GLOBAL UNDERSTANDING AND LEARNING FOR LOCAL SOLUTIONS (GULLS)

REDUCING VULNERABILITY OF MARINE-DEPENDENT COASTAL COMMUNITIES TO CLIMATE CHANGE
INTRODUCTION

The project ‘Global learning for local solutions: Reducing vulnerability of marine-dependent coastal communities’ or GULLS, is an international project within the Belmont Forum and G8 Research Councils Initiative on Multilateral Research Funding. Initiated in 2014, the project has been investigating five regional ‘hotspots’ of climate and social change, defined as fast-warming marine areas and areas experiencing social tensions as a result of change: south-east Australia, Brazil, India, South Africa, and the Mozambique Channel and Madagascar. It has focused on contributing to reducing the vulnerability of coastal communities and other stakeholders dependent on marine resources to climate change and variability through an integrated trans-disciplinary approach. It includes participants from Australia, Brazil, India, Madagascar, South Africa, the United Kingdom and the United States of America. The research programme comprises six inter-linked components: ocean and climate change modelling, species sensitivity, social and economic vulnerability, system modelling, governance, and communication and education.

The project is delivering a comprehensive set of options to reduce coastal vulnerability and position vulnerable coastal communities for an improved future.

COMMUNICATION AND EDUCATION

Education workshops for primary school teachers, high school teachers, scientists and other educational and leadership professionals on ‘Communicating Ocean Science and Climate Change’ were held in Australia, Brazil, India and South Africa. The workshops provided professional development opportunities and locally relevant scientific educational resources geared towards expanding climate and ocean literacy through effective teaching, learning and communications practices.

WHY IS THIS IMPORTANT?

Expanding climate literacy and understanding the potential consequences of climate change are imperative for ensuring that citizens throughout the world will be better prepared to mitigate climate change and respond to both the economic and environmental challenges, as well as the opportunities that climate change will bring.
Ocean and climate change modelling

Anthropogenic climate change is a global phenomenon. However, its impact on living marine resources and dependent communities is local and often unique. Information from global ocean models is immensely complex and includes a multitude of environmental characteristics. Long term trends in these variables are of limited value for planning local climate change adaptation unless the model output is translated into a form that meet local needs. The main challenge for the GULLS global modelling team was to find common unifying parameters and metrics of climate change between all hotspots, so their commonalities and differences with respect to the strength of climate stressors could be compared. This was achieved by working closely together with the species vulnerability group to identify key stressors threatening the most important species. One of the novel studies conducted by the Ocean Climate Group in GULLS included a demonstration of the influence of currents on ecosystems and the impact that climate change has on these currents and ecosystems.

Why is this important?

Successful adaptation to climate change can only be achieved using a participatory approach that combines climate science with local data and knowledge to identify impacts on species critical to the livelihoods and wellbeing of the communities involved.
WHY IS THIS IMPORTANT?

The traits-based sensitivity assessments are transparent, repeatable and relatively rapid, and thus can quickly identify priority species that are most sensitive, even where fisheries are data poor. The approach can enable fisheries managers to understand likely changes to fisheries under a range of climate change scenarios, highlight critical research gaps and priorities, and assist marine industries to identify adaptation strategies that maximise positive outcomes.
WHY IS THIS IMPORTANT?

People need to deal with change that is currently happening and change that is yet to come. To prepare effectively, the social, cultural, economic and institutional characteristics that make people better at adaptation or increase their resilience need to be understood. By knowing how people make decisions in complex environmental and institutional contexts, governments will be able to make the necessary adjustment and investment to support prosperous coastal communities in the future.
WHY IS THIS IMPORTANT?

Many problems observed in the marine environment, such as pollution and over-fishing, can be attributed to governance systems: actors (individuals, organisations) and the rules or ‘institutions’ that structure their interactions. Understanding how actors and institutions function is therefore an important step to promote climate adaptation.
SYSTEM MODELLING

System modelling provides tools for the synthesis of the climate stressors of marine ecosystems impacting marine hotspots in all project locations. System models, at differing degrees of detail, were developed or modified for each of the hotspots.

**System Models**

Focus on subset of ecosystem

- **Ecosystem subset**
  - Generic SEA-MICE*: all hotspots
  - NETLOGO

- **Whole system models**
  - EwE: 3 hotspots
  - Atlantis: 2 hotspots

**Activities**

- Identify key species in each hotspot (e.g. from species sensitivity analysis) and develop models/fit to available data
- Identify key climate stressors and project resources based on future climate and fishing impacts
- Compare performance under alternative future adaptation scenarios

**Tools**

**Outcomes**

- Projections with fishing and climate change versus with adaptation scenario
- Modelling Toolbox
  - Alternative models + common SEA-MICE approach for improving understanding and testing performance of alternative adaptations across 5 ocean warming hotspots
- Integrated understanding
  - Modelling framework being extended to link with social and governance studies e.g. test adaptation option with improved governance = improved compliance

**WHY IS THIS IMPORTANT?**

The GULLS regions differ in modelling capability and data availability, therefore we developed a simple generic method for linking future projected biological variables to changing environmental variables as well as social and governance analyses. Comparing hotspot regions in a consistent manner improves global learning and sharing of knowledge.

*Socio-Ecological Adaptations Model of Intermediate Complexity for Ecosystems*
ADAPTATION PLANNING

GULLS is undertaking a synthesis of the climate stressors of marine ecosystems impacting marine hotspots in all project locations. The GULLS working groups contribute to integrated vulnerability assessments and adaptation planning.

WHY IS THIS IMPORTANT?

Coastal communities typically face a diverse set of threats to their livelihoods and wellbeing including over-exploited resources, environmental stressors from a range of human impacts, competition with other sectors, and climate change. Attempts to address these different threats in isolation from each other would be inefficient and unlikely to provide the communities with the resilience they need. The only way to ensure feasible and effective adaptation and resilience is by looking at the social-ecological environments of coastal communities as an integrated whole, including the different external drivers, and to identify the priority areas where action is most urgently needed and most likely to have the desired positive impacts.

CONTACT AND FURTHER INFORMATION

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For further information, publications and details on figures, visit http://www.marinehotspots.org/index.php/featured-projects/gulls