

Ecoadapt Pacific 2018-2019 Annual Report

The Benefits of Ecosystem-based Approaches for
Climate Change in Least Developed Countries

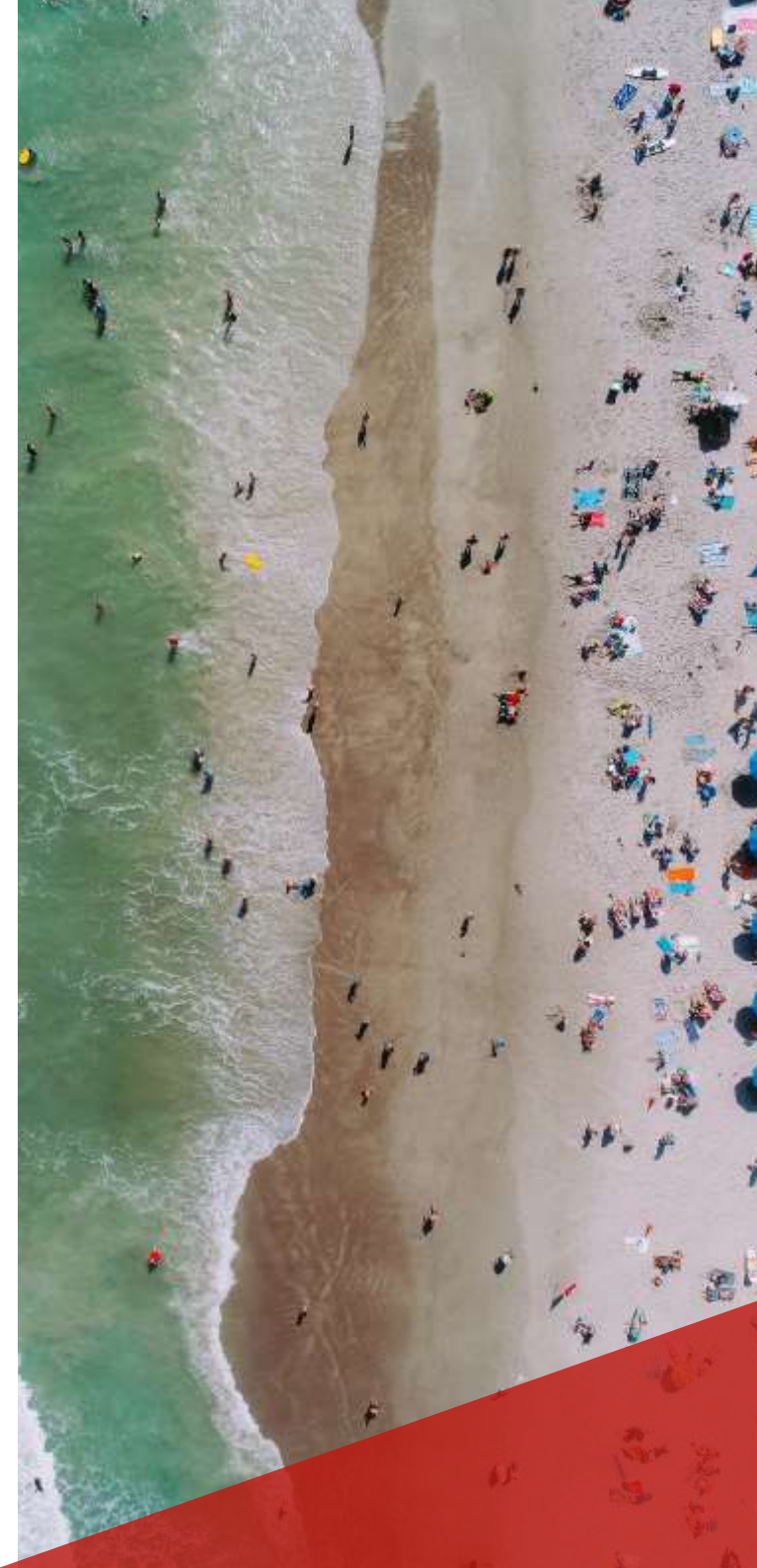


Griffith Climate Change
Response Program
March 2019



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Project Overview

The EcoAdapt project is designed to address three primary research questions:

1. What constitutes an ecosystem-based approach to climate change adaptation?
2. In the Pacific context, under what circumstances are ecosystem based approaches an appropriate climate change adaptation response?
3. What information and decision making processes are required by stakeholders to evaluate adaptation options?

To address these questions, our research is organised around five themes, each of which has a set of secondary research questions that they are exploring (Appendix 1). The five themes are: (1) Coastal Process; (2) Risk Assessment of Adaptation Options; (3) Micro-economic Benefit-cost Analysis; (4) Policy & Social Analysis; and (5) Project Integration, Ecosystems and Climate Change Analysis.

The geographic foci of our research is Tanna Island in the Tafea Province of Vanuatu (Figure 1). Additional work has also involved locations in Port Vila, Efate Island, Vanuatu and Savaii Island, Samoa.



Figure 1 | Main Case Study Location

Director's Review

As our EcoAdapt project comes to the end of its third year, I am pleased to report that our research team has increased both engagement with stakeholders and research outputs which will improve the prospects for Ecosystem Based Adaptation to be appropriately and effectively used in Vanuatu and elsewhere in the Pacific and globally. Our stakeholder engagement efforts extend from involvement in international negotiations with the Intergovernmental Panel on Climate Change to developing capacity within the Port Resolution community for monitoring coastal ecosystems. Our research outputs have covered how we can improve prospects for ecosystem based adaptation through better understanding of concepts such as traditional indigenous knowledge, the use of advanced environmental modelling and decision-support systems, and new insights into how adaptation can occur in the absence of the availability of “ideal” data sets and mindful of the need for a “bottom-up” approach that is based on the perspectives and aspirations of the local communities. Over the year our researchers have conducted a range of field work activities in Vanuatu:

- In April 2018 our Microeconomics Team visited Port Resolution conducting interviews with community members and Tafea Provincial Government representatives to understand use and governance of ecosystem services;
- In May 2018 our Project Manager conducted briefings with Vanuatu Government stakeholders in Port Vila including the Forestry Department, the Climate Change Department, the Cultural Center and Non Government Stakeholders the Melanesian Spearhead Group and University of South Pacific to seek input to future research plans;
- In September 2018 we conducted a Coastal Ecosystem Assessment for Port Resolution and conducted an internship program for Griffith University Media and Communications students at Port Resolution to develop capacity for media communication of Pacific Environment and Climate Change issues;
- In October 2018 our Coastal team conducted field work in Port Vila to enable the development and calibration of coastal process models for the area to inform coastal management and adaptation decisions.

Through the year we have continued to use the project funding to develop the Ecosystem Based Adaptation Research Capacity and Funding opportunities through partnerships in particular with:

- The University of South Pacific with whom we have signed an MOU to support development of research capacity on climate change and which has already resulted in successful funding proposals, visits by USP Academics to Griffith University and Coastal Ecosystem Fieldwork Training opportunities for USP Students; and
- Ewha Womans University Korea, Center for Climate/Environment Change Prediction Research (CCCPR) to develop next generation of high resolution regional climate models to that can provide information on future climate impacts at a scale more relevant to informing adaptation decision making at sub-national and island scales.

We have had a change to our team personal with Dr Johanna Nalau leaving our Social and Policy Team following the award of a prestigious National Research Grant (ARC DECRA). Dr Nalua has been replaced by Dr Wade Hadwen who brings experience working in Social Research in Pacific Communities with regards adaptation. Also of note within the team is the successful confirmation of Coastal Team PhD Scholar Gaelle Faivre.

Milestones & Research Progress

As noted, EcoAdapt's research is organised around five themes. As per our contractual arrangements, there is an agreed set of milestones for each theme. As we are now some years into the research program, a number of the milestones have been revised in light of (1) research outcomes which point to critical knowledge gaps that need to be addressed and (2) the emerging pressures on Tanna communities and their ecosystems and the changing needs expressed by stakeholders about how the project can benefit them. For example, the original deliverable for the coastal team was a storm surge decision support tool for emergency management. However, following an initial phase of assessment, we concluded that changes in waves climate and erosion hazards are a greater priority than storm surge flooding. This change of direction was confirmed by stakeholder including the Vanuatu climate change department. Table 1 presents the original and revised milestones for each theme and the evidence that the milestone has been in fact achieved. Where the milestone deliverable is a publication, a digital or hard copy of this is available and will be gladly forwarded on request.

Tab1e 1 | Milestones and Evidence of Completion

Original	Revised	Evidence
Coastal Process		
Completion of a digital library of climate change and extreme events and its integration into Surge-Impact decision-support tool for site specific locations.	Development of a Remote Assessment Methodology for Climate Change Coastal Hazard Assessment	Faivre, G., Tomlinson, R., Ware, D., Mackey, B., 2018. First-pass assessment for a small Island Developing State, Tanna Island, Vanuatu. Asia Oceania Geosciences Society, AOGS, 3rd-8th June 2018, Honolulu, Hawaii.
Report on best-case calibration of regional and coastal process models based on new and existing data	Capacity to investigate the impact of future climate scenarios on regional ocean circulation model	Internal report
User guide for demonstrating Surge-Impact decision-support tool.	Develop alternative approach to Surge-impact decision support tool	Internal report
Risk Assessment of Adaptation Responses		
System Dynamics Model completed using the information from the previous stage and other input from the other teams' research	Apply Systems Modeling to Assessment of Climate Change Impacts on Coral Reef Ecosystems at Port Resolution	Hafezi M, Sahin O, Stewart R, Connolly R and Mackey B 2018 Hybrid systems approach supporting management to improve coral reef resilience and provision of ecosystem services in a changing climate SDWES 2018 30 September to 3 October Palermo Italy
Model testing, calibration and validation through engaging expert stakeholders and sensitivity analysis	Apply Systems Modeling to Coastal Hazard Assessment at Port Resolution	Sahin O, Stewart R, Tomlinson R, Ware D, Faivre G and Mackey B 2018 Spatial Bayesian Network for making probabilistic predictions of coastal erosion in a small Pacific island SDWES 2018 30 September to 3 October Palermo Italy
Journal paper submitted and conference paper presented on model outputs and implications of different adaptation options for the three study sites	Journal Paper Published on Application of Systems Modeling to Climate Change Adaptation for Small Island Developing States	Hafezi M, Sahin O, Stewart R, and Mackey B 2018. Creating a Novel Multi-Layered Integrative Climate Change Adaptation Planning Approach Using a Systematic Literature Review, Sustainability 2018, 10(11),

Tab1e 1 | Milestones and Evidence of Completion (Cont.)

Original	Revised	Evidence
Micro-economic Benefit-costs Analysis		
Completion of cost benefit analysis for the case studies, including preliminary identification of impacts and consequent costs and benefits in physical term	No change from original deliverable	Buckwell, A., Ware, D., Fleming, C., Smart, J., Mackey, B., Nalau, J., Dan, A. (2019) Social benefit cost analysis of ecosystem-based climate change adaptations: a community-level case study in Tanna, Vanuatu. Australasian Agricul-
Final outcomes chapter for project synthesis report.	Develop capacity for remote assessment of ecosystem services to reduce the costs of planning for Ecosystem based adaptation	Under review - Land Use Policy: Buckwell, A., Fleming, C., Smart, J., Mackey, B., Ware, D., Hallgren, W., Sahin, O., Nalau, J., Connolly, R.: A remotely operable assessment methodology for valuing ecosystem services at national and regional scales.
Policy and Social Analysis		
Second round of stakeholder interviews conducted and analysed - focus on Government and Regional organisations Second stakeholder workshop - integration of local and national level issues and solutions.	Identify constraints that must be overcome to enable ecosystem based adaptation generally and in particular for small island developing states	Nalau, J., Becken, S., Mackey, B. (2018). "Ecosystem-based Adaptation: A review of the constraints." Environmental Science and Policy 89: 357-364.
Communication material (e.g. in print, mobile APP, website, other media as appropriate) to overcome barriers produced and disseminated.	Identify the role of traditional and indigenous knowledge for the successful implementation of Ecosystem Based Adaptation generally and in particular for small island developing states	Nalau, J., Becken, S., Schliephack, J., Parsons, M., Brown, C., Mackey, B. (2018). "The Role of Indigenous and Traditional Knowledge in Ecosystem-Based Adaptation: A Review of the Literature and Case Studies from the Pacific Islands." 10(4): 851-865
Journal article submitted or conference paper presented on second round of stakeholder analyses	No change from original deliverable	Ware D., (2018) Stakeholder Engagement for Ecosystem Based Adaptation to Climate Change, Adaptation Futures 2018, Cape Town, South Africa, June 2018
Project integration, Ecosystem & Climate Analysis		
Climate change data and ecosystem impacts models are integrated into Surge impacts analysis	Capacity to assess changes in terrestrial land cover from climate change and land use change	Draft journal paper on literature review and Internal report
Journal article submitted and conference paper presented on priority ecosystem impact modelling	Conduct a baseline Coastal Ecosystem Assessment at Port Resolution	Draft Report
Year 3 project research symposium conducted		Conducted on 20 November 2018 at Gold Coast Campus Griffith University
Year 3 Project management report that reviews the year's activities, outcomes and issues arising.		This document

Coastal Process

Through year 3 of the project the coastal team has continued to work on development of a suite of coastal process models to develop understanding of climate change impacts on coastal processes at the Port Resolution on Tanna Island. The regional modeling work is currently being used to run a series of scenarios based on projected climate change impacts at future time stages to understand the implications for regional circulation. The local coastal process modeling is now comparing different modeling platforms in order to commence the scenario modeling work being undertaken at the regional scale.

Beyond Port Resolution, preliminary field work has commenced in September/October of 2018 at Efate involving collection of wave and current data for Port Vila's Erakor Lagoon. In addition to the data collection work, this has also involved significant engagement with local and national stakeholders who have expressed a great deal of interest and support for the project due to the significance of the natural resource management problems that the knowledge generated

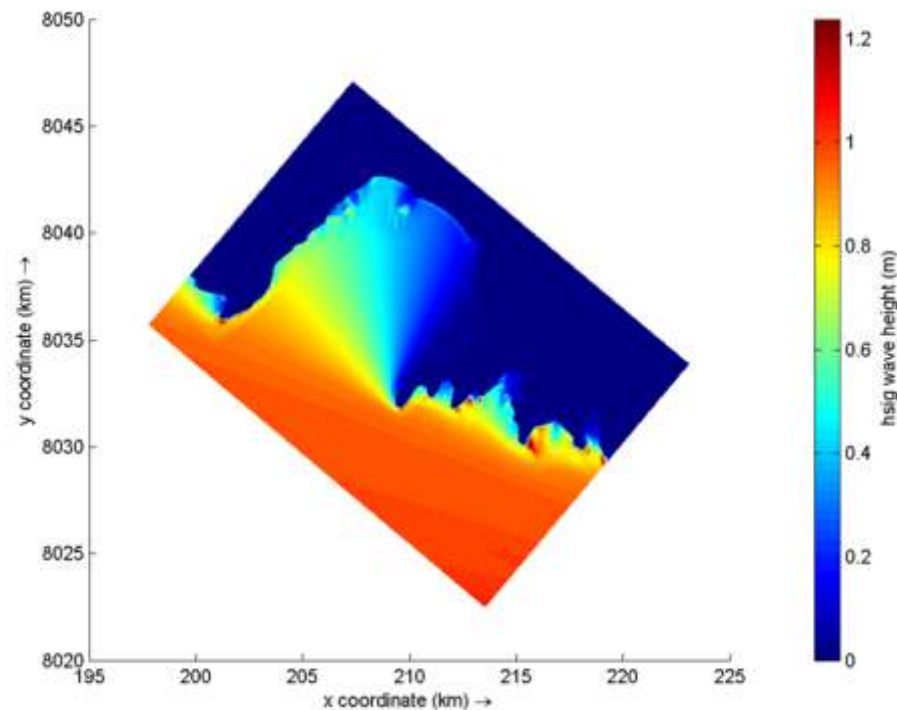


Figure 2 | Coastal Process Model Output of Wave Energy Dissipation—Port Vila

may help to find solutions for. Water quality has become such a concern in Port Vila that swimming has now been banned in the main harbour which in addition to the immediate environmental health concerns is also an important issue for the national economy, given Vanuatu's dependent on tourism. Ongoing development pressures around Port Vila will benefit from

the information this research will produce regarding the role of fringing coral reefs in attenuating wave energy and providing an ecosystem-based approach to mitigating climate change risks.

Theme leader

Professor Rodger Tomlinson
Director
Griffith Centre for Coastal Management

Theme members

Dr Serena Lee
Research Fellow
Griffith Centre for Coastal Management
Dr Fernando Andutta
Research Fellow
Griffith Centre for Coastal Management
Gaëlle Faivre
PhD researcher

Risk Assessment of Adaptation Responses

A significant shift is underway with regards the way adaptation is understood as the IPCC has sought to move away from a focus on “vulnerability” per se and towards the use of “risk” as the organising concept. This new approach is intended to promote the mainstreaming of adaptation into government and private sector planning as well as enabling better alignment with disaster risk reduction responses. One of the significant differences between the ISO standard on risk and the application of risk to climate change adaptation is that the latter stresses the need to consider interconnections within systems. To meet this challenge our risk team has used advanced systems modeling including Systems Dynamics and Bayesian Networks to allow the exploration of risk systems.

The risk team has two System Dynamics Models (SDM) under development focussed on:

1. assessment of the condition and resilience of coral reefs under different climate change scenarios, and their consequential impacts on human well-being in Port Resolution; and
2. Ecosystem-based risk assessments of current and future climate-related hazards on settlements and built infrastructure. The findings of these two models will be presented at a conference and published in relevant journals (eg: Journal of Environmental Management)

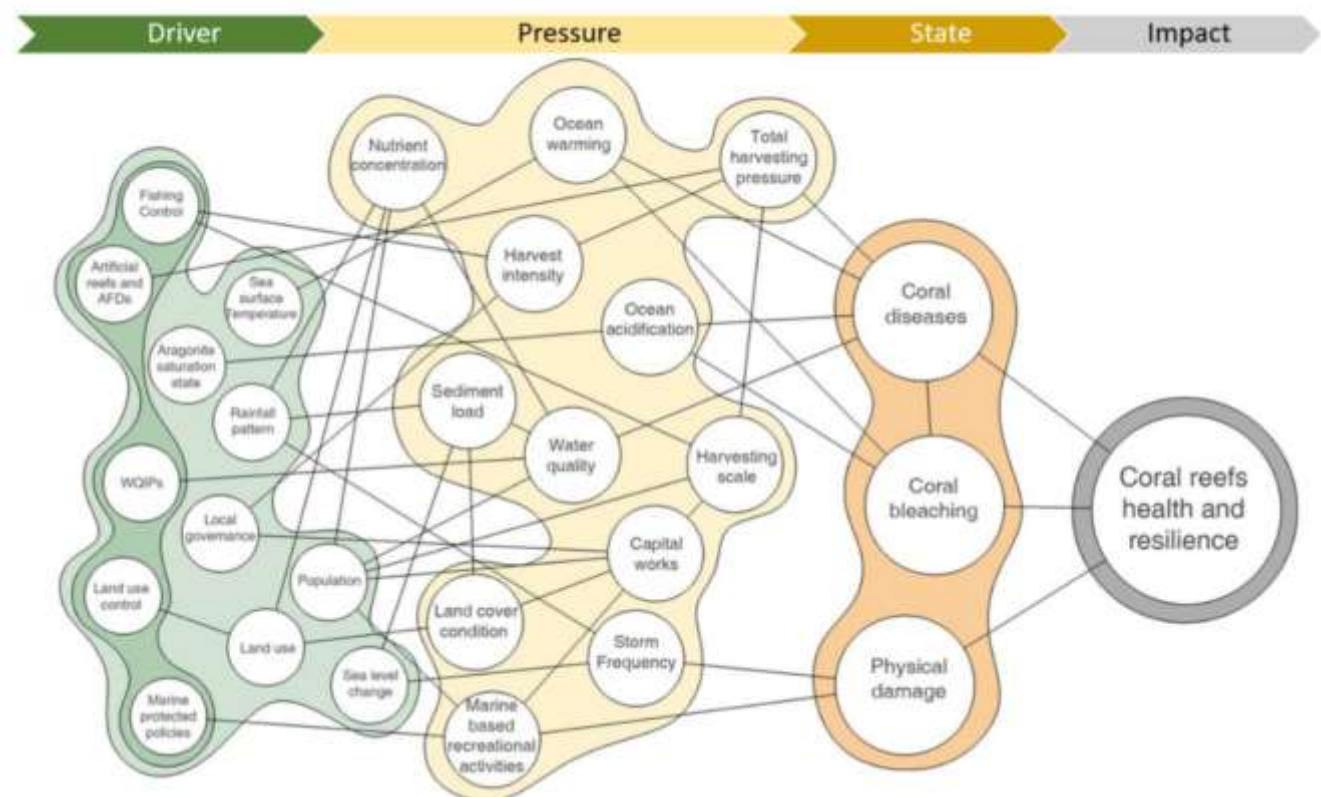
Theme leader

Prof Rodney Stewart
Griffith School of Engineering

Theme members

Dr Oz Sahin
Research Fellow
Mehdi Hafezi
PhD researcher

Figure 3 | Coral Reef Social Ecological System Diagram



Micro-economic Benefit-cost Analysis

Research to date has revealed that to evaluate the capital works adaptation options in comparison to ecosystem-based adaptation, requires knowledge of community attitudes towards natural resource management, ecosystem services, and economic transition in the context of a environmental and climate change and building community resilience. A key challenge or constraint for advancing EbA is how to cost effectively obtain accurate this information in a culturally appropriate way..

To address this challenge, the micro-economics team is using an approach to community value eliciting called the “Q” Method. In October 2018 the team travelled to Port Resolution to undertake the first stage of our Q-method study. During this field trip the team undertook separate focus group discussions with a group of women and a group of men of the community. In addition, several in-depth interviews were undertaken (with data combined with previous field trips to Tanna). This data



collection establishes the full spectrum of issues that are rationalised into the final set of cards for sorting in the substantive data collection effort.

Q has rarely (if ever) been deployed in a developing world context. Its application requires reasonable levels of comprehension of the task-at-hand, translation services, literacy, and established cross-cultural trust. Our implementation of Q deploys significant innovations,

including the use of combined text and illustrations cards and a colourful, engaging card sorting area. The team is returning to Port Resolution in March and April 2019 to undertake this substantive part of the data collection with the intention to submit two journal papers (one for the method innovations and another for the research) in May 2019.

Theme leader

Assoc Prof Chris Fleming

Griffith Business School

Assoc Prof Jim Smart

School of Environment and Science

Theme members

Dr Syezlin Hasan

Australian Rivers Institute

Andrew Buckwell

Griffith Business School



Policy & Social Analysis

The theme has focused research on two main areas. First, constraints to Ecosystem-based Adaptation (EbA) and how to overcome these. Second, Traditional Knowledge and how it can be applied to enable EbA. Research in the first area identified that some of the key constraints to EbA are context specific and therefore well-documented case studies of EbA are needed that crystallise the main lessons learnt such as the practical challenges faced in designing and implementing these projects and how they were overcome. Within the second area, at present, most EbA projects focus on the provision of information to main decision-makers only. However, since TK is held collectively, it is essential that entire communities are included in EbA projects. There is a huge potential for researchers and TK holders to coproduce knowledge that is best placed to guide climate adaptation at a local level.

Team members share Insights gained from the project's research as a number of key international meetings including at COP25 The United Nations Framework Convention on Climate Change, and the Nairobi Work Programme's 12th Forum during the Convention of Parties.

Johanna Schliephack continued her PhD activities which involved the conduction of further tourism and climate change stakeholder interviews on Tanna Island and the conduction of a stakeholder workshop in Port Vila in October 2018. Johanna submitted a paper on Tourism and Ecosystem-based Adaptation (currently under review). She also presented some of her work to date at the Tourism for Sustainable Development Goals conference in Auckland in January 2019 as well as at a tourism industry engagement event in Brisbane, organised by the Griffith Institute for Tourism in May 2018.

Dr Nalau accepted a full-time lecturing position at Griffith University since September 2018 and has moved away from the S&P researcher lead role to a supporting role in the project. Her position in the project has been taken up by Dr Wade Hadwen.

Theme leader

Professor Susanne Becken

Director,
Griffith Institute of Tourism

Theme members

Dr Johanna Nalau

Griffith Institute of Tourism

Dr Wade Hadwen

Griffith Institute of Tourism

Johanna Schliephack

PhD researcher



Project Integration, Ecosystem & Climate Analysis

This year the team's activities were focused around three tasks; (i) the review of literature regarding the impacts of climate change on Pacific Island Ecosystems; (ii) the development of capacity to model changes in terrestrial land cover from climate change and land use change; and (iii) an assessment of coastal ecosystems at Port Resolution. Our review of climate change impacts on Pacific island ecosystems considered more than 500 studies and found that;

- Attention to ecosystems impacts of climate change is increasing over the past 10 years
- Mangroves and Coral Reefs have received significantly more attention than other ecosystems
- The climate impacts most frequently discussed have been sea level rise, air and sea temperature rises, changes in precipitation patterns, and changes to storm/cyclone activity.
- Few studies were found which specifically addressed the biophysical limitations of EbA for the main ecosystems found in the Pacific Island region.



We now have an operational land use model which can show how population, development in particular roads and climate change will alter land use and land cover - in particular the extent of terrestrial ecosystems. This model is now being developed to enable it to be used to predict how land use and land cover will respond to scenarios based on projected impacts of climate change.

In September 2018 the team conducted field work which will inform an assessment of Port Resolutions

Coastal Ecosystems. The field work involved transects of coral reefs across five separate zones to enable comparison of different management regimes such as unrestricted use compared with 'taboo' or no take areas. The field work involved capacity development with members of the local community being trained in field techniques.

Theme leader

Professor Brendan Mackey
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Theme members

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Dr Willow Hallgren
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