Economic impacts of coral reef degradation caused by climate change and ocean acidification

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Outline

• Economic questions on climate change and OA
• Coral reef impacts: ecosystem services framework
• Global coral reef damages from ocean acidification
• Conclusions
Economic questions on climate change and ocean acidification

• What are the human welfare impacts of climate change (expressed in monetary terms)?

• Do the benefits of mitigation and adaptation (reduced climate change damage) outweigh the costs?

• What is the expected distribution of damages?
Framework for coral reef impact assessment

• Ecosystem Services (ES) framework to link bio-physical environmental change to human welfare

• ES are the benefits that humans derive from ecosystems

• Coral reef ES:
  – Fisheries
  – Coastal protection
  – Tourism/recreation
  – Biodiversity
  – Bio-prospecting
Impact pathway for coral reefs

Socio-Economic Activity

CO₂ Emissions

Climate Change and Ocean Acidification

Bio-physical impacts on coral reefs
- Bleaching
- Storm damage
- Lower growth

Ecosystem Services
- Fisheries
- Coastal protection
- Tourism
- Biodiversity
- Bio-prospecting

Socio-economic impacts
- Population
- Income
- Welfare
- Distribution
- Vulnerability
- Food Security
- Adaptation
Coral reef degradation from OA

- Link models that describe the impact pathway for coral reefs:
  - Economy-Climate (FUND)
  - Ocean acidification
  - Coral loss
  - Visitor demand
  - Ecosystem service values
- Scenario analysis 2000-2100 (SRES)
Population

- **A2**: Green line
- **B1**: Red dashed line
- **A1**: Purple line
- **B2**: Blue dashed line

The graph shows the projected population growth from 2000 to 2100, with predictions for A2, B1, A1, and B2 scenarios. The population is expected to reach 10 billion people by the end of the century, with variations depending on the scenario.
Conclusions

• This is a first attempt to put a money value on OA impacts on coral reefs

• Provides an argument for both mitigation of CO₂ emissions and adaptation to likely impacts

• Impacts are likely to be highly localised depending on vulnerability (exposure + dependence + adaptive capacity)

• Need for research at local scales
Thank You