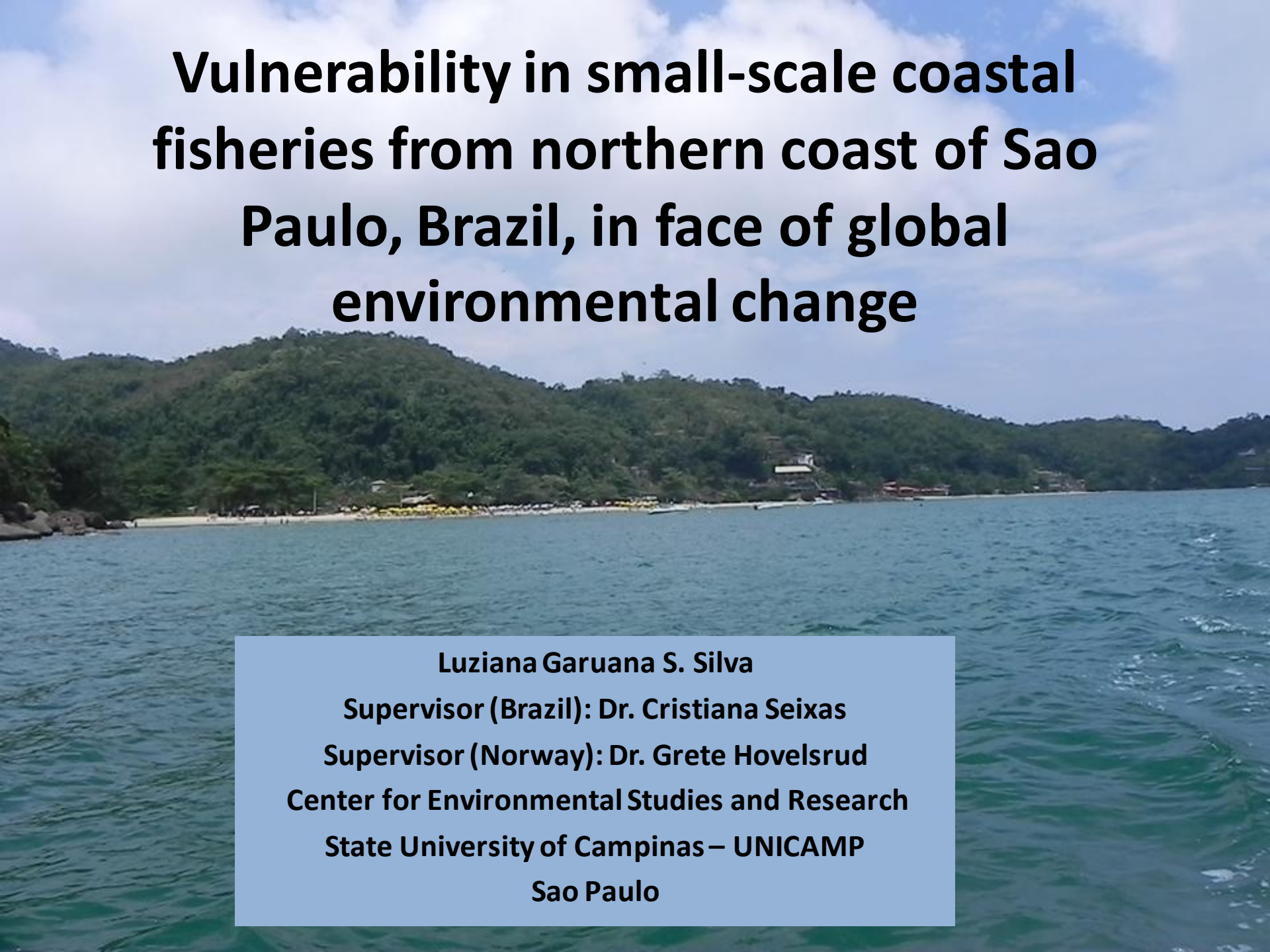
# Vulnerability in small-scale coastal fisheries from northern coast of Sao Paulo, Brazil, in face of global environmental change




**Luziana Garuana S. Silva**

**Supervisor (Brazil): Dr. Cristiana Seixas**

**Supervisor (Norway): Dr. Grete Hovelsrud**

**Center for Environmental Studies and Research**

**State University of Campinas – UNICAMP**

**Sao Paulo**

# Projects in Brazil

**URBAN GROWTH, VULNERABILITY AND ADAPTATION: social and ecological dimensions of climate change on the Coast of São Paulo (2009-2014).**

Ubatuba – Sao Paulo

# Projects in Brazil

- **COMMUNITY-BASED RESOURCE MANAGEMENT AND FOOD SECURITY IN COASTAL BRAZIL: cooperation between Canada and Brazil (2009-2014).**


Paraty – Rio de Janeiro

# What's vulnerability?

- Multiple interpretations , different areas of knowledge

(economy, anthropology, ecology, geography, medicine, engineering, and so on).

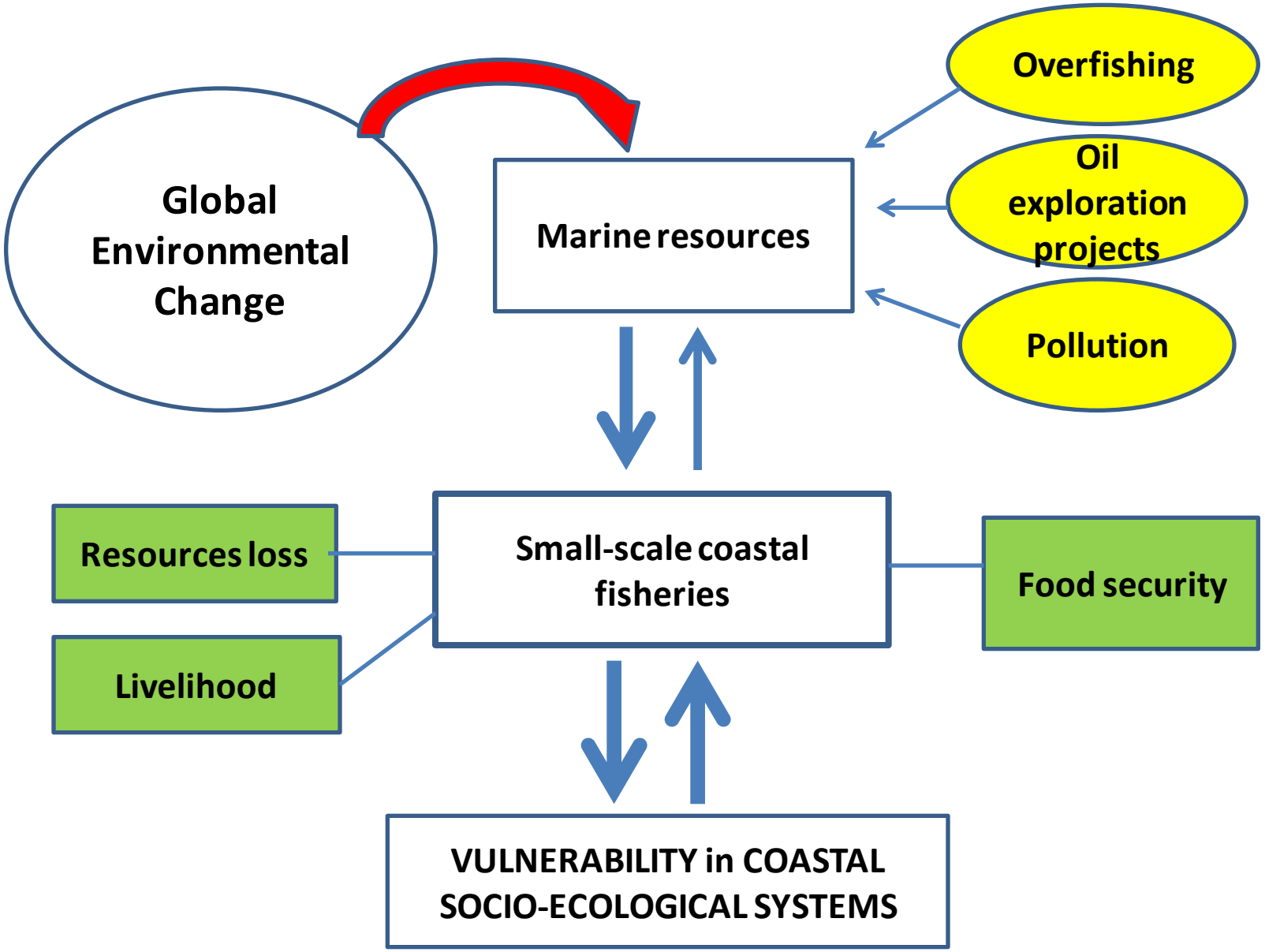
- In the global environmental change science:

**"Vulnerability is the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt " (Adger, 2006).**

- This concept includes biophysical and social aspects.

# Vulnerability in Coastal Ecosystems

- Environmental change in coastal areas:
  - ➢ frequency and intensity of the natural events (high temperatures, storms, flood, landslides)
  - ➢ influence of human activities (overfishing, pollution, urbanization).
- Fisheries: provides 20% of animal protein and feeds around 1.5 billion people worldwide (FAO, 2009).

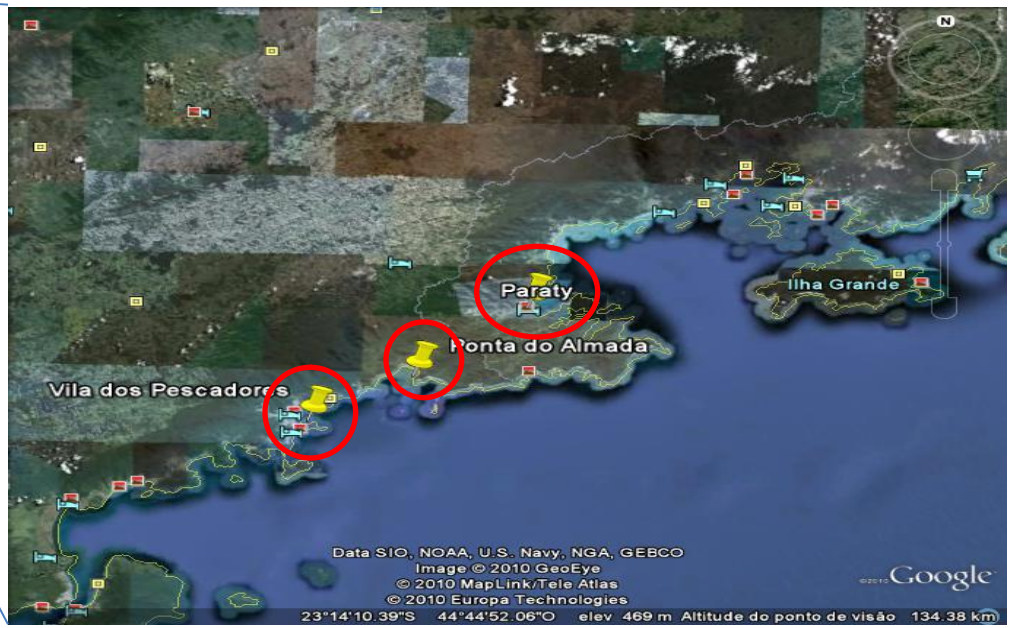

Overfishing
Oil exploration projects
Pollution
Global Environmental Change
Marine resources
Resources loss
Livelihood
Small-scale coastal fisheries
Food security
VULNERABILITY in COASTAL SOCIO-ECOLOGICAL SYSTEMS

| OBJECTIVES | HYPOTHESES | METHODOLOGY |
| --- | --- | --- |
| 1- To investigate if artisanal fishermen in the Northern coast of Sao Paulo perceive environmental change. | Traditional populations that depends of natural resources for livelihood use local ecological knowledge (LEK) to perceive changes in the natural environment. | Semi-structured interviews about perceptions of changes in the weather and sea. |
| 2- To analyze vulnerability in two small-scale coastal fisheries in face of environmental change. | The vulnerability in small-scale coastal fisheries increases with increasing frequency and intensity of climate events, which leads to destabilization of the coastal fisheries. | Vulnerability analysis framework. |

| OBJECTIVES | HYPOTHESES | METHODOLOGY |
| --- | --- | --- |
| 3- To analyze if local ecological knowledge (LEK) of artisanal fishermen is used in the adaptation to environmental change. | To dealing with the increasing of the vulnerability, the local ecological knowledge (LEK) of artisanal fishermen in small-scale coastal fisheries is used in the adaptation to environmental change. | Semi-structured interviews about changes in fishing gears, fishing methods and fishing spots and history of region fisheries from 1960's until 2011 . |
| 4- To analyze whether the adaptations to environmental change have contributed or not to reduce vulnerability of fishery social-ecological systems. | Adaptations to environmental change emphasizing local knowledge and local policies contribute to reduce vulnerability in small-scale coastal fisheries. | Working on it. |

# Study Area

Northern coast of Sao Paulo (Ubatuba city) and Southern coast of Rio de Janeiro (Paraty bay)

# Almada community

•35 km far from Ubatuba town

• Population: about 270 inhabitants

• About 30 artisanal fishermen

•Main sources of income: artisanal fisheries and tourism

# Vila dos Pescadores community

- Downtown Ubatuba
- Port of artisanal fisheries
- Around 113 inhabitants
- Around 80 fishermen
- Main source of income: fisheries


# Fieldwork - **Steps completed (2009 to 2011)**

- Seasonal fishing landings: 11 days in every 2 months (jun/2010-mai/2011)

- Semi-structured interviews (fev/10 – jun/11)

- Identification of fish species (mai/11 – aug/11)

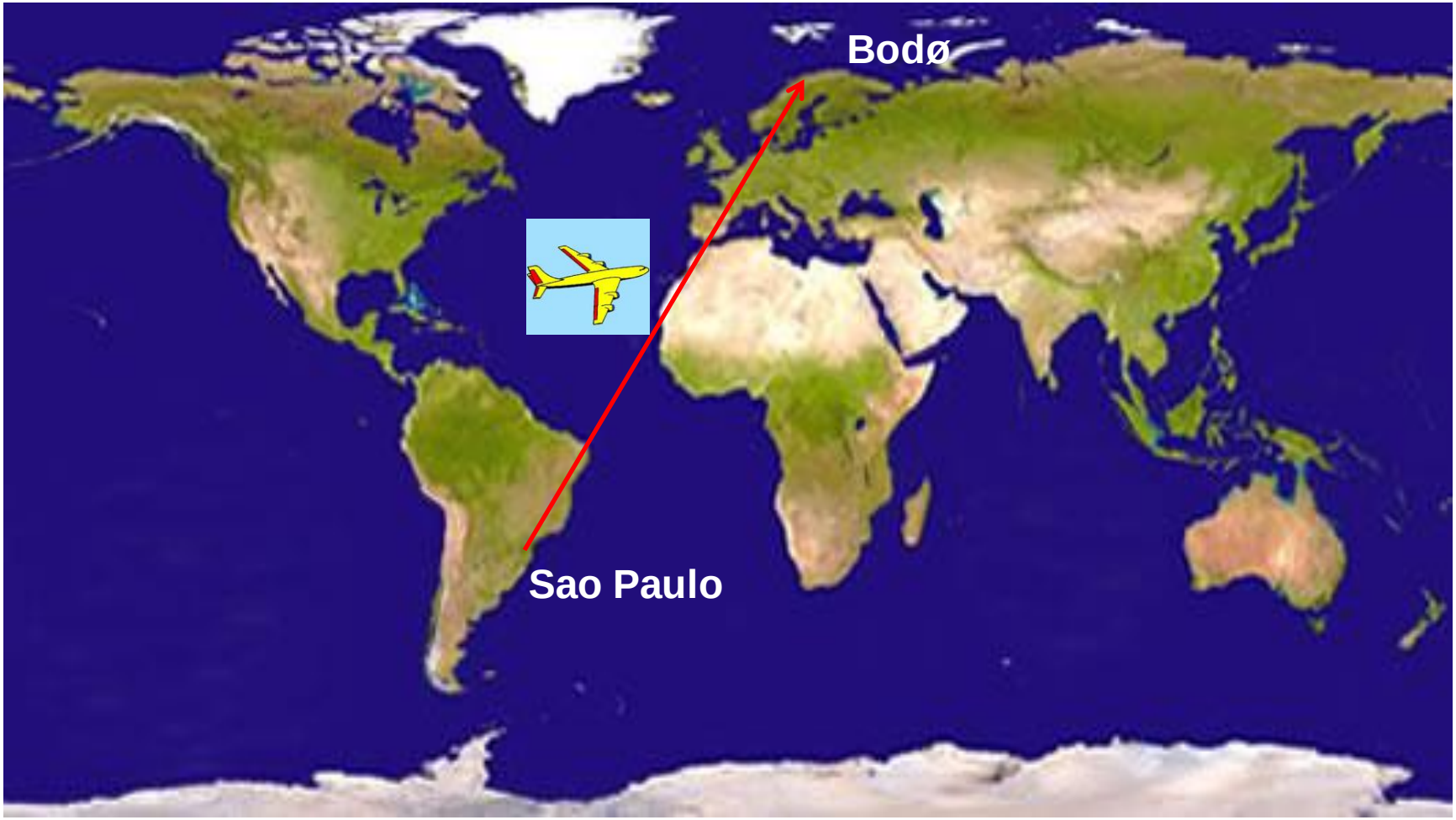

*Kyphosus sectatrix*

*Dasyatis hypostigma*

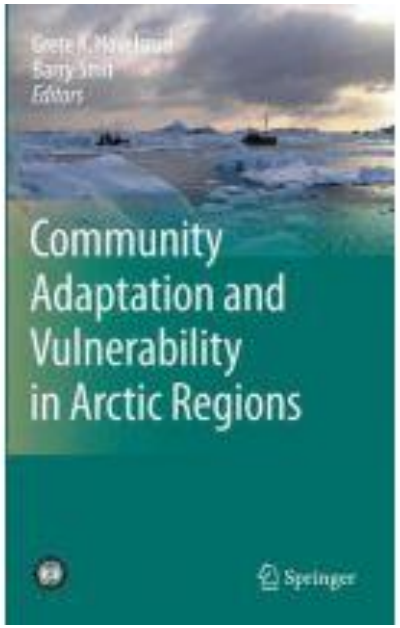
# Steps to complete

- **Toxicological analysis - food security in Ubatuba and Paraty bay (2012)**
- **Vulnerability Analysis Framework (2011-2012)**
- **Publication of papers in international journals and participation in conferences and congress(2011-2012)**
- **Thesis completed (mar/2013)**

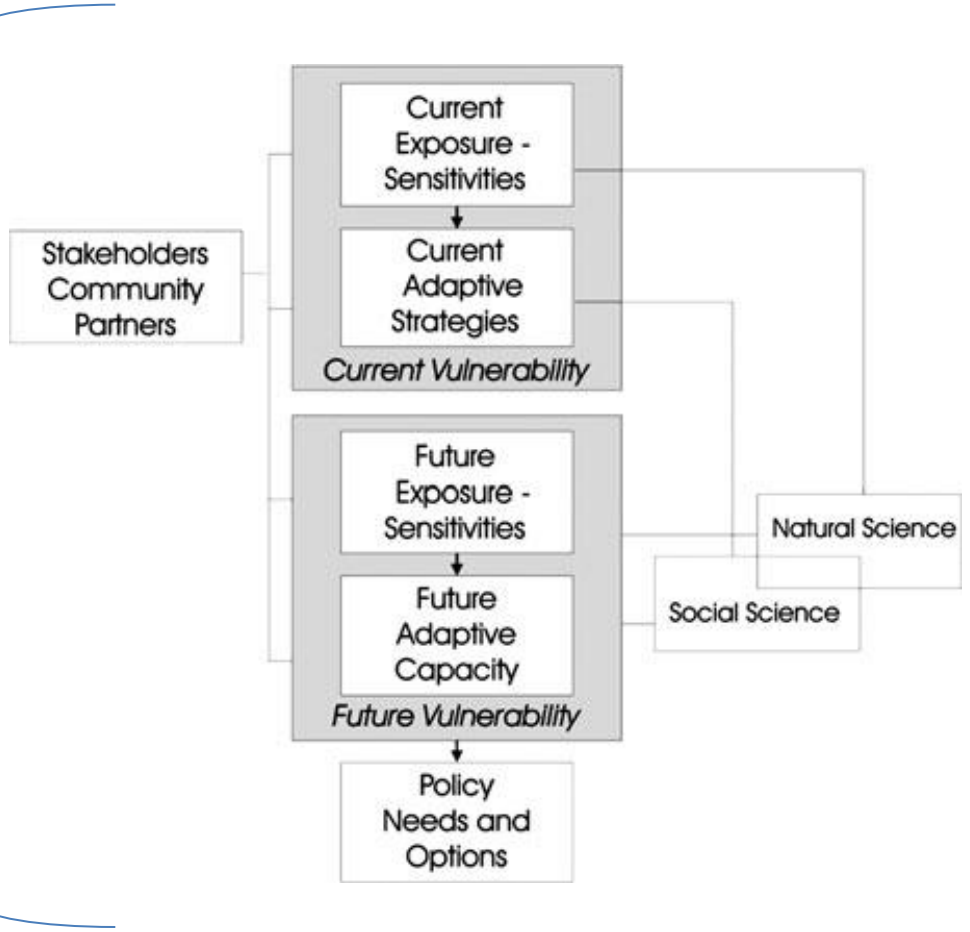
# Why Norway????



# Vulnerability in Arctic Regions

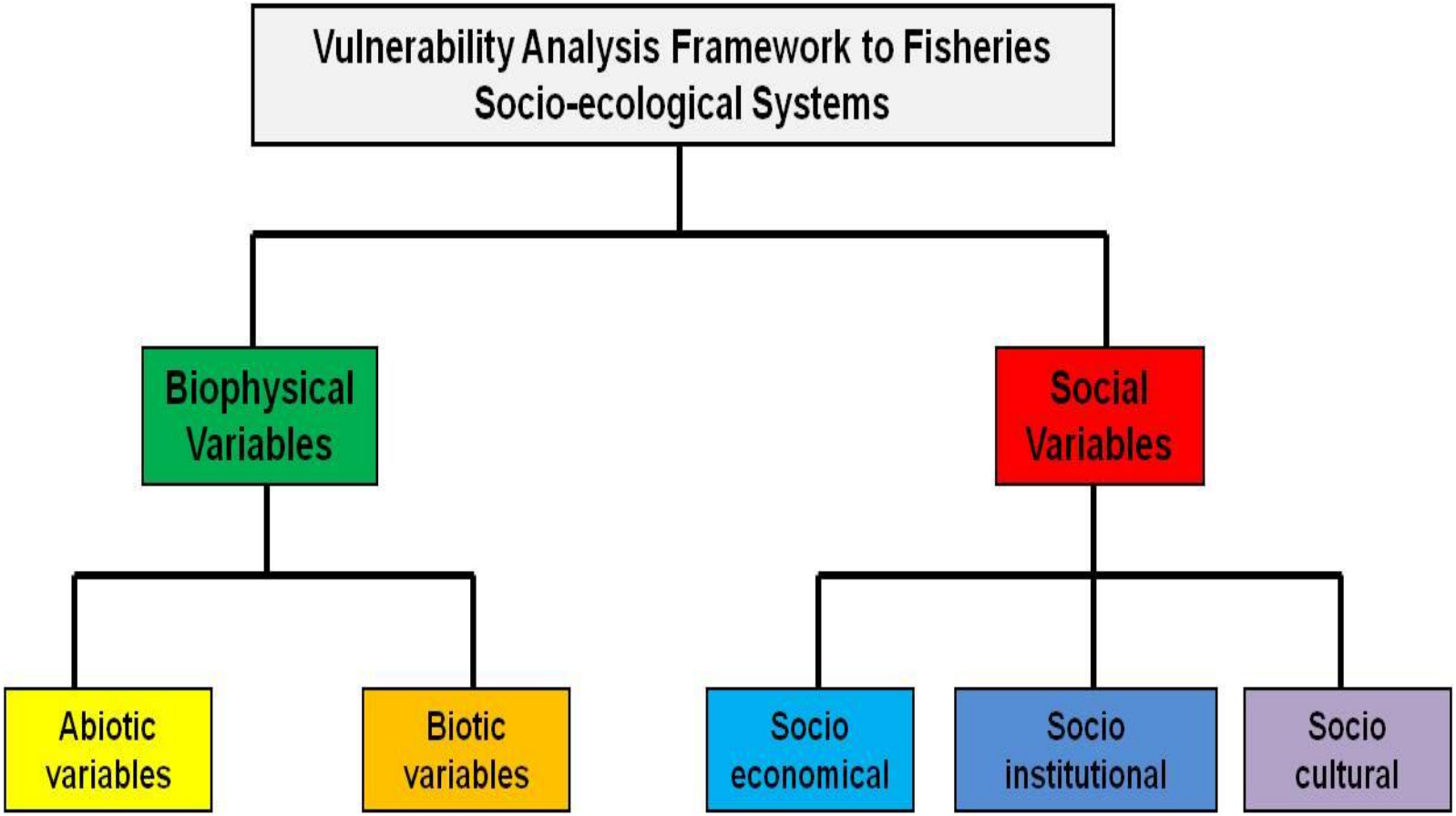



Hovelsrud & Smit (Ed.)
2010




Smit et al., 2010 (chapter 1, page 8)

# Vulnerability Analysis Framework



# Biophysical Variables

**Abiotic Variables (secondary data)**

- Meteorological/climatological variables
- Water quality of beaches
- Topography
- Land cover

**Biotic variables**

- Fish species (richness)
- Local disappearence of species
- Emergence of exotic species
- Toxicological analysis of species

# Social Variables

**Socio economical variables**

- Fish catch for sale/consumption
- Value assigned to the fish
- Fish catch distribution
- Average income from fishing
- Economic activities besides fishing
- Own vessel or employee
- Types of government aid
- Nº of people in family/nº dependents
- Health (chronic diseases/epidemics)
- Education (schooling)
- Health infrastructure and housing
- Access to media (internet, radio, TV)

# Social Variables

**Socio institutional variables**

- Local and community organizations
- Representativeness of local groups and institutions
- Arenas
- Local demand and capacity for fishing
- Legislation related to fishing
- Laws for fishing methods, fishing gears and fishing spots

# Social Variables

**Socio cultural variables**

- Fishing methods
- Fishing gears
- Fishing vessels
- Fishing spots
- Transmission of fishing knowledge

# Results

- Fishing landings: 176
- Fish species identified: 76
- Interviews:
  - Fisheries and history: 46
  - Interview weather and climate change: 46
  - Interview vulnerability: 46

# Results

- Local knowlegde about weather and sea (submited to PLAN 2012):

(Methodology: 18 interviewers in PA community and 28 in VP)

- summers (89% PA and 68%VP) and winters (61% PA and 43% VP) are getting warmer.

- the sea water is becoming warmer in the summer and this is harmful to fisheries (55% PA and 64,5% VP).

- the increase in the frequency of storms in the sea is contributing to increase fish spawning migration race for species such as mullet (*Mugil platanus*) and Spanish mackerel (*Scomberomorus brasiliensis*), during the winter season (72% PA and 43% VP). **Maybe a positive effect of climate change?!**

These findings are in accordance with other weather and sea research in the Brazilian coast.

# Results

Most fishermen began to use sources of forecast other than local ecological knowledge (LEK) (such as TV, radio and Navy information) submited to PLAN 2012:

- Until the 1990's: 5% of PA and 11% of VP fishermen
- Nowadays: 50% of PA and to 61% of VP fishermen

**Preliminary conclusions:**

- The fishermen are not relying anymore only on their own knowledge to decide to go fishing because the increased climate unpredictability represents risks to their activities. **(the opposite of third hypothesis!!)**
- Local knowledge are not being adapted as fast as the weather and sea changes.
- The availability of other "easier-to-learn-from" forecast's sources are contributing to the lost of local knowledge.

# Preliminary Results

- Vulnerability analysis framework:

**Biotic variables**

- Decreasing in the quantify and diversity of fishes (temporal comparison of fishing landings).

**Socio-cultural variables**

- Use of new fishing methods, fishing gears and fishing spots (to find another fish species).

**Socio-economical variables**

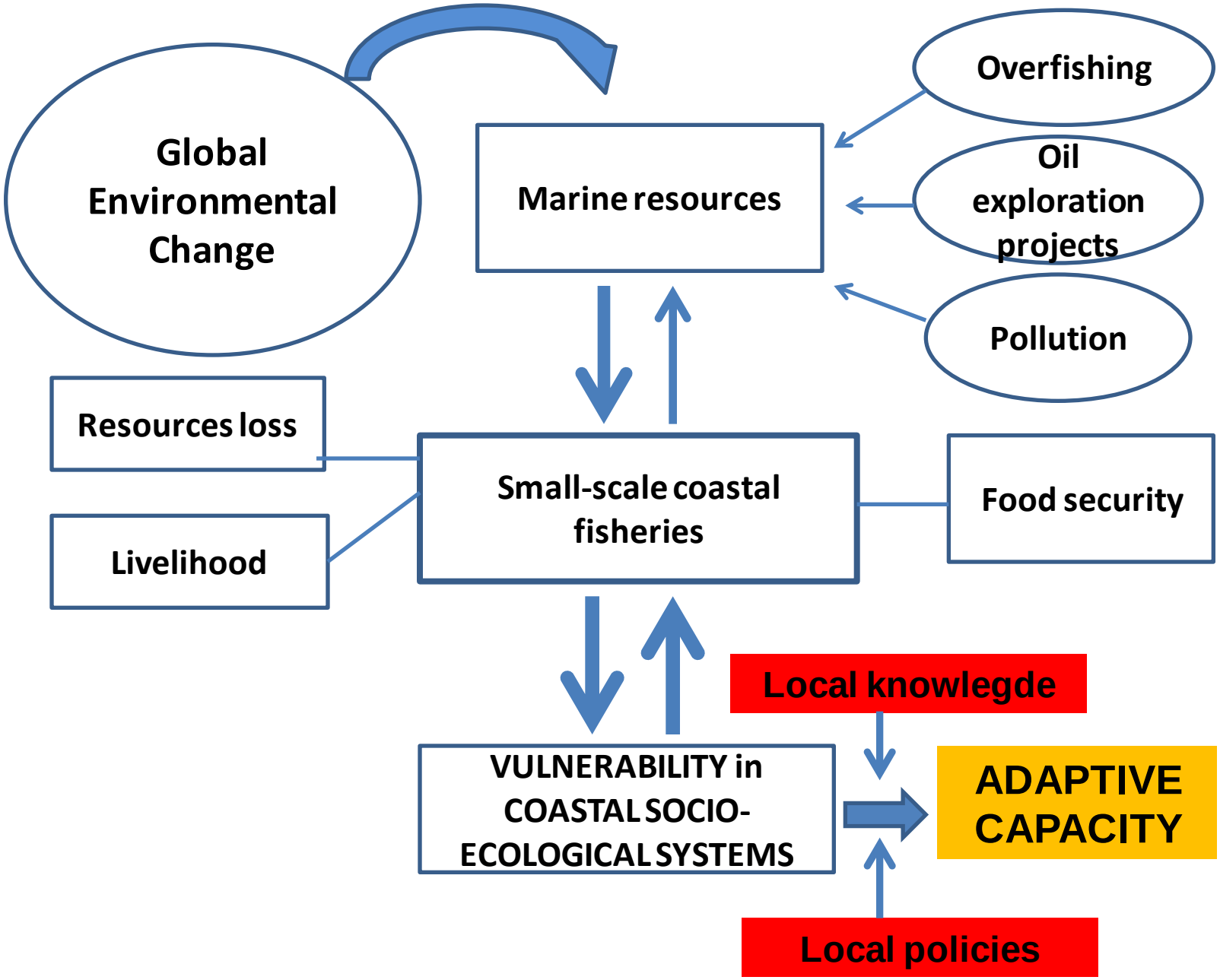
- Activities besides fishing: tourism, trade, building (low income from fishing)

# My questions.....

- How to isolate the effects of climate change and the effects of other factors (overfishing, pollution, urbanization) in the coastal fisheries?

- How to relate social variables and biological variables in the same vulnerability analysis framework (quali-quanti analyisis)?

- How to respond the 4th hypothesis: local knowledge and local policies contribute to reduce vulnerability in small-scale coastal fisheries??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VULNERABILITY in COASTAL SOCIO-ECOLOGICAL SYSTEMS
ADAPTIVE CAPACITY
Local policies

# Acknowledgements