Pacific Australia Climate Change Science and Adaptation Planning Program
Adaptation planning and decision making

Integrated assessments combining biophysical and social approaches to explore climate change impacts, conducted in a (i) coral atoll, (ii) highland, and (iii) estuarine environment.

Background

Under the Pacific Adaptation Strategy Assistance Program (PASAP), adaptation assessments were undertaken in several countries: East Timor, Solomon Islands, Tonga, Cook Islands and the Federated States of Micronesia. These activities demonstrated best practice in conducting adaptation assessments, combining biophysical analysis with community participation and surveying. These activities responded to country priorities and were informed by a process of consultation with countries and other partners.

Through the PACCSAP, it is proposed that this work continue, but with a more defined set of parameters to demonstrate how applied science and assessment methods can help understand more complex impacts, including how climate change links with other stressors (e.g. how coastal processes and wave climate impact on low lying atolls over the longer term, or how storm surge and heavy rainfall could act in a co-incident event to impact on estuarine environments). Better information on likely impacts can then be used to inform the identification of effective adaptation responses.

Proposed approach

The integrated assessments will apply current climate change information and good practice adaptation planning methods to enhance the understanding of how climate change will impact on three distinct Pacific-region island types: coral atoll, highland, and estuarine environment.

This work will be led by the Secretariat of the Pacific Community, and in particular, the Applied Geoscience and Technology Division (SOPAC), in conjunction with a range of partners depending on the area of work and the climate change impact being addressed.

There are several important considerations for this work:

- The need to access or develop key baseline datasets to support the analysis. In many cases, sufficient data will not have been recorded or compiled over a suitable period of time. Investing in such data, where feasible and cost-effective, will be an element of this activity.

- Combining biophysical assessment with social and economic analysis to understand how communities value proposed adaptation options, and to convey the relative cost-benefit of particular adaptation responses. Linking this work with non-government organisations operating in communities will be considered.

- While work will be undertaken in one location for each environment (atoll, estuarine and highland), projects selected will preferably have broader regional application, as new learning from one type of environment can have relevance for similar environments. In this context, there will be a priority placed on engaging with a wide range of stakeholders to share outcomes.

Atoll assessment

Atolls are considered among the most vulnerable landforms on earth as they are generally small in size, low in elevation and are physically unstable to changes in environmental boundary conditions.[1] Atolls experience impacts from storm surge and flooding from king tides, as well as high water shortages making atoll communities heavily reliant on seasonal rainfalls. Those living in atoll environments rely heavily on marine resources for their daily food source, and crops grown on atolls are highly susceptible to salt-water intrusion of the water lens and damage from strong winds and storm events.

A less well understood element of atoll environments is increasing acidification and associated impact of bleaching coral. If the coral degradation is severe, it can cause existing reefs to perish or break apart, and can prevent new coral from forming. While research is growing on the effect of increasing acidification on coral, less is known about how this process will impact on the natural dynamics of atoll geomorphology and the role of reefs in protecting shorelines. The combination of increasing acidification and stronger waves may further damage the natural defences of an atoll, and affect the stability of the shoreline.

Research in this area will provide a more informed basis for long-term planning, and improve our understanding about the sustainability of atoll environments, which are already under significant duress from both development and environmental management practices.

Estuarine assessment

Many Pacific Island communities and major infrastructure are located in estuarine environments, more commonly known as bays, harbors, lagoons, or inlets, where the river environment intersects with the ocean environment. These environments are often exposed to high levels of degradation from a range of factors: sedimentation from soil erosion from deforestation, overgrazing and other poor farming practices, overfishing and discharge of waste including sewerage.

Climatic changes will affect the estuarine environment to varying degrees, both from the ocean through storm surge coupled with sea level rise and from the river through flooding and greater soil erosion from higher intensity rainfall. Our understanding of these coincident events is limited, but with improving country-level projections and investment in obtaining suitable data, we can improve our understanding of the extent to which future climate change will impact on these environments and exacerbate existing development challenges.

Understanding the climate change impact will provide guidance for infrastructure development and urban planning, including location of settlements and critical support infrastructure, as well as transport related infrastructure. Research will also support disaster risk reduction measures, noting the potential for flooding and landslides. Research in this environment is better suited to larger island types in the Pacific region.

Highland assessment

Papua New Guinea provides one of the most suitable locations to better understand the impact of climate change on a highland environment (although other highlands in the Pacific in Vanuatu and Solomon Islands with their own cloud forests may also provide appropriate research locations).

[1] http://www.sste.mmu.ac.uk/users/cperry/tropicalcoastal/reeform/p1islands.html

The highlands of Papua New Guinea (PNG) encompass many different ecosystems from tropical montane forest to alpine grasslands and glaciers in the highest peaks. The tropical montane forests, like many rainforests, are ecosystems of particularly high biodiversity. The highlands are also the source of tributaries to both the Fly and Sepik Rivers (two of PNG's most important river systems).

Most people living in the PNG highlands are subsistence farmers. Sweet potato is particularly important. The highlands provide an important source of income through coffee production. Coffee is PNG's second largest agricultural export; 90% of coffee is produced in the highlands region.

To this end, a study of a highland environment will reflect part of the diversity of impacts facing the Pacific region, and given the many environments of this sort in PNG, it will provide lessons and inform adaptation responses in other locations.

Increasing temperatures as a result of climate change will affect the ecological zones at different levels of altitude, forcing the migration or, where there is limited potential to migrate 'upslope', possible extinction of species. The related impacts this will have for the complex interdependencies between biodiversity and ecosystems are only just starting to be understood. Intensity of rainfall and the duration of the rainy season will also impact on highland environment

Another impact is on the sustainability of food sources, particularly crops grown both for subsistence and for economic purposes. Coffee production is a major source of income for PNG[2], and with improved climate projections, analysis may now be able to determine the impacts on this important crop and the broader implications for PNG.

Discussion questions

1. What kinds of climate change impacts do you think require closer analysis, or are you concerned that aren't being addressed, in the following environments (please identify specific locations if possible):

    a. Atoll environments

    b. Estuarine environments

    c. Highland environments

2. What activities, programs or forums are already undertaking research in these environments that we could potentially collaborate with, both as biophysical or community-based activities?

3. What other considerations are important for you to have included in an assessment like this? *E.g. community surveying, analysis of adaptive capacity, identification of specific adaptation options.*

4. Does capacity exist in your country/organisation to be engaged in this particular part of the PACCSAP? If so, please identify your area of interest and how you would like to be involved.

[2] Australia imported A$50m in coffee and substitutes in 2010-11, representing PNG's fourth largest export to Australia. Source: http://www.dfat.gov.au/geo/fs/png.pdf