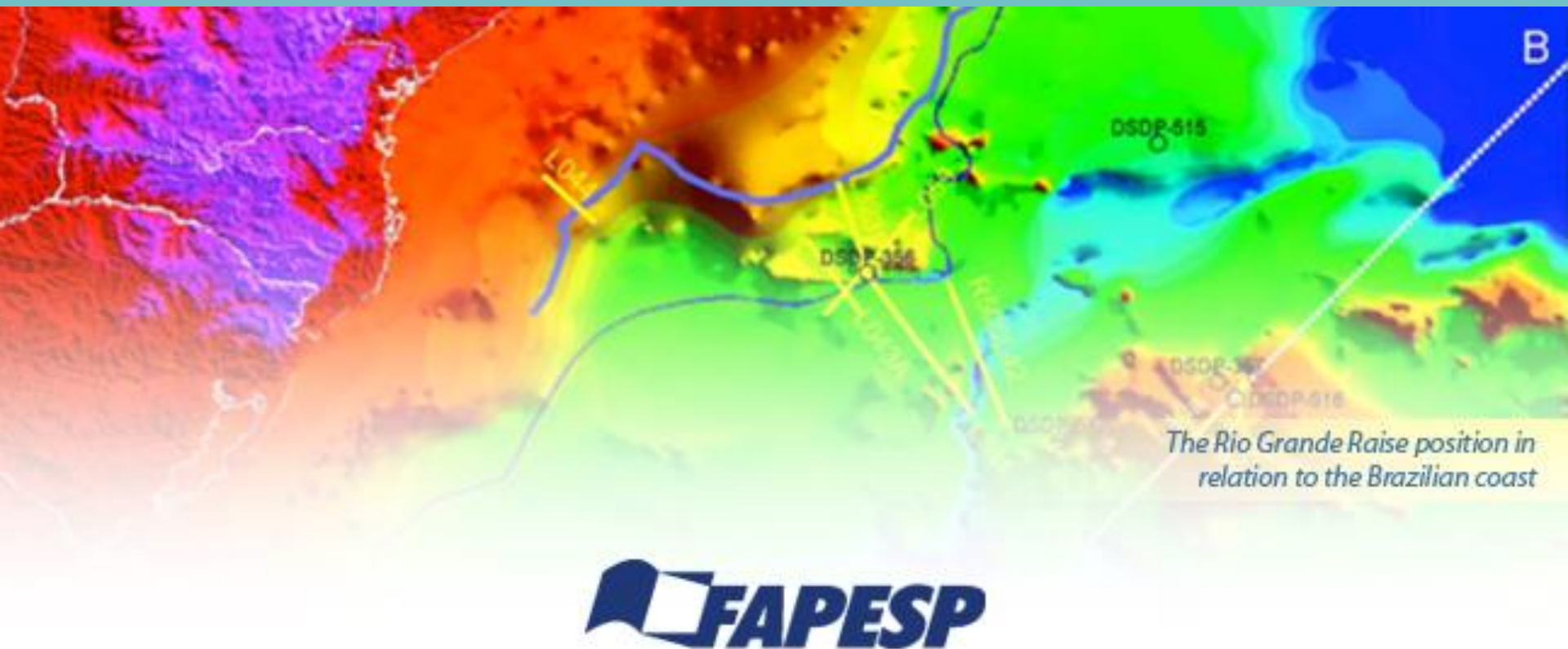


# The E-tech Element Submarine Ferromanganese Crusts Research Workshop



**FAPESP**  
**December 8<sup>th</sup> 2015**

# Theme 2

## Ongoing and future research on Rio Grande Rise

### Sustainability of deep-ocean exploration – challenges and opportunities

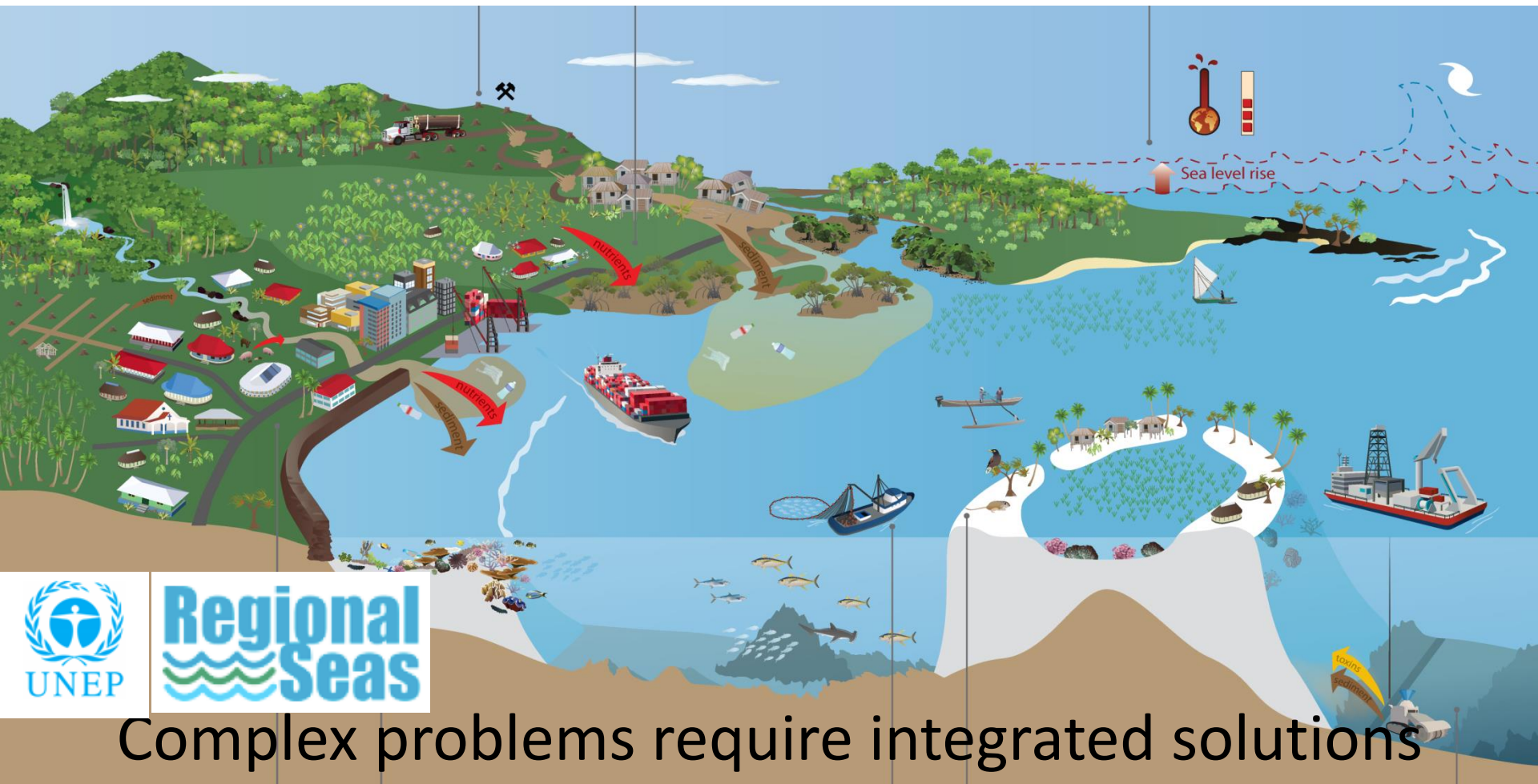
Alexander Turra



Unsustainable land use

Pollution and Waste

Climate Change

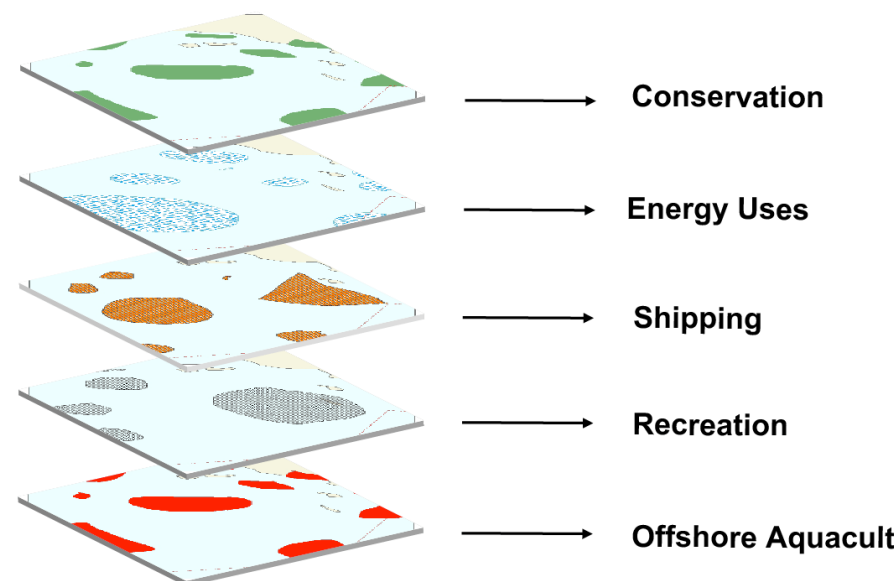
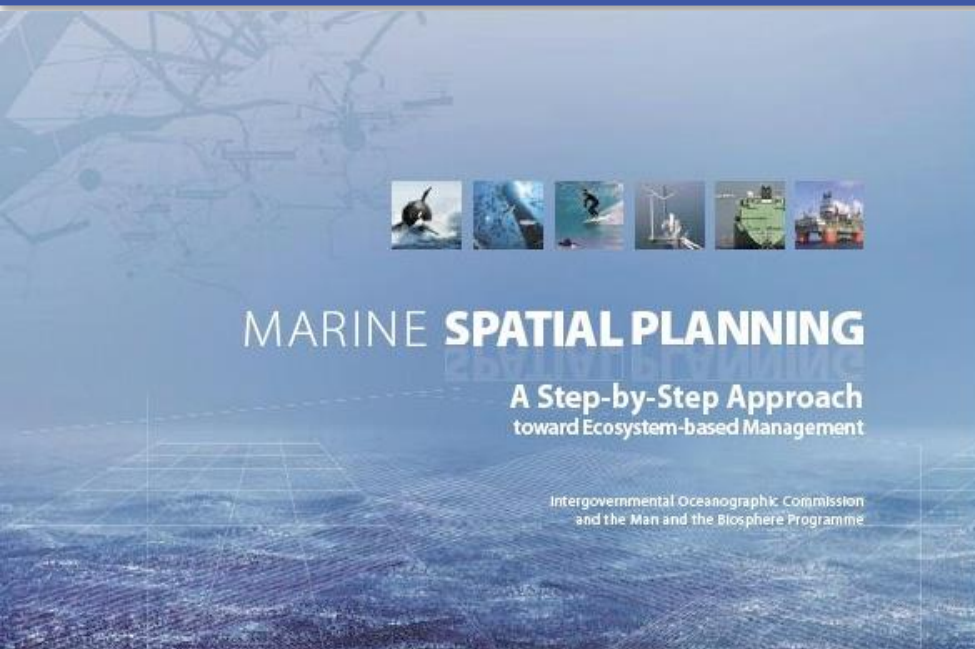


Coastal Development

Invasive Species

Emerging Uses

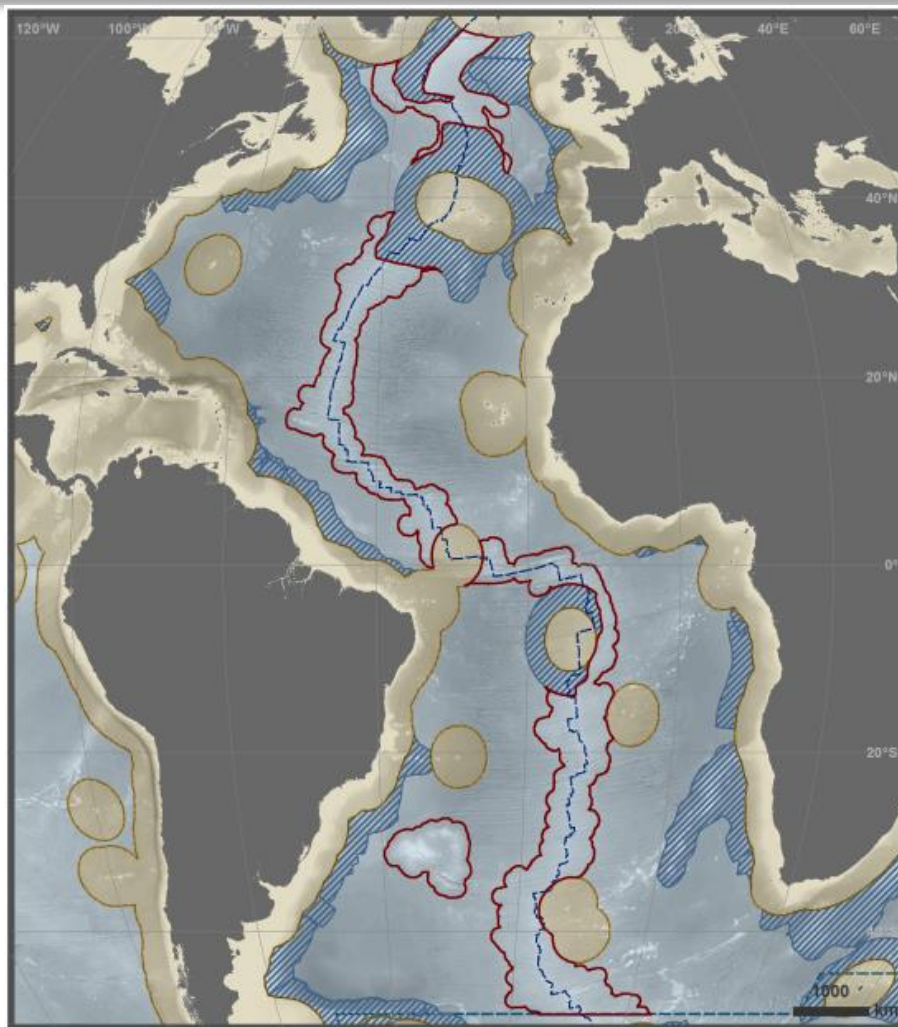
# Marine Spatial Planning







# New frontiers, new challenges

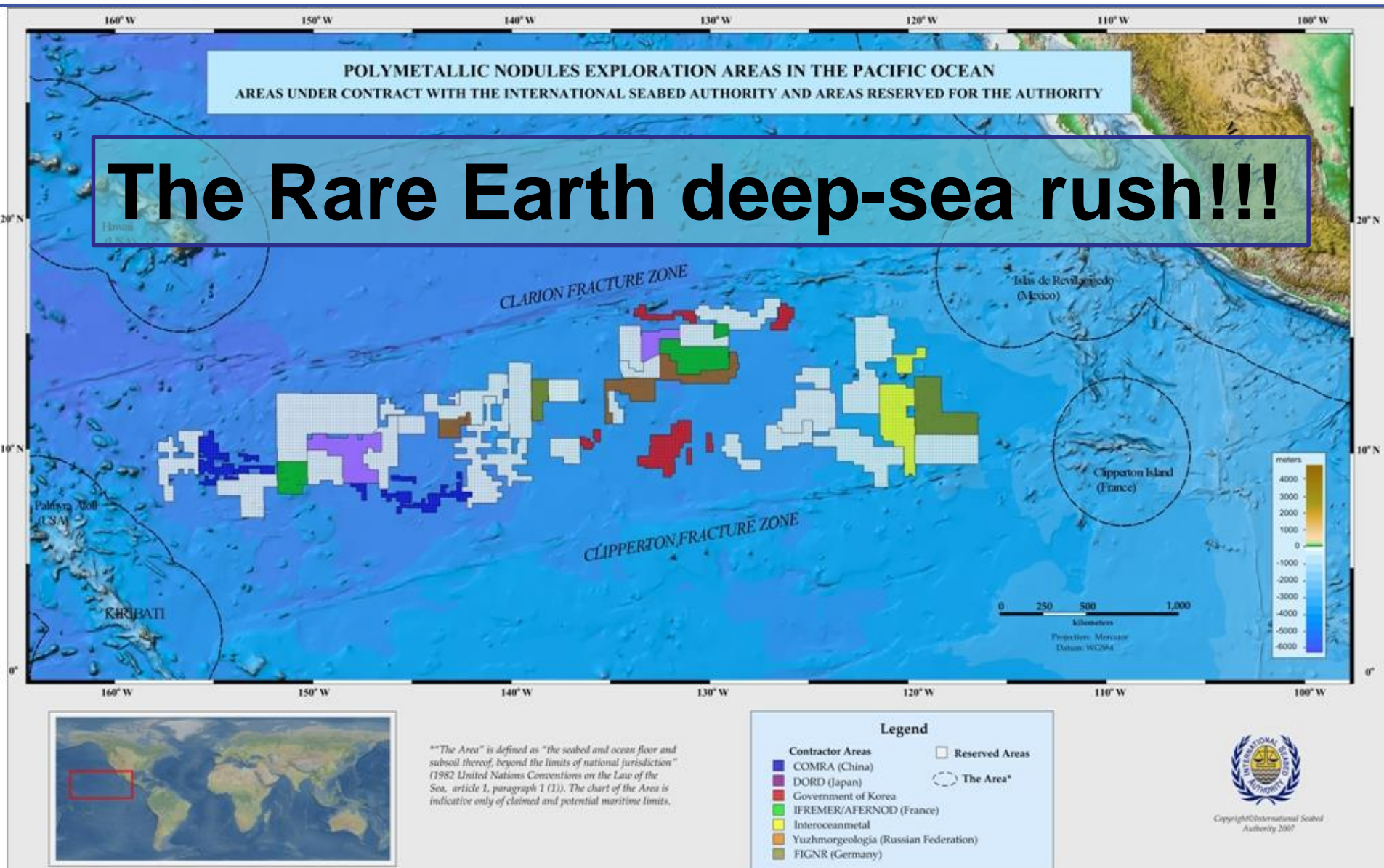


Marine Geospatial Ecology Lab, Duke University (2015)

## Marine Boundaries



# Clarion-Clipperton Zone





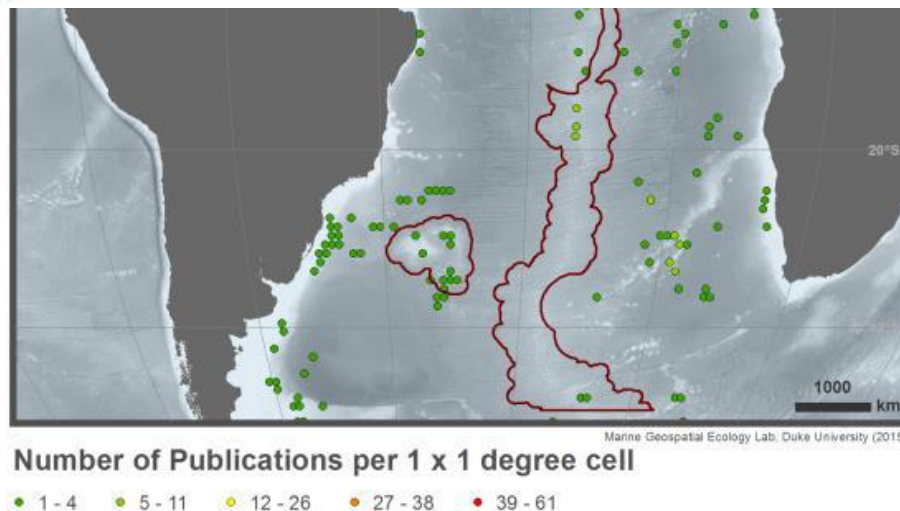
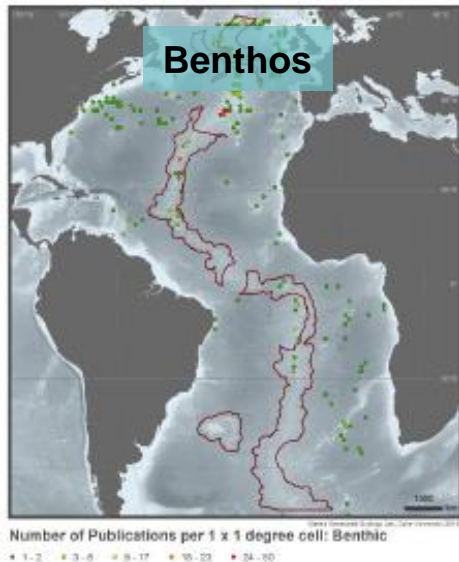
# SEMPIA Workshop

**Workshop Towards the development of a strategic Environmental Management Plan for deep seabed mineral exploration and exploitation in the Atlantic basin (SEMPIA)**



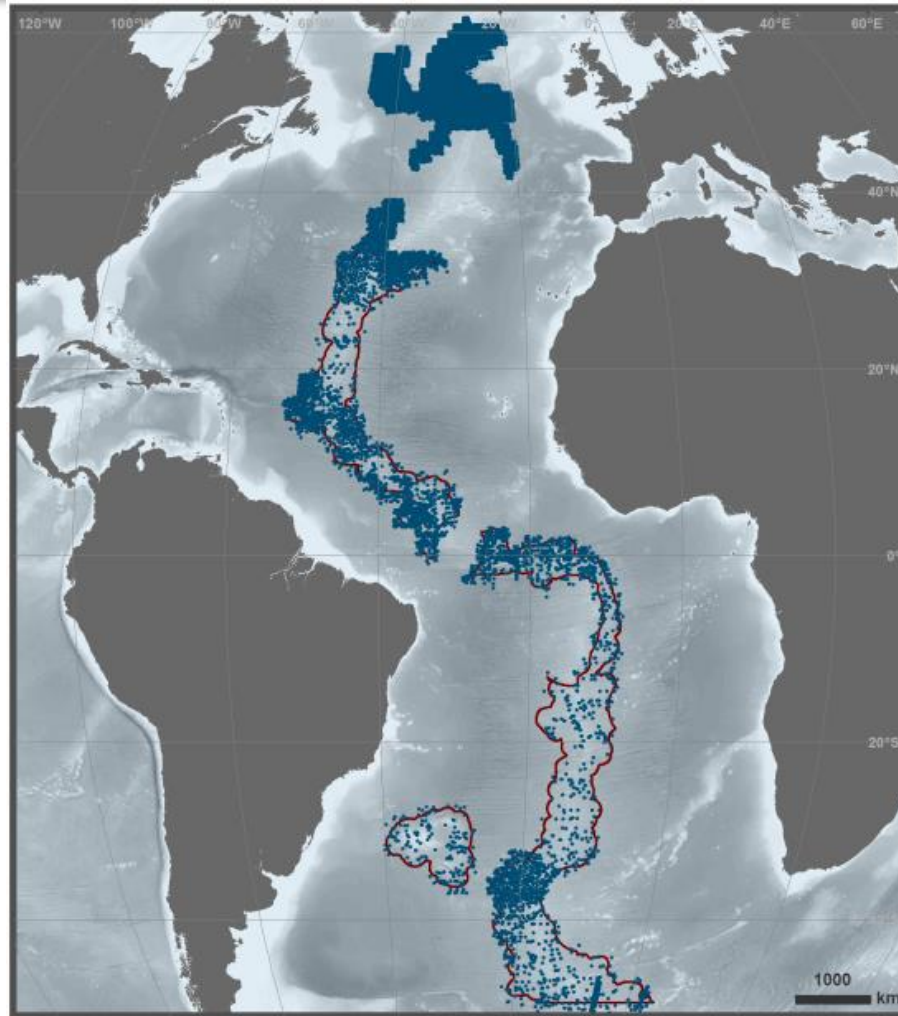
**1 - 3 June 2015, Horta, Azores, Portugal**

# Data mining - publications





# Data mining – OBIS records



OBIS Records: Area of Interest

- OBIS record (all, ~316K)

- **Identify and map the biodiversity, habitat types (geodiversity), ecosystem processes and ecosystem goods and services in the RGR;**
- **Identify the actual and potential anthropogenic (cumulative) uses, pressures and impacts in the RGR, including mining, shipping, fisheries, pollution, climate change/ocean acidification;**
- **Map related policy and legislation;**
- **Undertake a cost-benefit analysis under variable scenarios;**
- **Integrate existing and new information and discuss the assessment with stakeholders under an ecosystem based approach to propose a Environmental Management Plan for RGR.**

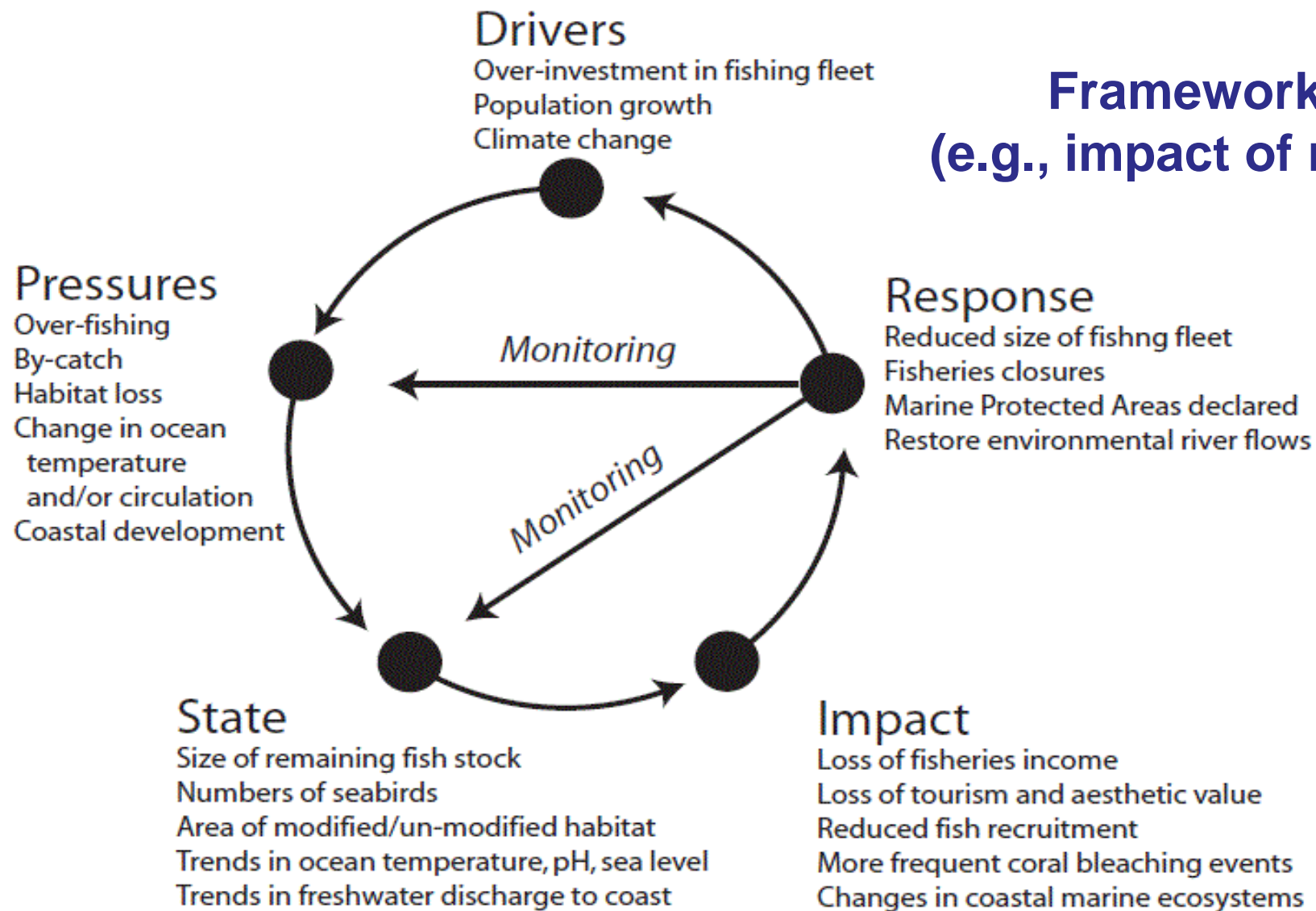
# Assessment outline





# Assessment outline

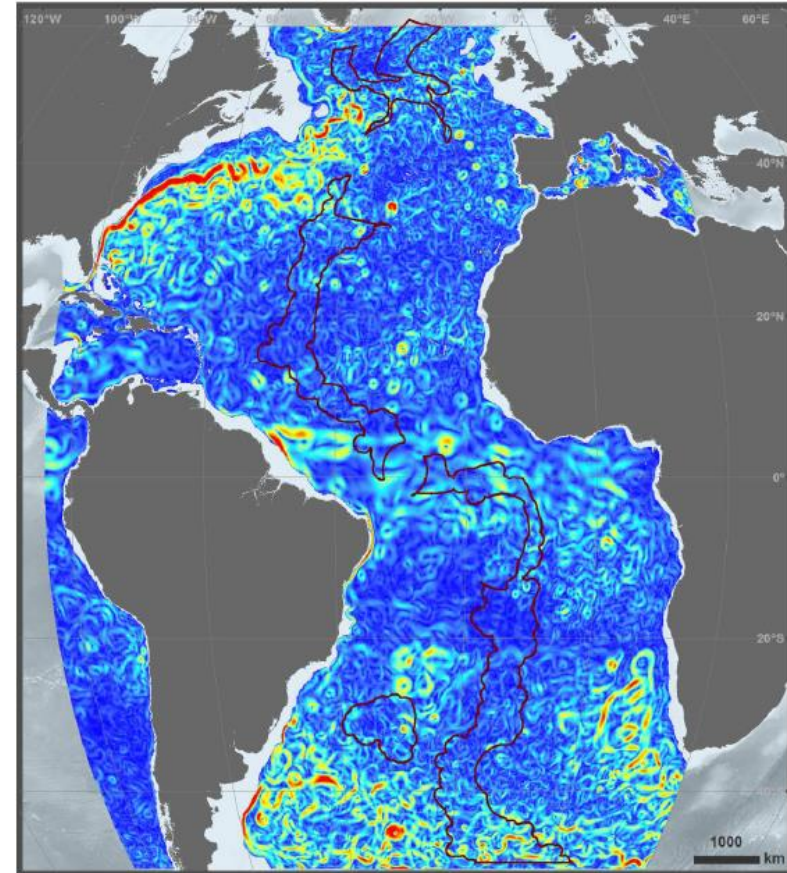
## Framework DPSIR (e.g., impact of mining)



# Information for conservation

## Hotspots and Connectivity

- Larval ecology
- Physical Oceanography
- Population Genetics
- Geodiversity
- Diversity hotspots
- Depth range



500m Current Velocity (HYCOM, January 2014)

Velocity (m/s)



H: 0.9

L: 0.0004

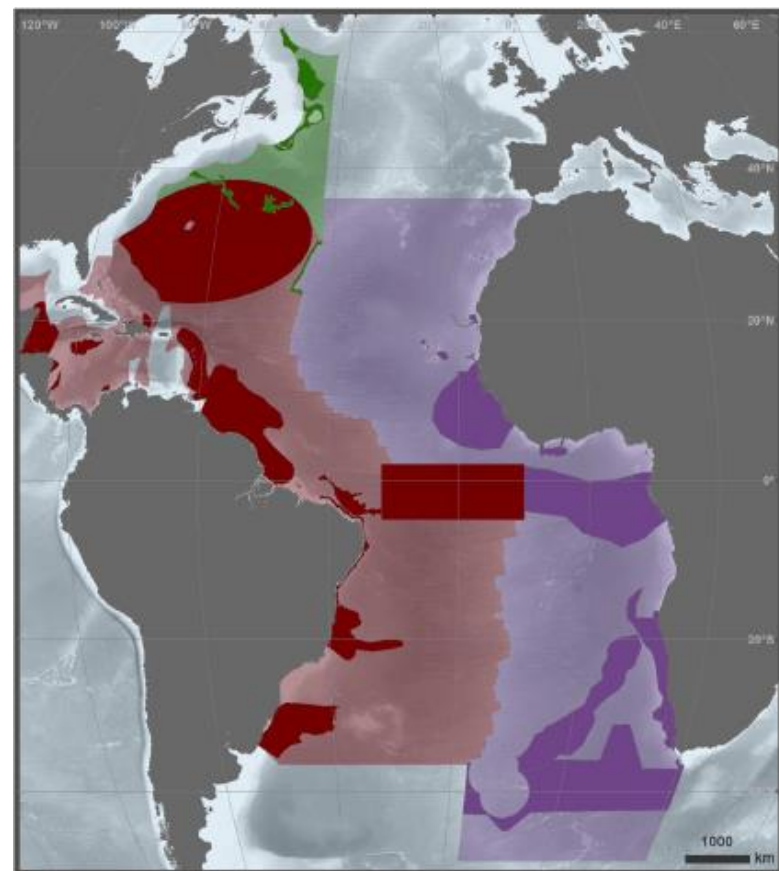
High velocity

Low velocity

# Information for conservation

## Benefits and pressures

- Goods and services – overall value
- Uses
- Impacts
- Specific impacts of mining
- Marine Protected Areas



**CBD Ecologically or Biologically Significant Areas (EBSA)**

Workshop Boundary

Described EBSA

North West Atlantic

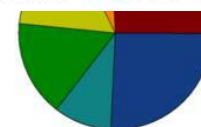
South East Atlantic

Wider Caribbean and Western Mid-Atlantic

NWA EBSA

SEA EBSA

WVC and WMA EBSA



metal

Glass

Other

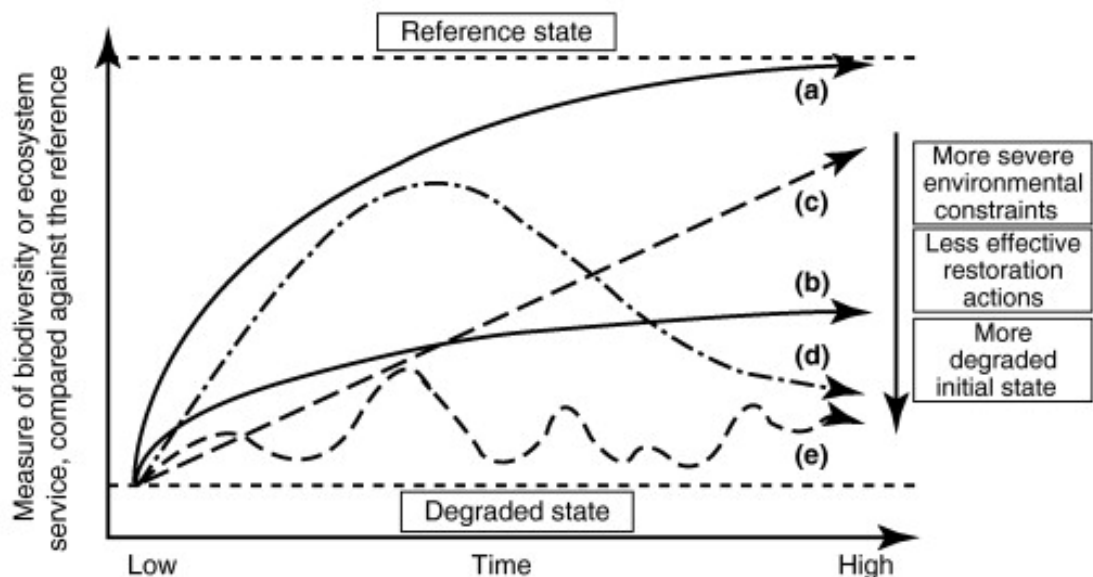
Clinker



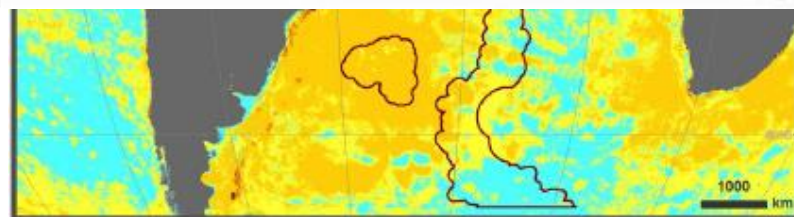
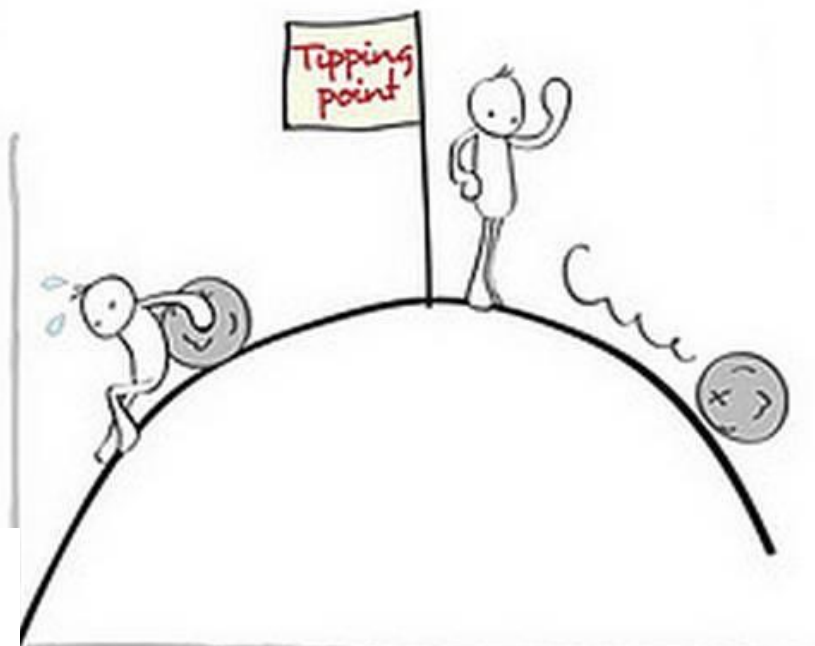
# Information for conservation

## Resilience to Disturbance

- Cumulative impacts
- Recovery times
- Trajectories (results)
- Tipping points (limits)



TRENDS in Ecology & Evolution



Cumulative Human Impact  
(Halpern et al. 2008)

Very Low Impact (<1.4) Medium Impact (4.95-8.47) High Impact (12-15.52)  
Low Impact (1.4-4.95) Medium High Impact (8.47-12) Very High Impact (>15.52)

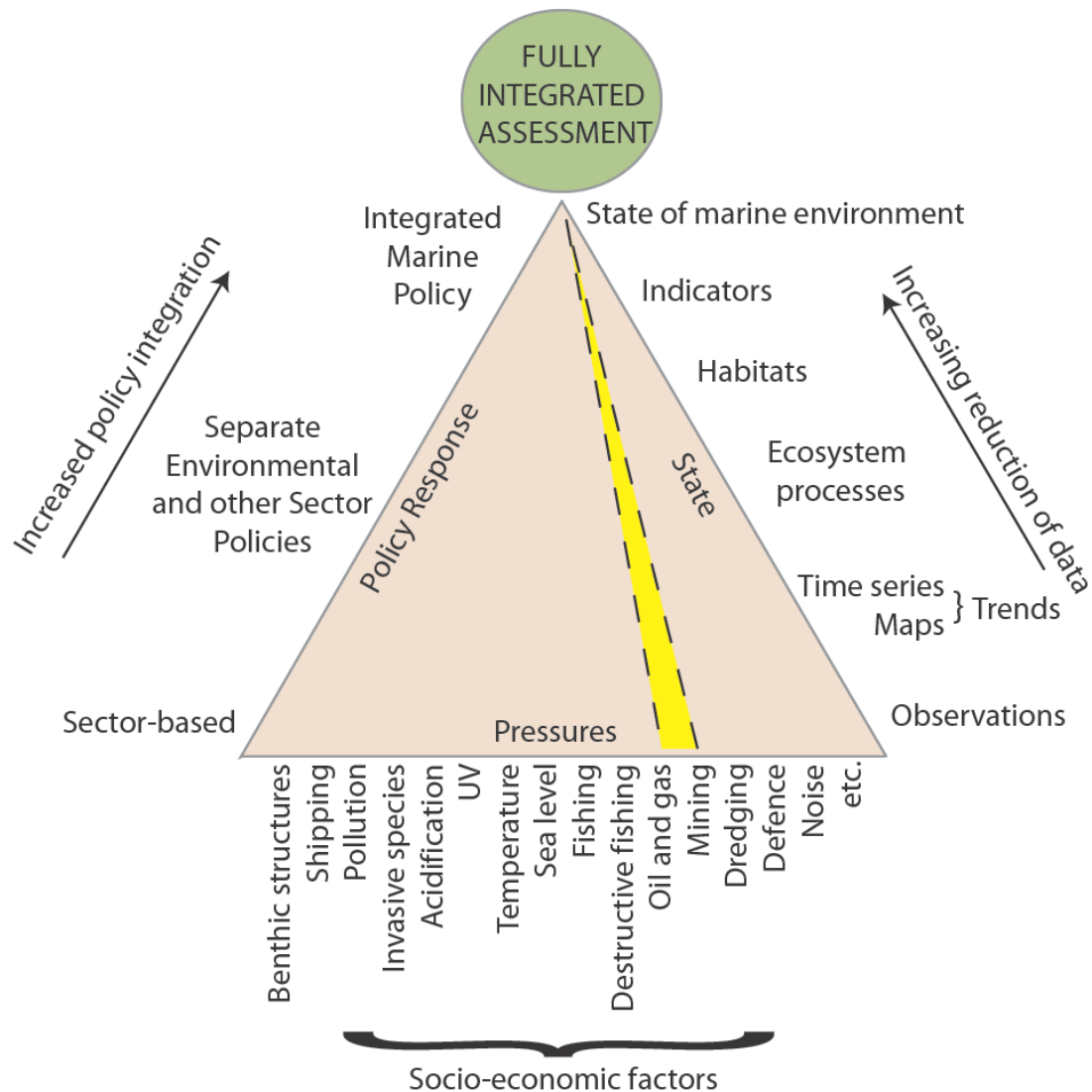
# Principles for conservation

## **Effectiveness of management strategies**

- **Avoidance, mitigation, offsets (compensation), bonds**
  - **Precautionary approaches**
  - **Adaptive management**
  - **Transparency**
  - **Enforcement / mandate**
  - **Integration of policy and legislation**
- 
- **Cost-benefit analysis**  
**(costs x impacts x profits x shared benefits for society x life cycle x economic scenarios)**

**In what conditions deep-sea mining is viable?**

# Assessment scheme





# Integration with stakeholders



**PROAREA – National Program  
for Prospection and  
Exploration of Mineral  
Resources in the International  
Area in the Southern and  
Equatorial Atlantic  
(October 10<sup>th</sup> 2015)**

**Working Group on the Shared Use of the Marine Environment  
(Marine Spatial Planning)**

# Strategy - Workshops

- **Kickoff Workshop – Project launching (end 2015);**
- **Workshop I – inception meeting (early 2016): setting the road map; integrating partners & defining sampling strategy;**
- **Workshop II – intermediate assessment (early 2018): data inspection & cruise adjustments;**
- **Workshop III – Environmental Management Plan elaboration (end 2020).**
- **Intermediate group meetings (2/year)**

- **Environmental Management Plan for RGR**
- **Outreach material (structure, functioning and importance) for RGR**
- **Papers (wish a lot of good papers...)**
- **Thesis/Dissertations (capacity building)**