

## Limits to climate change adaptation for two low-lying communities in the Torres Strait

### Introduction

Adaptation is essential to address climate change impacts. However, the capacity of natural and human systems to adapt is limited, either by the severity of the climatic perturbation, or by vulnerabilities in the system. This is one of six regional case studies of the limits to adaptation that explore the underlying causes and potential to transcend these limits.

### Context

#### Geographic

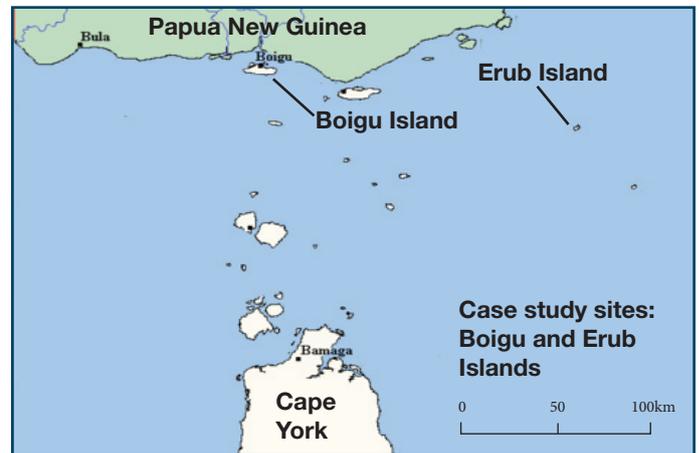
Over 100 Torres Strait Islands are distributed over 48,000 km<sup>2</sup> of shallow sea between Papua New Guinea and Cape York. This study worked with communities on two different islands – Boigu and Erub. Boigu is flat and low, formed of mud deposited on an old reef platform. It is 17 km by 6 km but consists mostly of brackish swamps. Mangroves encircle the margins, except for an 800 m by 500 m slightly higher (4-5 m above Lowest Astronomical Tide level) area on the northern coast known as Koedal Boepur, where the village is located. Much of the village already floods on the highest tides. Erub is a 3 km by 2 km volcanic island. Significant infrastructure, housing, and cultural sites lie on the low coastal fringe.

#### Climatic

The annual average temperature is 26.8°C (December mean: 28.1°C; August mean: 25.3°C) with a warming trend and strong inter-annual variability. Until the mid-1990s the maximum temperature increased by 0.32°C/decade and the minimum by 0.18°C/decade. Between the mid-1990s and 2009 these values increased to 0.67°C/decade and 0.51°C/decade respectively. Rainfall is seasonal, with high annual variability. Average wet season (October-April) rainfall is 1750 mm, and 90 mm during the dry (May-September).

#### Human: economic and social

Approximately 8700 Islanders inhabit 18 communities across 16 islands, with over 47,000 others on mainland Australia. Torres Strait is home to a unique set of histories, traditions, laws and customs referred to as Ailan Kastom, which pervades daily life through strong cultural, spiritual, economic and social connections with land and sea country. Ailan Kastom provides a governance system that oversees beliefs, rights, responsibilities, and traditional resource management, and reinforces relationships with land, sea, plants, animals, and with others in Torres Strait. Torres Strait is administratively complex with more than 25 government agencies or departments represented. Some Boigu and Erub residents are employed in government or government-sponsored programs, with few private sector



opportunities beyond limited commercial fishing and art sales. Remoteness, social and economic disadvantage, and the physical constraints of small island environments may appear to heighten vulnerability to climate change. However, the resourcefulness of these communities and their resilience to past environmental changes mean Torres Strait Islanders have knowledge, skills and resources they are willing to contribute to adaptation.

### Current stresses

Major stresses are:

- Inundation during high tides or storm surges on both islands, which threatens traditional lands, cultural sites, infrastructure, and resources such as garden soils and vegetation;
- Coastal erosion: communities have attempted to slow erosion using local resources, but are concerned by lack of government action;
- Changed seasonal climate and disrupted natural cycles, affecting traditional resource use and management;
- Declining marine ecosystems manifested as coral bleaching and reduced reliability of important food resources such as turtle;
- Particularly on Erub, the unreliability of water supply.

### Future climate

By 2070 temperatures may be 1-4°C warmer, with consecutive days above 35°C possibly increasing from 6 to 50 days. Rainfall is likely to increase, mostly due to higher wet season falls; dry seasons may become drier (as much as 23% of 1990 levels). Overall, rainfall is expected to become less reliable. Torres Strait may expect more intense tropical cyclones, with higher rainfall intensity but reduced frequency. Sea surface temperatures should increase, and sea levels should rise. Global sea levels are expected to increase by 0.18

to 0.59 m on average by 2100 (90% confidence). Regional sea levels may differ from global, but nevertheless are expected to increase.

## Impacts of future climate change

Accelerated coastal erosion and seawater inundation were considered the most serious potential impacts on both islands. If sea level rises by 0.59 m by 2100, the present seawall at Boigu will be overtopped 140 times a year (compared to 25 times a year now). On Erub, tidal incursions of at least 0.42 m above the lowest habitable floor level will occur annually. Such events will affect public and personal property and infrastructure function and maintenance, and may contribute to salinisation of water supplies and garden soils. On Boigu the northern shoreline on Koedal Boepur has retreated by up to 50 m over the past 50 years, with the loss of three rows of houses, and the cemetery is presently threatened.

Both communities depend on healthy ecosystems for food, income generation, and ecosystem services such as shoreline protection. A healthy ecosystem is an essential economic and cultural resource, central to Ailan Kastom. For example, coral bleaching and seagrass declines attributed to warming threaten important food resources and cultural activities. Community members raised reduced food and water security as potentially serious impacts (subsistence fishing and hunting for consumption and trade remain important in many Torres Strait communities). Loss of land or productivity due to coastal erosion, seawater inundation, or the need to relocate infrastructure over scarce 'garden soils', were considered constraining. Concern was expressed that reduced economic opportunities, and uncertainty regarding the future of community infrastructure, would encourage outmigration of younger people, and that the cultural identity of some community members may be affected as climate change impacts affect Ailan Kastom. These changes threaten the strong social capital, supportive networks and clan groups, which will be invaluable in facing future climate change.

## Adaptation: options and barriers

The only adaptation option in the short term for Boigu is the construction of appropriate seawalls and infrastructure to protect against inundation and erosion. The community does not consider relocation an option and the low elevation excludes retreat. Erub's topography offers a buffer, with accommodation, retreat (to higher ground) and protection-type strategies possible. However, some community members felt strongly that protection must be considered – retreat was distressing and would render livelihoods unsustainable.

Communities fear that their views will not be adequately considered in decision-making - a governance issue. Moreover, there is a frustration that action has been slow to follow collaborative assessment of climate change impacts and adaptation strategies.

Strong social capital contributes to adaptive capacity in both communities. Interviewees related how skilled locals had returned after studying or pursuing careers off island, but believed that better infrastructure, services and economic opportunities, must be provided if these people (who are

crucial in developing and maintaining adaptive capacity) are to be attracted and retained.

Underperformance is an emerging concern that may have ramifications for engineered solutions. On Erub, infrastructure built to solve water supply problems has not met expectations, and has flattened community confidence in technical solutions. Moreover, there is significant risk that some approaches, such as removing personal responsibility for water conservation and using desalination plants, are maladaptive.

## Policy implications: limits to adaptation

Engineered fortification of the Boigu shoreline is necessary to sustain livelihoods in a climate-changed future.

There is waning community confidence in the complex governance that oversees climate change impact and adaptation assessment. It is critical to restore confidence, and ensure community involvement in formulating adaptation policy.

The primary goal articulated by Boigu and Erub residents was to continue sustainable livelihoods on traditional lands while maintaining customary practices. Prioritisation of adaptation strategies should reflect views and values determined after consultation and mediation, and acknowledge that traditional owners have the right to decide on the acceptability of risks and solutions.

Strategies to improve adaptive capacity by fostering alternative livelihoods should be explored. Opportunities



*'Prioritisation of adaptation strategies should reflect views and values determined after consultation and mediation, and acknowledge that traditional owners have the right to decide on the acceptability of risks and potential solution.'*

exist in tourism, aquaculture, natural resource management, and environmental and agency service provision. New opportunities in sectors of increasing demand, such as education, health, and biosecurity and border security compliance, should be developed. Improved support should be given to initiatives that ensure Torres Strait Island communities regain greater control of livelihoods in enterprises dominated by outsiders, such as commercial fishing. Care must be taken to ensure governance does not limit adaptation by inadvertently constraining livelihoods when seeking to address another issue.

This document summarises key findings from the NCCARF report 'Limits to climate change adaptation for two low-lying communities in the Torres Strait' by Karen McNamara, Scott Smithers, Ross Westoby and Kevin Parnell. Download the report at [www.nccarf.edu.au](http://www.nccarf.edu.au). Images: Above: Ewan Bell. Overleaf: Campervan; NASA; Annabel Jones.