

Natural Disasters, Vulnerability and Coastal Ecosystems in Colombia

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Presentation Outline

- Background information
- Regional and National context on coastal ecosystems and natural disasters
- Case studies: Tumaco and Cartagena, Colombia
- Methodological Framework
- Preliminary results
- Expected outcomes
- Conclusions

Natural Hazards in Coastal Areas and Vulnerability

- Climate related events – hurricanes, cyclones, storms surges, floods
- Geological events – earthquakes, subsidence, volcanoes
- Small frequent events – erosion, river floods, storm surges
- Extreme events - Volcano eruption Dominique 1902, Tsunami in the West Pacific 1979, Earthquakes 1982, Mexican earthquake in 1985, Hurricane Mitch 1998, Hurricane Wilma 2005.
- **Human/Social vulnerability**
- **Physical vulnerability**
- **Geophysical vulnerability**
- **Multidisciplinary approach indexes.**
- Natural resources provide environmental services to vulnerable areas, including coastal protection. Such services are usually not considered in the indexes, neither as economic values nor as physical barriers. Several studies on the intrinsic capacity of ecosystems to recover or resist damage; termed resilience.

Ecosystem Resilience

- **Impacted by** hurricanes, tsunamis, tropical storms
- **Direct impacts** to corals are waves and sediment discharges to mangroves also wind
- **Indirect impacts** from changing sediment regime
- Other systems impacted beaches and seagrasses
- **Consequences corals** complete destruction, breaking, damage of branching corals, burying by sediments.
- **Consequences Mangroves** defoliation, uprooting, flooding, sediment movement, accumulation of debris, pollution

Ecosystem responses depend on the magnitude of the event, the damage to the ecosystems, species composition, and availability of propagules...

World Atlas of Mangroves

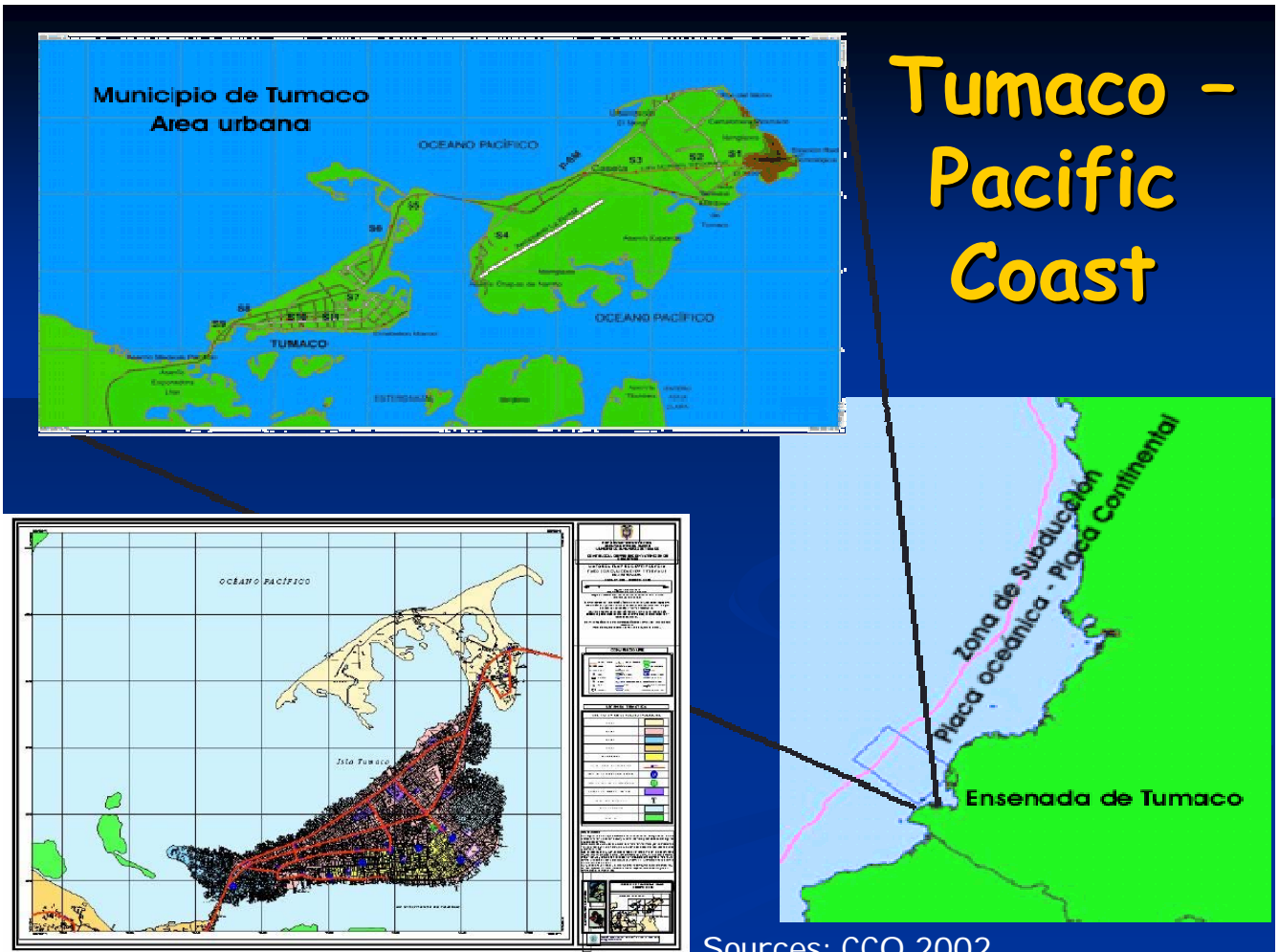


Mangroves Review



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Source: UNEP-WCMC 2005



Sources: CCO 2002

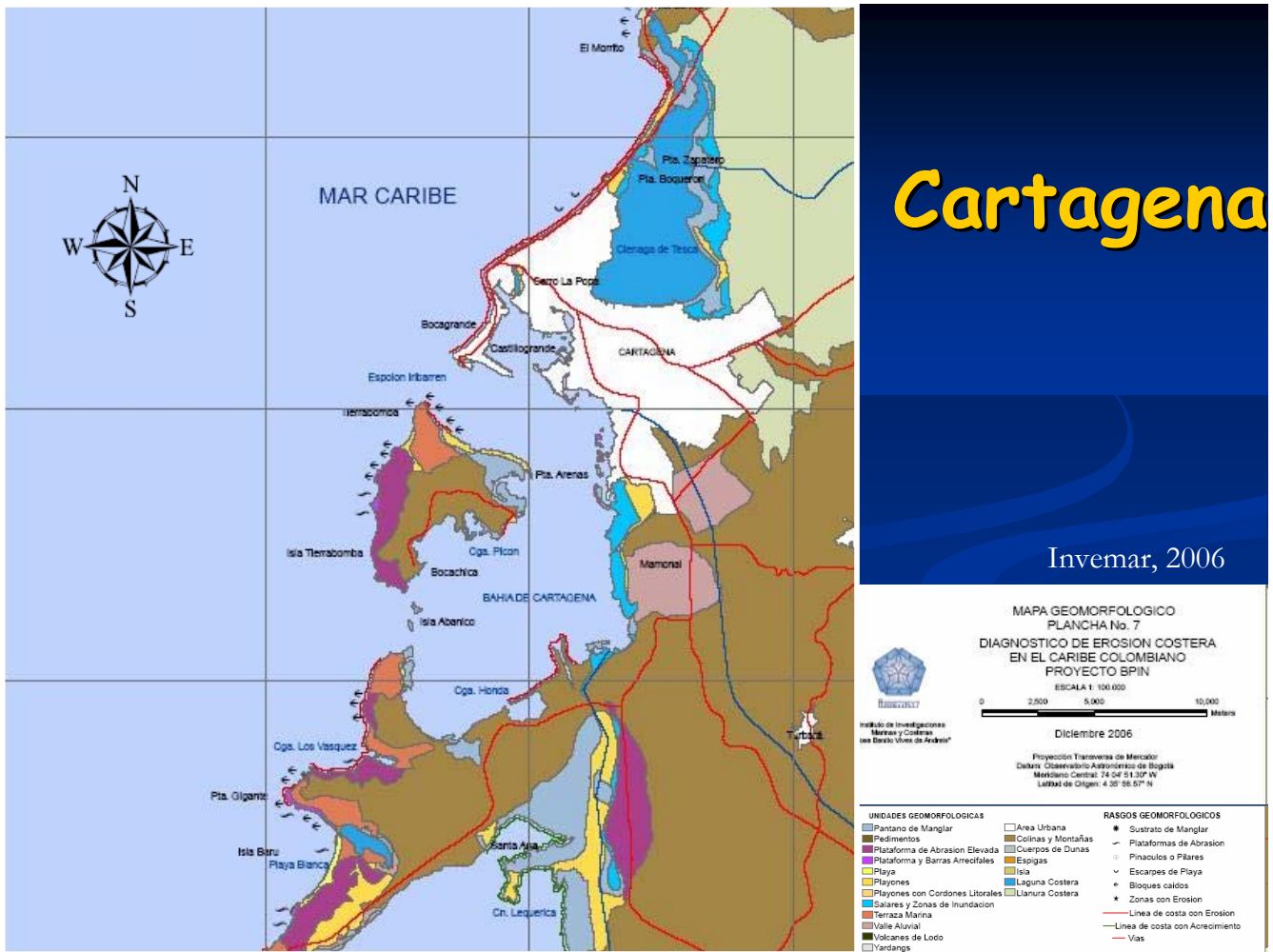
Tumaco after Tsunami 1979



Source: CCO 2002



Tumaco 2005



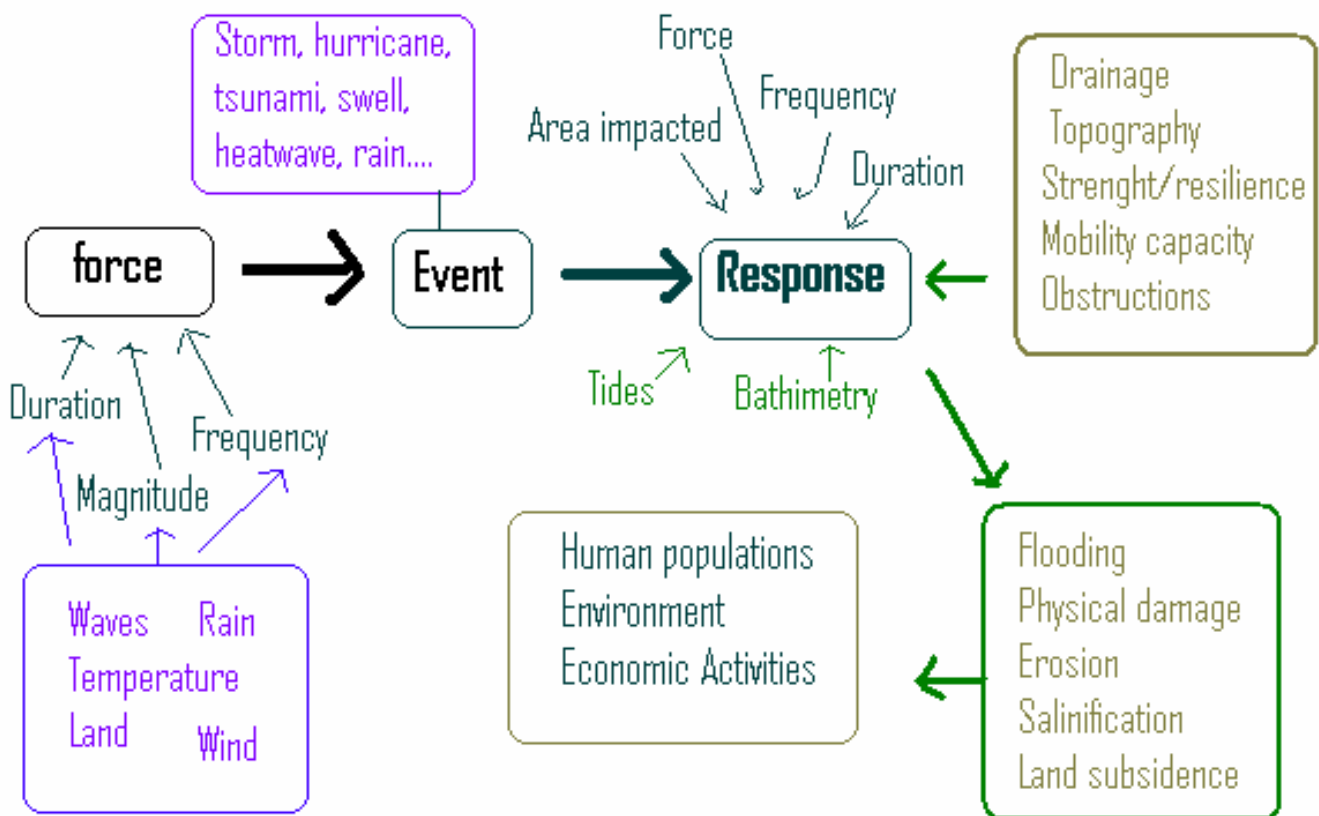
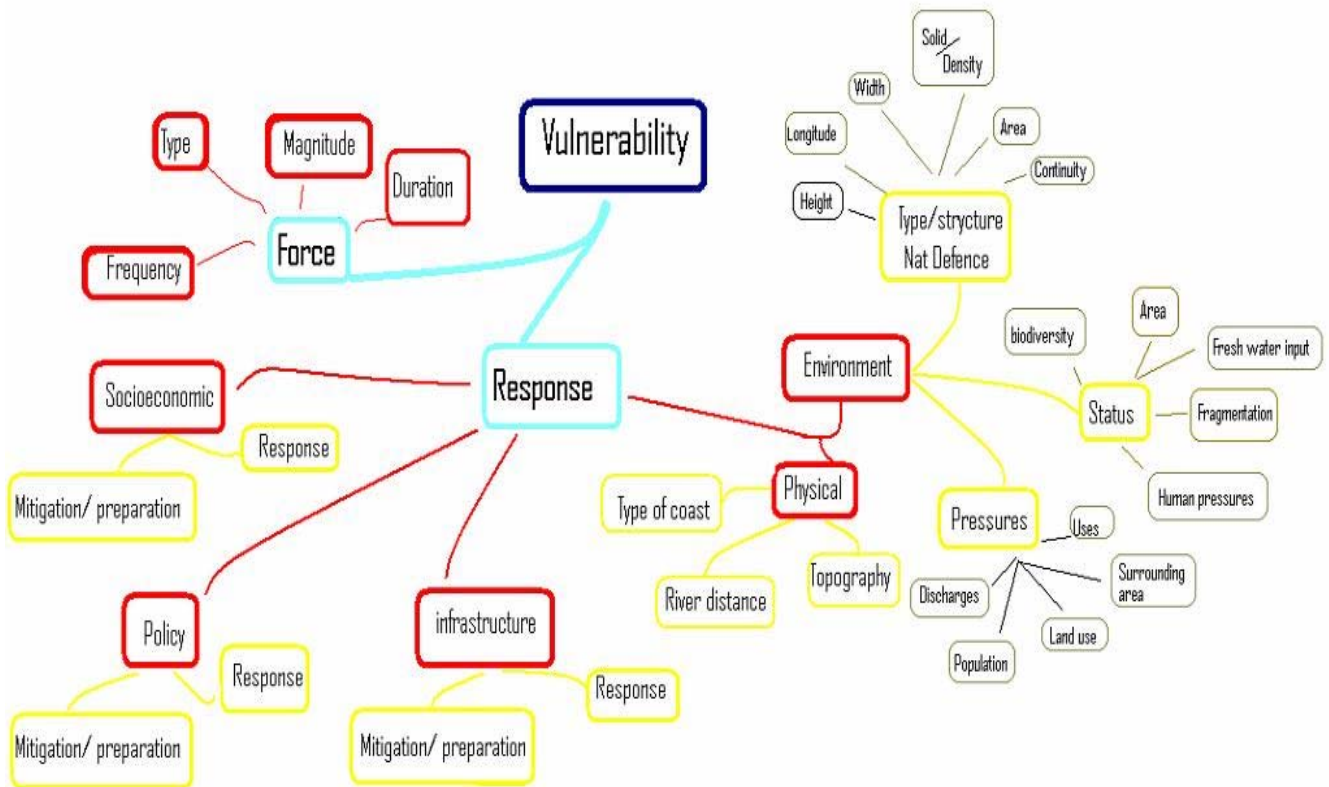


Cartagena 2007

Basic Information required

- Natural disasters: event description, communities affected, infrastructure and natural and physical environments when they occurred
- Natural environment: ecosystems health, conservation status and resilience
- Physical characteristics: geomorphology, bathymetry, hydrology, soil type, topography
- Current economic activities, land use, population
- Historical information regarding land planning, development plans, natural resources exploitation

Vulnerability Framework



The Force Event Response -FER- diagram presents the different forces that impact coastal areas in the region, together with possible responses and, physical and natural characteristics that will influence in those responses. Depending if it is a hurricane or a flood, for example, the impacting forces will vary and so will the responses from the system.

Preliminary results

Tumaco

- Vulnerable to floods (rivers, high tides) and in a very seismic active area.
- Living conditions are very poor in most of the city; however ecosystems surrounding the city seem healthy.
- Population are aware of their vulnerability and know what to do in case of emergency.

Cartagena

- Vulnerable to floods, both as a consequence of sea surges and rivers that flood during the wet season.
- There has not been a severe impact for a long time but annually thousands are affected by floods.
- Environmental degradation in Cartagena is massive, particularly in poor areas of the city.
- Coastal ecosystems are very degraded.
- Population are unaware of the city's situation, both in terms of vulnerability to natural disasters and environmental degradation.

Expected results

- Better understanding of coastal ecosystems' role in vulnerability in tropical coastal areas of Latin America
- An ecosystem-inclusive vulnerability index that considers physical, economic and ecological variables.
- the potential for extrapolating such index to other areas

Conclusion

- Natural disasters in coastal areas of Latin America have been poorly understood, even less so from an ecosystem perspective. A good knowledge of the interactions /responses of coastal ecosystems and their role/impact from natural events could provide a tool for management in those coastal areas where a soft coastal management approach would be less invasive, less expensive and more in accord with natural events.

