encouraging social organization										
	Education, training, and research in the communities										
	Public environmental awareness campaigns										
	Climate extreme events' risk management										

Practices and strategies of climate change adaptation	
Group	Subgroup
Technological development	Use of new varieties of grains and instruments
	Development and use of early warning systems and meteorological data acquisition
Changes in agriculture production	Diversification of products and activities
	New procedures
	Alteration in place
	Implementation of artificial irrigation practices
	Variation of the production schedule
	Modification of natural disasters' relief procedures
Change in financial and governmental management	Non-planned products commercialization

# The Brazilian Amazon coastal zone management: implementation and development obstacles

Claudio Fabian Szlafsztain

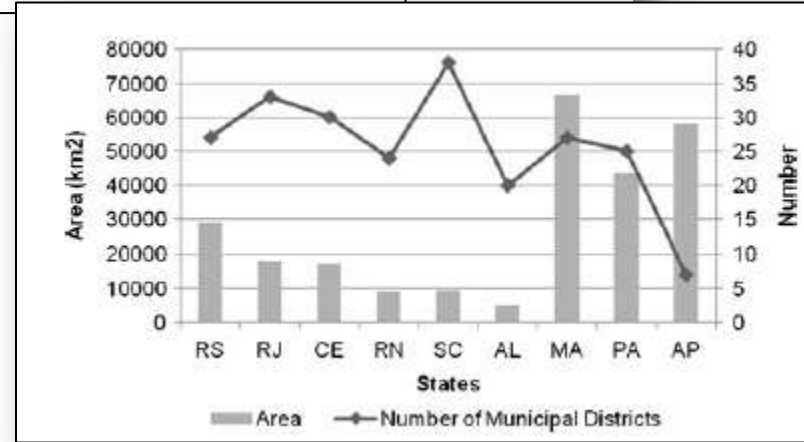
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**Abstract** The Amazon region represents approximately 35% of the Brazilian coastline and includes the states of Amapá, Pará, and Maranhão. After several years, the Amazon coastal zone has not made clear progress and has failed to show important results in terms of management plans based on the weak societal and local community support, the absence of a strong institutional coordination, and the scarcity of resources. This study aims to present and discuss the existence of others important factors that have obstructed

## Introduction

In sibility due to the incre concentrated in coas objects of scientific s promote their sustain Coastal Management law 7661/88 and deta

### Coastal zone boundaries



### Governmental lack of interest area

