# **CONSIDERATIONS ON THE POTENTIAL OF INCREASE IN COASTAL VULNERABILITY IN** TINHARÉ AND BOIPEBA ISLANDS, BAHIA, BRAZIL, IN FACE OF CLIMATE CHANGE

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recifes de corais e mudanças globais





### **Coastal Vulnerability**

Exposure to erosion and inundation

#### +

Population





### **Coastal Vulnerability**

recifes de corais e

 Biological and geophysical factors → increase/decrease in CV



#### Natural Capital

#### **Ecosystem Services**



Study Citation: Ferrario, F., M.W. Beck, C.D. Storiazzi, F. Micheli, C.C. Shepard, L. Airoldi. 2014. The Effectiveness of Coral Reefs for Coastal Hazard Risk Reduction and Adaptation. Nature Communications. Doi:10.1038/ncomms4794 © 2014 The Pew Charitable Trusts





## **Coral Reefs in Brazil**

- High endemism
- Low diversity
- Siliciclastic sediments on nearshore reefs

Stressful factor: decrease in luminosity

### Tinharé and Boipeba Islands



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- Fringing reefs
- Important ecosystem services
- MPA
- Chronic human impacts

Tourism: *Morro de São Paulo* 

Lack of sewage system

Fisheries

### Tinharé and Boipeba Islands



recifes de corais e

Climate change impacts?



- Fringing reefs
- Important ecosystem services
- MPA
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Tourism: *Morro de São Paulo* 

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### Objective

 Assess the potential coastline protection provided by these coral reefs in the current scenario and in a scenario of coral reef absence (extreme reef decline)



# **InVEST** (Integrated Valuation of Ecosystem Services and Tradeoffs)

#### Coastal Vulnerability Model

recifes de corais e

- Qualitative  $\rightarrow$  potential for shoreline protection
- Exposure Index
  - Geomorphology
  - Relief

natural

capital

PROJEC

- Habitats
- Winds and waves
- Storm surges
- Simplification of processes

| General | Advanced                        |   |   |   |  |
|---------|---------------------------------|---|---|---|--|
|         | Output area: shettered/exposed? | both ·  |   | 0 |  |
| 1       | Workspace location              | C: V/v/EST_3_0_0_x85 (pointial_vulnerability_II                                 |   | 0 |  |
| 1       | Area of interest.               | C: /Users/Carla Eliff/Documents/InVEST/Novos shapes QGIS/novo AOI @Na/TE v2.shp | - | 0 |  |
| 4       | Land polygon                    | C://wEST_3_0_0_x86/Marine/Base_Data/Marine/Land/global_polygon.shp              | - | 0 |  |
| *       | Bathystett y layer              | C://nVEST_3_0_0_x86/Marme/Base_Data/Marme/DEMs/claybark_clem/hdc.add            | - | 0 |  |
|         | Layer value if path onvited     |   |   | 0 |  |
| +       | Relef                           | C:/hilEST_3_0_0_x86/Marine/Base_Data/Marine/DEMs/daybark_dem/hck.adf            |   | 0 |  |
|         | Layer value if path omitted.    |   |   | 0 |  |
|         | Model resolution (segment size) | 1000  |   | 0 |  |
|         | Depth Itveshold (m)             | 0   |   | 0 |  |
| 4       | Exposure proportion             | 0.0   |   | 0 |  |
| 4       | Geomorphology                   | C:/Users/Carla Eliff/Documents/InvEST/Shapes/topos_costaW/GS84.shp              |   | 0 |  |
|         | Layer value if path omitted     |   |   | 0 |  |
| 1       | Natural habitats directory      | C: Users (Carla Elliff (Documents UnvEsiT) Natural Habitats                     |   | 0 |  |
| 2       | Natural habitats .CSV table     | C: /Users/Carla Elliff/Documents/InvEST Natural solitat_TB.csv                  | 9 | 0 |  |
|         | Layer value if path omitted     |   |   | 0 |  |



### **Coastal Vulnerability Model**

#### Input

- Area of Interest → must include
  WaveWatchIII points
- Geomorphology polyline → Exposure
  Index
- Coral reef polygon
- Relief and bathymetry
- Population data





🐻 🥂 CNPq 🤇

#### Current scenario

recor recifes de corais e

#### Scenario of absence of coral reefs

- Extreme
- Chronic impacts + bleaching + ocean acidification...





#### \*pixel size $\rightarrow$ 350x350 m



J.

CNPq recor



• Morro de São Paulo

**Population** 

Gamboa





#### Population





with the coral reefs





recifes de corais e



with the coral reefs



Without the coral reefs

**46.8%** of the coastline with **moderate** to high vulnerability

Increase of 12.7%

**50.5%** of the coastline had some increase in the vulnerability index

Areas with mangroves had low vulnerability



without the coral reefs



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Northern Boipeba → 7 km (continuous)

without the coral reefs

recifes de corais e

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- Management strategies
  - Climate change adaptation
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- Greater resilience → supply of ecosystem services

# Thank you

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