




Global Change & Coral Reef Management Capacity in the Pacific

Engaging Scientists and Policy Makers
in Fiji, Samoa, Tuvalu & Tonga

2010 ~ 2011



Project Outline

Healthy coral reefs are vital to the sustainability of the peoples' livelihoods in the Pacific Islands. Global change has increasing impacts on Pacific coral reefs, including sea level rise, increased sea surface temperature, ocean acidification, and natural phenomena like cyclones, leading to increased vulnerability of coastal communities. Integrating this knowledge of global change across various national government sectors, then translating this into policies that lead to sustainable management of coastal ecosystems remains a challenge. This will be addressed through face-to-face dialogue between reef experts familiar with the science of climate change, and government personnel responsible for the development of appropriate policies focussing on the sustainable management of coral reefs.

This project aims to bring Pacific Leaders together with scientists and experts on the sustainable management of coral reefs, so that they can be apprised of the impacts of global change and of those factors that are affecting the health of their coral reefs, using the most recent information available.

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List of Acronyms

CBD	Convention on Biological Diversity
CC	Climate Change
CI	Conservation International
CO ₂	Carbon Dioxide
DOF	Department of Fisheries
EEZ	Exclusive Economic Zone
FAB	Fijian Affairs Board
FLAMMA	Fiji Locally Marine Managed Areas
GDP	Gross Domestic Production
GHG	Green House Gases
GCRMN	Global Coral Reef Monitoring Network
GTZ	German Technical Corporation
IAS	Institute of Applied Science
ICM	Integrated Coastal Management
IUCN	International Union for Nature Conservation
NAPA	National Adaptation Plan and Assessment
NGO	Non-Government Organization
NUS	National University of Samoa
MAF	Ministry of Agriculture and Fisheries
MDG	Millennium Development Goal
MECC	Ministry of Environment and Climate Change
MNRE	Ministry of Natural Resources and Environment
MMA	Marine Managed Areas
MPA	Marine Protected Areas
PACC	Pacific Adaptation to Climate Change
PACE-SD	Pacific Center for Environment and Sustainable Development
PI-GOOS	Pacific Islands Global Ocean Observing System

SOPAC	South Pacific Applied Geoscience Commission
SPREP	Secretariat of the Pacific Regional Environment Programme
POWPA	Program of Work for Protected Areas
USP	University of the South Pacific
UNCED	United Nations Conference on Environment and Development
UNFCC	United Nations Framework Convention on Climate Change
UNCLOS	United Nations Convention on the Law of the Sea
UN	United Nations
WSSD	World Summit for Sustainable Development

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Executive Summary

- Four successful workshops on Climate Change Adaptation were held for 130 senior officials from Fiji, Samoa, Tonga and Tuvalu in June - August 2010;
- These workshops, organised by the University of the South Pacific, featured briefings on likely impacts of climate change on Pacific Islands and sought suggestions for policy changes for island adaptation;
- Climate change will increase existing threats to coral reefs due to unsustainable fishing, pollution from the land and habitat destruction via sea level rise, sea temperature rise, ocean acidification and increased strengths of cyclones. Rapid population growth will exacerbate these;
- All countries recognise the threats posed by climate change and have signed relevant UN Conventions and instruments. They all have policies to tackle climate change threats;
- However, the governments have a lack of capacity to seriously address climate change threats and these are yet to be incorporated as a cross-cutting theme among the relevant government departments.
- The countries recognise a need to raise awareness of the issues and include these in school curricula, which are often based on developed country models;
- Tonga recognises that existing government departments will need to improve communication and coordination to develop an integrated approach;
- Fiji questions whether a national ocean policy could serve the purpose of addressing issues such as sustainable fisheries management (including ecosystem-based management), cross-sectoral corporation, linking scientists with policy makers, education and awareness;
- Samoa recognises the challenges presented by developing an integrated approach which involves cutting across ministries;
- Tuvalu has several existing social and economic threats despite their traditional leadership system;
- The governments recognise that an expansion of Marine Protected Areas offers a potential mechanism, however only Fiji and Samoa have active MPA programs in association with user communities;
- The countries recognised that building on the Regional Oceans Policy template approved by the Forum Leaders in 2002 was an essential first step in improving policy and all recognise the important role of climate change in the long-term sustainability of their marine resources and food security;

1.0 Introduction

A general overview of coral reef issues in the Pacific was prepared by the Institute of Marine Resources, followed by dossiers on each country, including a gap analysis regarding global change and coral reef governance issues. Input from the countries was sought before the dossiers were distributed to participants. Workshops were held during June – August 2010, at which a total of some 130 senior officials from the four countries attended. The workshop format comprised presentations on the current status of coral reef and climate change issues and policies given by the project team leaders, government officials, NGOs and civil society representatives. Following open discussions break-out groups reviewed the gap analysis and recommendations, with provision being made of modifications, additions and comments. The resulting conclusions were then discussed in Plenary, when a national coral reef action plan was formulated. Follow up on progress with the action plans will take place during the coming year.

The workshops presented a welcome opportunity to engage with the senior government and civil society representatives from the four countries. Time was also available to organise meetings with some stakeholders and to discuss areas of common interests such as how USP can assist the countries with their self determined plan.

Although there are great differences among the four target countries in terms of size, environment, culture and population, the workshops identified a number of common and recurrent themes. All of the countries are signatory to the relevant UN Conventions and Agreements relevant to global change and the environment, although for some reporting presents challenges. All countries have in place and are currently reviewing or updating the necessary policies regarding the conservation and sustainable use of their coral reefs and marine resources, and all recognise the important role of climate change in the long-term sustainability of their marine resources and food security, but climate change issues have not yet been incorporated as a cross-cutting theme among the relevant government departments. In Tonga, for example, the Ministry of Environment and Climate Change seeks to put things in perspective under one umbrella, but it was evident that there are difficulties between them and Fisheries regarding allocation of funding and responsibilities. In general the governments recognise the need for integrated planning, but there is a need to improve communications among those line departments responsible for the management of coral reefs: for some this will require a significant change in mind-set and *modus operandi*. There was a universal lack of knowledge of the 2002 Regional Oceans Policy, developed and approved by the forum Leaders and presented at the World Summit on Sustainable Development held in Johannesburg. In discussions, two countries (Tonga and Tuvalu) resolved to examine the possibility of using the Regional Oceans Policy as a template for the development of National Oceans Policies.

The need to raise public awareness about global change and coral reef issues was recognised by all, as was the need to find ways to incorporate marine issues in the school curriculum. Much of the curriculum is currently based on developed country principles. This would require the necessary teacher education. A significant amount of work needs to be done in this area.

There are common threats to coral reefs throughout the region, including unsustainable fishing causing stock depletion, pollution from land-based sources, habitat destruction and global change, including sea level rise, sea temperature rise, ocean acidification and increased strengths of

cyclones. Exacerbating all of these is rapid population growth. All of these threats are evident to greater or lesser extents in the target countries.

All four countries recognise over-fishing and depletion of reef fish stocks as a major problem and this, coupled with high population growth indicates that there will be serious shortages of fish within the next twenty years, unless some strong conservation measures are put in place. The difficulty in enforcement of fishery regulations is a serious problem throughout, largely because of a lack of capacity. Alternative livelihoods will need to be developed for disenfranchised fishers. The expansion of aquaculture is seen as a possible replacement source for reduced protein supplies; however, the scope for this is limited in Samoa and Tuvalu but has good potential in Fiji and Tonga.

The establishment and management of Marine Protected Areas (MPAs) (or similarly designated areas) is of high priority in all the countries, as well as the recognition of the important role they play in conservation; but only in Fiji and Samoa has this reached a high level of community engagement through the Fiji Locally Managed Marine Areas programme, and the Village Fish Reserves, accompanied by Village By-Laws in Samoa. Community engagement was seen as crucial to the long-term effectiveness of protected areas. Tonga has a variety of reserves and parks, with policies and community engagement still evolving, whereas in Tuvalu there is only one significant MPA (involving significant community participation), with others in the outer islands under consideration.

All countries have reef monitoring programmes to various degrees of frequency and location; the importance of monitoring from the point of view of provision of management advice was recognised, as well as the need to engage more with communities. The lack of monitoring capacity is an issue. Significantly, it is evident that monitoring and recording of biodiversity is in its infancy, with the exception of Fiji. National Biodiversity inventories are thus seriously inadequate and much of the marine biodiversity, with the exception of commercially important species, is unrecorded. The need for incorporation of global change aspects and socio-economic monitoring was also recognised.

A significant number of global change and related projects are underway in all four countries, and with the support of a variety of donors. The participants noted that there is a need for better coordination of projects and donor support to avoid duplication of effort.

Overall, the workshops were very successful. The University of the South Pacific certainly was recognized for the effort to engage the countries in the important area of coral reef management and development. The challenges faced by the countries are huge and provide opportunities for joint projects with USP. A significant number of initiatives arose during the workshops, including the following:

- The potential for marine biodiversity surveys in Tonga, Samoa and Tuvalu;
- Introduction of Seagrass Watch programmes in Samoa and Tonga;
- The need for coral identification training in Tonga, Samoa and Tuvalu;
- Development of a regional Climate Change Clearing house, preferably at USP;
- The need for assistance with capacity building in all countries (USP can play a pivotal role);
- Facilitation of attachments of USP students with their relevant home Governments;
- Assistance with the new Marine Science programme at the National University of Samoa (NUS)
- Closer collaboration with Secretariat of the Pacific Regional Environment Programme (SPREP) in the area of coral reefs and coral reef management;

- Re-activation of the Two Samoas initiative (between American Samoa and Samoa);
- A commitment by two countries (Tonga and Tuvalu) to work towards development of National Ocean Policies, based on the Regional Oceans Policy template approved by the Forum Leaders in 2002. Need to consult within the country, as well as with Traditional Leaders
- Need for improved collaboration between all stakeholders – interaction with Government will lead to securing more political will, e.g. population growth
- Need to harmonize among projects, to have better coordination among agencies
- Need to address the disconnection between community (bottom up) and government (top down) resource management systems
- Need good governance at community level
- Need continuous monitoring or else we will not have statistics on fisheries (subsistence, per capita consumption)

2.0 Generic Discussion of Reef Issues in the Pacific

Most people heavily depend on coral reefs and their resources for their livelihood especially in the Pacific island countries. This over dependence on coral reef ecosystems can have adverse effects to the continuance of a balanced ecosystem. Some of the major threats that affect the reef ecosystem are: global climate change, overfishing, pollution, coastal development and biological threats. Exacerbating all of these is rapid population growth. All of these threats are evident to greater or lesser extents in the target countries. However, monitoring results in the South West Pacific have indicated that reefs in this region appear to be resilient in the face of continuing acute threats from increased sea surface temperatures, cyclones, tsunamis and crown of thorns although there are suggestions that reefs are experiencing an increase in exposure to chronic stresses such as the human-induced impacts which are difficult to measure (Whippy-Morris, 2009). As suggested by Veitayaki *et al* (2007), the challenge for the Pacific Islands is to design and institute a disaster management plan at the regional, national and district local levels.

Global Climate Change

Climate change issues are widespread in the Pacific region but are regarded differently by each country which has its own set of priorities, strategies and responses to the different issues. The Pacific Islands are vulnerable to the effect of climate change but the atolls, coastal and low lying areas are most at risk (Veitayaki *et al* 2007).

Coral bleaching is a global phenomenon that seems to be increasing in frequency, scale and severity. The South Pacific experienced major mass coral bleaching in 2000. During late February through to early March 2000, mass bleaching occurred in Fiji after a prolonged period of temperatures in excess of 30^o C. This coincided with similar coral bleaching being reported across the South Pacific from Papua New Guinea to Easter Island. Prior to and during this period, satellite surveillance of sea surface temperatures (SST) revealed a band of progressively elevating temperatures. Degree Heating Weeks (DHWs) indicate the accumulation of thermal stress that coral reefs have experienced. One

DHW is equivalent to one week of sea surface temperatures 1° Celsius greater than the expected summertime maximum. Two DHWs are equivalent to two weeks at one degree above the expected summertime maximum or one week at two degrees above the expected summertime maximum (and so on). For the duration of the event, Tonga and the Cook Islands and areas south of Fiji showed 10-15 Degree of Heating Weeks (DHW). Bleaching occurred after 5-6 DHW in Fiji. South Pacific countries such as Kiribati, Tuvalu and the Samoas experienced no coral bleaching. A major bleaching occurred subsequently in Fiji in 2002 and mainly affected the north sides of the two main islands, which had escaped the 2000 bleaching. Kiribati suffered severe bleaching in 2003 in the Phoenix Islands and in the Gilberts in 2005 (Lovell, 2005).

Loss of land is a major concern throughout the Pacific, considering that in many countries, a large proportion of their population live in urban areas. Even for the higher and larger islands, the loss of land associated with sea level rise will be devastating in the coastal areas. In the atolls, where the average height of landmass is less than 5m, the loss of land or whole islands will mean catastrophic changes. At the moment, the effects of higher sea level are evident in cultural sites such as burial grounds in Tuvalu (Veitayaki *et al* 2007).

In addition to sea temperature and sea level rise, ocean acidification is also predicted with the increase of carbon dioxide (CO₂) in the atmosphere, which will have adverse effects on the marine ecosystems. Loss of land is a major concern throughout the Pacific Islands. Oceans, along with terrestrial plants absorb CO₂ from the atmosphere. In the past 200 years, the increase in CO₂ in the atmosphere had led to an increase in amount of dissolved CO₂ in the ocean, which in turn increases carbonic acid concentration in the ocean (Solomon *et al* 2007). "A decrease in ocean pH would affect marine life by lowering the amount of calcium carbonate (the substance created when CO₂ is initially dissolved) in the water which would put the productivity and even the survival of thousands of marine species at risk" (www.climatechange.org).

Increased frequency of natural disasters (hurricanes, earthquakes, tsunami etc) threatens reefs around the Pacific. For example, Lovell *et al* (2004) mentions that cyclones Ofa and Valarie in 1990 and 1991 respectively devastated the reefs of Samoa, stripping the seaward reef slopes of its coral. In 2004 cyclone Heta damaged 13% of coral reefs in Samoa (Samuelu and Sapatu, 2009). A preliminary post-tsunami assessment on coral reefs in Samoa found that damage was greater on the barrier back reefs and the more inshore portion of fringing reefs, due to wave transport of shingle, boulders and especially displaced coral colonies affecting attached coral through impact and burial. The assessment concluded that the impact of the tsunami on coral resulted in the degree of exposure to the wave and the influence of the island shore morphology in reducing or augmenting its force (Lovell *et al* 2009). A report from American Samoa mentioned that researchers found several sites which lost 20-30% of their existing coral although a marine ecologist reckoned that reefs in the main urban center were in a poor condition before the disaster (<http://www.msnbc.msn.com/id/33358072/>).

Overfishing

Overfishing is defined as fishing at a rate faster than the reproductive rate of any marine organism. Overexploiting reef resources is one of the principal threats to its ecosystem stability (Newton *et al* 2007). An exponential increase in the human population has led to a directly proportional increase in demand for fisheries resources for food. Long-term unsustainable fishing may result in a reduction in species diversity, and/or endangerment or extinction of target species, also affecting other species (not directly fished) in the process (Roberts 1995). Commercial exploitation has led to many marine species becoming endangered. Examples in the Pacific as stated in various reports and programmes include, the Maori wrasse, turtles, whales, bumphead parrotfish, sea cucumber, pearl oyster, trochus, green snail, giant clam and triton (Pippard, 2009; <http://www.sprep.org/topic/marine.htm>; Foale, 2008; Whippy-Morris, 2009).

In Fiji, studies by the Institute of Applied Science at the University of the South Pacific have shown that nationally, most food fish catches are of a length less than that of the length at maturity indicating that the fisheries around the nation are not healthy (Per. Comm. James Comley, June 2010). Such a situation could ultimately lead to loss of entire functional groups of species as pointed out by Roberts (1995).

The live reef food fish trade (LRFFT) often targets spawning aggregations of selected high value species, leaving a population with relatively reduced spawning stock, thus resulting in recruitment limitation (Pomeroy *et al.* 2004). A study conducted by Sadovy and Domeier (2005) concluded that, although the need for aggregation protection is now obvious to most biologists and fishers, the vulnerability of spawning sites, aggregations and aggregating fish species is still not widely recognized by fisheries managers, particularly in the Indo-Pacific and Caribbean. In addition, few exploited aggregating species are regularly monitored and few aggregations globally are currently managed or incorporated into MPAs and other means of protection such as seasonal closures. Furthermore marine ornamental and curio trade may also have negative effects on the reef ecosystem if not done sustainably (Scales *et al* 2007).

Pollution

Primary sources of coral reef pollution are land based (www.noaa.gov). Developments on land that are near coastal areas can alter the landscape and increase the level of runoff from land (Wilkinson 2004). "Runoff often carries large quantities of sediment from land-clearing, high levels of nutrients from agricultural areas and sewage outflows, and other pollutants such as petroleum products and pesticides" (www.noaa.gov).

All Pacific Islands have fringing reefs adjacent to the shoreline which are particularly susceptible to land-based pollution. The major sources of nutrients to coastal waters in Fiji and other Pacific Islands are typically from human waste and chemicals (detergents and fertilizers). Problems are caused by the poor sewage treatment such as septic tanks, primary treatment and pit latrines which are used. Little water quality studies are available except for limited studies in major harbours. Anecdotal evidence suggests that many reefs in Fiji are undergoing a phase-shift to become macro-algal dominated (Mosley and Aalbersberg, 2005). Waste management in atolls is challenging as nutrient-

rich waste (human and livestock) quickly enters the groundwater due to the porous nature of the soil and high water table. In addition, sludge from septic tanks must be pumped out periodically while suitable treatment and disposal arrangements are not currently available (Veitayaki et al 2007).

Coastal Development

Coasts are dynamic systems which undergo natural changes over time. In addition to these natural changes, coasts are subjected to human-induced changes including, beach mining, reclamation of shorefront land and building coastal structures. According to Veitayaki *et al* (2007), mining of coral aggregates in the Pacific provides in some cases the only sources of construction materials in several countries including Fiji, Tonga, Tuvalu and Samoa. However, this activity disturbs the sand budget of the coastline. As Gillie (1994) explains, small islands (atolls, reef and raised islands), have a limited volume of beach material and a relatively low rate of natural replenishment in comparison to rates of beach mining for use as construction aggregates. For example, in Tongatapu, many beaches that are subject to mining have natural replenishment rates of 20-50% of the extraction rate which is not sustainable. The understanding of natural sources of beach material and carbonate sediment budgets in many Pacific island nations is fundamental to the management of coastal resources.

Land-use practices related to logging, mining, farming and grazing have led to extensive sedimentation problems in the Pacific which affect the coral reef. For example, results of a study carried out in Tefisi village, Vava'u in Tonga, found that the removal of forests for development of agriculture land, roads and settlements resulted in high sedimentation of the stream and coastal waters due to soil erosion. This sedimentation led to a low coral cover, low number of benthic organisms and fish assemblages. There was actually no butterfly fish found (Palaki *et al* 2005). In Fiji, an extensive dredging program has been undertaken to deepen rivers and reduce flooding. The dredging has been associated with loss of wetlands and the destruction of marine fisheries on which villagers rely (Veitayaki *et al* 2007).

Biological threats

Coral disease outbreaks (bacterial, viral, fungal) also deteriorate reef health. "Coral diseases and syndromes generally occur in response to biotic stresses such as bacteria, fungi and viruses, and/or abiotic stresses such as increased sea water temperatures, ultraviolet radiation, sedimentation and pollutants" (coris.noaa.gov). The frequency of natural disasters and disease outbreaks may increase due to global climate change and pollution. According to Lovell and Sykes (2004), coral disease was more widely reported in Fiji as a post-bleaching phenomenon. Various researchers had reported white band disease and coralline lethal orange disease was discovered in 1995 by M. Littler and D. Littler. White band disease has also been reported in Samoa following localized bleaching (Lovell, 2004).

Crown of thorn starfish infestation has been reported in certain areas of the Pacific. Fiji experienced an infestation from 2006 to 2007, which resulted in a decrease coral cover (Whippy-Morris, 2009). Researchers found infestations of crown of thorns starfish in different stages of development in many island areas - usually in close proximity to villages or urban areas. There was no "common

denominator" to clarify the cause of the population blooms. Instead, the picture that emerged was that blooms are likely to occur where the reefs are stressed. And the reefs of the Pacific are stressed by many different causes (<http://www.tellusconsultants.com/Thread/ACANTH.HTM>).

3.0 Country Reports

The APN (Asia Pacific Network) workshops on *Global Change and Coral Reef Management in the Pacific Engaging Scientists and Policy Makers in Fiji, Samoa, Tuvalu and Tonga* were held in 2010 as follows: 9th and 10th June in Fiji, 11-12 August in Samoa, 3-4 August in Tonga and 18 August in Tuvalu. For each country, background information on the laws, strategies and policies associated with coral reefs and global change were presented in the dossiers prepared by the Institute of Marine Resources and provided to the workshop participants. The general workshop programme involved a set of presentations by the various scientists and policy makers associated with coral reefs and global change. This was followed by a general discussion session, breakout group discussion session and formulation of a set of recommendations from the analysis of all the presentations and discussions. The following section outlines the outcome of the workshop discussion in each country.

3.1 Fiji

3.1.1 Summary

The workshop discussion sessions looked at a number of issues, including the different approaches that could be adopted to gather information, identify appropriate scientists who could aid in developing policies, addressing issues and actions that need to be taken into account for sustainable coastal management, the value and use of the resources (subsistence fishing), the action of the local communities on the coastal area and to what extent global change may be blamed for the coastal threats.

Sustainable fisheries is an issue which needs to be reinforced to all. Monitoring and assessments are important for providing information for adaptive management.

Overfishing is a serious threat to the fisheries which is evident from the large quantity of under-sized fish sold in the municipal market and results from a study carried out by the University of the South Pacific.

More information and research in fisheries is needed. For example, a regular census on subsistence catches including value. The statistical analyses of fisheries inventory data collected by government would be critical information for management. In addition, the need for scientific research in marine managed area establishment has been identified in particular, the effects of periodic opening.

Policies focussing on ecosystem-based management with special emphasis on mangrove management are needed. There is also a need for better enforcement and improved licensing system. In addition, new legislation should consider the existing system of locally marine managed areas having a legal status.

As a precautionary principle the changes associated with global change need to be addressed promptly.

It is essential for the stakeholders, policy makers and government to work together to address common environmental issues. A more integrated approach is necessary for coastal management and an agreed set criteria is needed to determine hotspots and deep sea marine managed areas.

The method of communication with the local communities is important when dealing with sustainable management of resources.

Introducing topics on global change and its impacts in the school curriculum would increase awareness of global change among the children of Fiji, who will be the leaders of tomorrow.

3.1.2 Discussion of Reef Issues

Sustainable fisheries - In order to sustainably manage the fisheries resources it is essential to identify which resources are threatened. A lot of undersized fish are sold in the local markets; the local fishermen are unable to make a connection between undersized fishing (overfishing) and the unavailability of bigger sized fish. It is essential to educate the local fishermen about the significance of sustainable management of the resources. The current laws and regulations that are applied to sustainable fisheries are “enforcement friendly”. Placing hefty fines and spot fines may enhance the level of enforcement.

Scientific research – Apart from explosion of algae there could be other factors which influence coral cover.

The livelihood of the locals may have been affected by the 20% decrease in Fiji’s economy over the past three years.

Legislation – There is a need to develop of joint policies in order to recognize the significance between the different ecosystems, especially between coral reef ecosystem and mangrove ecosystems (Currently the Fisheries Department does not have authority over the management of mangroves; they are managed by the Lands Department). In the case of mangroves there is a need for sustainable management rather than conservation. The mangrove management plan has been revitalized under the National Biodiversity Strategy Action Plan (NBSAP) Program at the Environment Department.

Climate change – it is unclear whether the global change issue will be taken into account in the review of the Fisheries Act. The global change issue has been subconsciously looked at, just not identified as that – for instance the current regulations for coastal development has a setback of 30 meters from the high water line. As the urgency of the climate change and variability increases, its priority will change respectively. The global change issues are addressed at a regional level by Council of Regional Organizations in the Pacific (CROP). However, as a precautionary principle the changes associated with global change need to be addressed promptly. Impacts of climate change and variability should not be used as a ‘scapegoat’ for the local issues. If the resources are not managed well, climate change will make the situation worse.

Sectoral and stakeholder consultations – there should be better coordination between different sectors and the industry rather than the ministry and the industry. It is difficult to convince the government seniors that the government (Ministry of Fisheries and Forests) work to maintain the industries. It would take time to change their mindset [“to work for each other rather than against each other” (Mr. Viliame Naupoto)]; however, it is not impossible to do so. In order to address the common environmental issues it is essential for the stakeholders, policy makers and government to work together.

Communication with the locals – the natural resources (coral reefs, mangroves) are precious to the local communities; they contribute significantly to their livelihood. Hence, dealing with the locals on such issues is a delicate situation. The method of communication is important; sending out the ‘right message’ of sustainable management of the resources to the local communities. In cases of issues associated with natural disasters apart from the fact that it would be difficult to part with lifelong assets, the cost of relocating would be hefty.

Education – apart from educating the local communities about the impacts of global change, introducing topics on global change and its impacts in the school curriculum would increase awareness of global change among the children of Fiji, who will be the leaders of tomorrow.

Finally, can a national ocean policy serve our purpose in addressing these issues?

3.1.3 Gap Analysis and Recommendations

The following section is the outcome of the workshop which addressed gaps and recommendations in fisheries, marine managed areas, global change impacts and multi-sectoral/multi-stakeholder consultations.

FISHERIES

1. The value of subsistence fisheries is more than half the value of commercial fisheries in Fiji, however, it remains poorly documented. The Fisheries Department should be encouraged and financially supported to continue doing marine inventory surveys and development of fisheries management plans. Fisheries management plans should be given formal recognition to improve management of the subsistence fisheries. A portion of the funds allocated for the inventory surveys by the government departments needs to be directed towards statistical analyses of the results obtained from the surveys in order to draw substantial conclusions for management purposes.
2. Greater use of market surveys of subsistence catches should be encouraged.
3. There is a need for more scientific (ecology, reproductive biology, habitat preference) studies are carried out on the species caught for subsistence fisheries. All species important to Fiji’s subsistence fisheries should be researched on.

4. The consequences of the loopholes in the regulations and the potential impacts they have on stocks and endangered species should be considered. A regular census of the subsistence catch by locals is needed. (Note: MMA has been conducting studies related to catch per unit effort regularly in their sites (FLMMA Network). In addition, better enforcement is required such as all fishermen to have a fishing license (fishing license to be made affordable, hence subsistence fishermen could easily obtain one); identification tags; de-merit system for non compliance; on-spot fines; higher fines and designated areas for fish sales. Fish wardens can be empowered through incentives.
5. Reduce fisheries effort to levels determined by science.
6. Identify information needs to allow fisheries management, conduct spatial management, determine export limits (high-value products) and identify safe and feasible aquaculture for protein needs.

MARINE MANAGED AREAS

1. Fiji has more marine managed areas (MMA) than any other Pacific Island Country and this number has increased largely since the establishment of the FLMMA network, however these MMAs do not have any legal basis nor does the status of fish wardens. New fisheries legislation needs to allow for a simple system to have a legal basis. (IUCN/USP produced a report on approach to LMMAs having legal status and role of fish wardens).
2. The MMA network needs to be reinforced through an examination of connectivity, scientific inventories, physical and human resources. Fiji MMA group meeting (2007 and 2009) has identified the need for scientific research needed in MMA establishment. Especially important are the effects of periodic openings of MMAs. Scientific inventories should follow accepted international protocols. Existing MMA network research is looking at the living range of certain species, catch per unit effort, satellite mapping of habitats and some work on the effects of opening of the MMAs. CI/FLMMA studies involve the genetic connectivity of fish (6 species). Research topics need to respond to the needs of the communities. Alternative livelihood should be determined eg.,– value-added products, handicraft, fee for sight-seeing in MMAs. Aquaculture could be another livelihood; however, good management of MMAs could yield higher profit than operating an aquaculture facility. Causes of threats related MMAs: lack of awareness, lack of money.
3. There is a need to follow up work carried out on identification of biodiversity hotspots for Fiji. We strongly support the work of the NBSAP technical working groups. An agreed criteria to determine the hotspots should be developed. The National Environment Council has a sub-committee looking at protected areas – POWPA (Program of Work for Protected Areas). One of the major issues in developing the criteria to determine the hotspots is the proposal of conflicting criteria by NGOs.
4. Fiji should pursue the possibility of identifying a marine area to be designated as a World Heritage Site. This will be recommended by the POWPA. Consider having biologically diverse sites to make up the World Heritage site. Instead of focusing on micro sites for the World Heritage Site, the whole of Fiji Islands could be declared a World Heritage Site.

5. Government to provide support for MMAs and to declare MMA in Fiji's EEZ. This issue can be related to 3, above; government supports MMAs. There is a need to identify deep sea areas within the EEZ as MMAs. There is a need to set criteria to identify the deep sea sites.
6. Strengthen community leadership. Leadership training needs to be conducted; IAS, USP/FAB has a joint leadership program in Cakaudrove, Macuata. The government has stopped supporting this project as of this year; a continued support by the government is required.
7. Improved mechanisms for compliance and enforcement.
8. Awareness and education – schools, communities. Lack of awareness and income (economic drivers) are root cause of poor MMAs.
9. More economic studies on the value of biodiversity, ecosystem services and MMAs.

GLOBAL CHANGE

1. It is recommended that the impact of climate change events on the coral reef fisheries should be monitored and assessed, for instance, bleaching events, quantification of ocean acidification and sea-level rise. Existing groups and systems: GCRMN, Reef Check, LMMA, Tide gauges. Existing efforts need to be strengthened and satellite derived data/ global and regional model data need to be utilized. Scientific findings to be translated into easily understood language. Use networks: SPREP (PI-GOOS – Pacific Islands Global Ocean Observing System), SOPAC (SPSLMP – South Pacific Sea Level and Climate Monitoring Project). Monitoring needs to be coordinated or communicated effectively.
2. There is a need for more community awareness on potential impacts of climate change on fisheries such as increasing sea surface temperatures, coastal inundation, ocean acidification, and sea level rise. Need for awareness material such as pamphlets and posters in local language. Incorporate such issues into school curriculum and translate global change into national action.

MULTI-SECTORAL, MULTI-STAKEHOLDER CONSULTATIONS

1. It is recommended that there be wider consultation among relevant government departments and stakeholders with respect to coastal development.
2. There should be a national integrated coastal zone management plan for Fiji. We support the work of the Integrated Coastal Management committee currently working on this.
3. Integration must be strengthened.

3.2 Samoa

3.2.1 Summary

Discussion centred on legislation issues, the role of civil society, education and awareness, fisheries management, research, marine protected areas, community involvement, collaboration between government sectors and between the two Samoas and minimizing land-based pollution and urban litter.

The issue of having too many policies and the need to review this was identified in addition to lobbying government to use environment friendly practices.

The role of civil society and involving them in regional and international meetings needs to be considered as they are an important link to the communities.

Increasing education and awareness on sustainable fisheries and management both in the formal and informal education systems is required. Printed awareness material seems to be more receptive.

Catches from all sectors need to be substantiated and having licensed fishers to ensure accurate recording of catch is required.

More research on marine biodiversity and its value and on land-based activities which affect the marine environment is needed as well as the inclusion of MPAs in the assessment of marine invasive species.

Having a suitable approach in communities with regards to resource management and extension of fisheries reserves is also required. Involving communities in monitoring and awareness helps keep them motivated, except when conflicts deter them. Also need to promote alternative income-generating activities and involve civil society in community based activities initiated by government. Managing fisheries and marine resources is difficult; inactiveness relates more to community choice.

There is a need for more collaboration between the two Samoas and at all levels (government, non-government organizations and educational institutions).

Government management focuses on awareness and education, coastal management and fisheries although monitoring needs to incorporate resilience indicators.

Waste management issues in particular recycling of bottles and cans which end up littering towns and eventually end up in the sea.

3.2.2 Summary of Reef Issues

Legislation – Pacific governments very keen on developing new policy without deleting old policy, need to look at all laws and decide which ones to get rid of and which ones are relevant, otherwise it could lead to more problems. There is a Law Reform Commission currently looking at all existing and old laws to ensure no overlap.

Need to re-look at Regional Oceans Policy and make it known to policy-makers. Through the Two-Samoas initiative, Samoa and American Samoa work together on marine and terrestrial issues. Samoa has many policies that can fit into a national coral reef policy, although this will cut across ministries which will be a challenge. Policy issues need to trickle down to communities, no-take zones not enforced. No policy on seawall construction. The Apia policy (2008-2013) incorporates issues of the Regional Oceans Policy.

No specific plans for Mangroves but have a Biodiversity plan which includes mangrove management. MNRE intends to work on mangrove management under an IUCN project.

Role of civil society - There is lack of links to the communities, there is a concern about proper civil society representation in regional/international forum. Need community involvement in land use management.

Awareness raising and capacity building - curriculum – Ministry of Agriculture and Fisheries worked on primary level curriculum, a lot of public awareness carried out in communities. Secondary schools have marine related research topics.

An important component of awareness campaigns is the printed awareness materials which MNRE does. Also developed study cards for primary schools. In addition, MNRE is working with Ministry of Education to introduce marine units to secondary schools (Marine Science). One of main roles of civil society is training and awareness in natural resources and livelihood for communities which cover marine related topics. Resources for educational programs have been developed such as a booklet on science and coastal ecosystems for years 7-10 and a Mangrove booklet for primary schools to promote mangrove conservation.

Climate Change - workshop presentations have shown that our Pacific Islands region generates very little Green House Gases (GHG) but are greatly affected so need to get to international meetings to make voice heard with regards to high GHG emitting countries to lower their emissions.

Education and awareness - A request by National University of Samoa (NUS) to involve students in some of the activities of government related to marine conservation. SPREP, DOF and MNRE all agreed to provide assistance to NUS students. MNRE have assisted students (including NUS students) with their marine presentations and projects.

American Samoa does a lot of outreach and educational programs.

AquaSamoa offered to take NUS students for reef field trips provided they can swim.

SEAGRASS WATCH can provide an excellent way to involve students in monitoring seagrass.

Sustainable fisheries - Many community-based projects exist. No-take areas have been established although there are many problems such as change in leadership. Consortium of MPA's do exist at the district level but in terms of enforcement and daily operation, it needs to come from individual villages.

A biodiversity analysis of Samoa has been carried out by SPREP to identify priority areas. All habitat types have been included.

Without monitoring, we will not have statistics on fisheries (subsistence, per capita consumption

Collaboration between the two Samoas - Interesting and delicate scenarios between American Samoa and Samoa. Bio-geographic activity is on-going between these countries under the 2 Samoas Initiative and there have been some exchange workshops.

3.2.3 Gap Analysis and Recommendations

The following section is the outcome of the workshop which addressed gaps and recommendations in fisheries, marine managed areas, global change impacts and multi-sectoral/multi-stakeholder consultations using the Samoa dossier as a guide.

FISHERIES

1. There is a need to more accurately document the catch from all sectors, so that the full contribution of fisheries to the national GDP can be assessed. The Central Bank of Samoa (CBS) reports separately from MAF on fisheries catch. There is a need to have a uniform / standardized sampling method between MAF and CBS. This is critical so that all are operating on the same database. Subsistence fishers could be issued with licenses to more accurately record catch.
2. Regulation of the fishery has not prevented the continued use of destructive fishing methods (e.g. Derris). There is a need for education of fishers on the consequences of these practices. Start with the schools on awareness; increase the fines on culprits eg derris and dynamite. There should be a law to protect “whistle blowers” who report on destructive fishing.-
3. There is a strong need for increased research on the marine biodiversity of Samoa: it’s hard to manage it if you don’t know what you are managing. Take up undergraduate students (including exchange programmes with other universities) to assist scientists and researchers. Collections are held by Fisheries Division on fishes and corals; the transfer of the collections to NUS should be considered.
4. Research is needed on the valuation of Samoas reefs and reef resources, as this information is vital to decision-makers. Sites that are especially vulnerable to identified threats need to be identified. There is existing collaboration between various departments, so the basis is there to start to draft a Samoa National Ocean Policy.
5. The apparent shift from subsistence to artisanal fishing could have significant socio-economic consequences, and needs to be carefully assessed. Need to carefully assess the data on subsistence fishing – need to check whether there are really small scale (or commercial) regulations in place to control fisheries and promote alternative livelihood generation eg. aquaculture.
6. Damage to critical sites (such as the five-mile reef) is impacting on biodiversity, tourism and the fishery and measures need to be put in place to try and reduce this as far as possible. Damage to 5-mile reef. Need regulation to reduce damage from ships and fishing vessels –

need a Vessel Monitoring System to aid the enforcement. An alternative to anchoring there will need to be identified.

7. The impacts of invasive marine species on Samoas reefs and resources should continue to be assessed. MNRE should keep up the good work of assessing species. The inclusion of MPA's in the invasive species assessment should be considered. Involvement of NUS consultants should be considered.

MARINE MANAGED AREAS

1. Do the village fisheries management areas fit into any of the IUCN MMA categories? If not, how should they be regarded in terms of Samoa's obligations under the WSSD requirement to have up to 30% of the coastline protected by 2012? Establish more MPA's/fisheries reserves to meet WSSD target. Principal Legislations (Acts) to emphasize on or reflect local community power and processes for establishment and management of MPA's/fisheries reserves, etc.
2. The Palolo Deep Marine Reserve (PDMR) should be extended towards the east (feasible & because of the many problems within the harbour/waterfront) if the plan goes ahead; Resolve issues pertaining to land ownership; Continue monitoring assessments to determine status of marine biodiversity in existing area; Conduct sound research and baseline assessment of the proposed area.
3. Do the village fisheries reserves serve as MMA's or is there a need for Samoa to identify other areas for full conservation (e.g. Manono Island)? Extend MPA/Fisheries Reserve coverage to uninhabited and isolated islands and Government Land E.g. Nusage'e, Nuulopa, etc. Encourage the management and sustaining of the current fisheries reserves; Improve and/or continue with MPA awareness and education (including official inclusion of Marine in curriculum). Need to carry out research on land-based activities. Encourage Guidelines according to Samoan context for eco-tourism activities within MPA's/fisheries reserves; network with the tourism sector.
4. There is a need to obtain empirical data on the impacts of the village fisheries management plans; i.e. there is a need for more scientific research. Continue with scientific research and assessment of MPA's/fisheries reserves conservation values; Update and improve data sharing among stakeholders; Consistent review of Management Plans based on findings of assessments; Strengthen stakeholder partnerships including community participation.

GLOBAL CHANGE

1. There is a need to measure sea-level rise vis-à-vis the "bounce" effects of geological events in the Samoa archipelago (e.g. how do you compare sea level rise with these geological events)?

2. The Aliepata reserve (CI) was badly impacted by the 2009 tsunami – is there an adequate Vulnerability and Adaptation plan in place to deal with this and future such events? Vulnerability and Adaptation assessments have already been carried out for most the sites – existing documents should be reviewed. In addition, such an assessment should be done in all areas. Take into consideration the Disaster Risk Emergency Response Plan, and those in NAPA and any other national plan. There is also a need to develop a bleaching response plan and a need to identify temperature tolerant corals and coral reef areas to improve reef resilience through best management practices, land-based pollution and coastal development

3. There is a need for education and awareness programmes; assessment of the impacts of seawalls, etc. Ensure that sea-walls are properly designed with engineering input. Need to enhance Samoa's political commitment to reduce green house gases in Samoa. There is also a need for a comprehensive sea level assessment to assist with future planning. Include examination of the impacts of the rising of the tectonic plates. Increase collaboration with other agencies such as coral reef advisory groups. Highlight community involvement e.g. for indigenous knowledge, collaboration with tourism, private sector. Recording stories of all the changes on the reef – pictures, stories, etc.

MULTI-SECTORAL, MULTI-STAKEHOLDER CONSULTATION

Waste disposal is a major national issue and despite the best of effort, members of the public are still dumping waste inappropriately. There is a need for a strong national campaign towards environmentally responsible waste management. Waste management is improving such as through the recent introduction of a new sewerage system for Apia. Recycling is happening – often with the help of recyclers in Fiji. An incineration facility has been built at the public landfill. Locally made plastics are now biodegradable. Marine environment and coral reef management should be mainstreamed in the Sector Plans. Improved communication between responsible government agencies is needed in areas such as coastal development, tourism, etc.

3.3 Tuvalu

3.3.1. Summary

The Tuvalu workshop participants discussed several subjects relating to legislation, research, climate change, marine protected area management, stakeholder consultation, environment and education.

Although comprehensive national laws were in place, there was a need to focus on more marine resource conservation and management regulations including the protection of turtles and the management of overfished areas. In addition, an urgent need to enforce by-laws in conservation areas was identified and to engage the communities in enforcement. National laws were in need of review in order to become relevant with prevailing circumstances and more importantly consistent with the requirements of regional and international agreements, conventions and instruments.

It was suggested that an inventory of Tuvalu's marine biodiversity be created.

A recommendation was made to review the activities of the National Adaptation Plan and examine potential adaptation strategies for climate change impacts. In addition, there was a strong feeling that climate change should be mainstreamed into the national plan.

As with most other Pacific Island Countries, Tuvalu also pointed out the need for better coordination/collaboration between departments responsible for the development and management of marine resources in addition to involving communities in resource development and management.

Tuvalu also would like marine issues and climate change issues incorporated into the school curriculum.

3.3.2 Discussion of Reef Issues

Legislation - Tuvalu should consider development of a Tuvalu National Oceans Policy that is aligned to and drawn from the Pacific Island Forum Secretariat's Pacific Regional Ocean Policy. Need the expertise (eg. USP) to consult within the country, as well as with Traditional Leaders.

Climate change - Climate change issues important, as they trigger the biodiversity reaction. Land biodiversity is equally important.

Research - the last 7 years of monitoring show deterioration in coral health, leading to more algae. The reserve is showing greater resilience. As the study was done in 2 chosen sites, not necessarily the picture for the whole country.

Stakeholder Consultation - Need for collaboration between all stakeholders – interaction with Government will secure more political will to address issues e.g. population growth, food security. There is an uneven distribution of resources even though tradition is respected. Remember that much is determined by men; beware of the rights of all stakeholders.

Need to try hard working with communities – Tuvalu might need assistance, e.g. from USP scientists.

Management - Clash of MPA management between Kaupule system and central government system in certain areas.

Need to address local aspects of development eg. imported goods, caution that forces of the market should not dominate our lives.

Using simple techniques for mitigation, with input of good advice. “Soft Engineering” is more appropriate to the environment.

It is clearly stated in the Tuvalu 1st national communications that important social and economic threats exist.

Need to harmonize among projects, to have better coordination among agencies. Coral reefs are important for Tuvalu, land area of 26 square kilometres – small is beautiful.

Education - Need to incorporate these issues into school curriculum, strengthen ties for cooperation and convince and influence leaders.

3.3.3 Gap Analysis and Recommendations

Using the Tuvalu dossier as a guide, gaps were identified and recommendations made where appropriate as follows:

FISHERIES

1. There is a need to obtain more comprehensive information on the biodiversity of Tuvalu’s reefs with the necessary scientific input.
2. Legislation to protect marine turtles needs to be put in place.
3. Over-fishing in heavily populated areas should be better regulated/managed.
4. National Fisheries Laws are comprehensive, but there is a need to promulgate more regulations to conserve and manage marine resources (coastal resources).
5. There is a need to undertake effective monitoring and assessment of coastal fisheries resources, and to develop capacities in these areas. In addition, awareness programmes are needed and marine education should be incorporated into the national curriculum.

MARINE MANAGED AREAS

1. There is a need to enforce the by-laws associated with conservation areas. Need to review and harmonize existing by-laws and regulations and identify issues which hinder implementation/enforcement of laws.
2. There is a need to establish the procedures of systematic surveys for taking marine resource inventories on a regular basis to maintain a long-term data set. Need to standardize monitoring methods and conduct regular surveys.

3. A formal inventory of Tuvalu's marine biodiversity needs to be created and maintained.
4. The possibility of creating more MPAs, and improving the management of the existing MPA should be examined with the establishment of new MPAs and share lessons learned from existing ones. In addition, there is a need to harmonize the process of endorsement and establishment of MPAs.
5. There is a need to engage local communities in the selection, planning, management and enforcement of marine protected areas. Sustainable donor support for maintenance and improvement of MPAs is also needed.
6. MPA activities should link to national strategies (Kakeega II).

CLIMATE CHANGE

1. It is recommended that the progress of the NAPA activities be reviewed and finalized and an examination of potential adaptation strategies for climate change induced threats should be undertaken.
2. The comparative impacts of over-population versus effects of climate change (e.g. sea-level rise) should be evaluated, as it appears that the former exacerbates the latter.
3. There seems to be a lot of environmental related projects currently being implemented in Tuvalu to combat impacts of climate change and sea level rise. However, there is a need to assess and review not only the outcomes of these projects against objectives, but their implementation at national level. This is important in order to avoid duplication of efforts and ensure better use of resources.
4. Coordination of donor agencies. More studies need to be carried out to assess the impacts of climate change on marine resources, fish stocks including coral reef ecosystems as well as the impacts of changes in ecosystems on fisheries.

Actions:

- Need for awareness-raising at the local level; need to put materials into local language; encourage effective awareness raising programs.
- Include climate change in the education curriculum and localise the syllabus. Institutional strengthening – need a National Advisory Body into which other groups (e.g. Climate Change Committee) participate on all activities.
- Need for a survey to find out the local understanding of climate change.

- Climate Change should be mainstreamed into the National Plan.
- There is a need for funding for the above. Focus less on enabling activities, and more on-the-ground activities.

MULTI-SECTORAL AND MULTI-STAKEHOLDER CONSULTATION

1. There is a need to assess the impacts of land-based activities such as agriculture and infrastructure on the coral reef resources.
2. There is a need to design and implement proper waste disposal practices and to reduce eutrophication in heavily populated areas. Liquid waste – composting toilets; solid waste – recycling. There is a need for capacity building on; need for greater coordination of donor agencies.
3. The possibility of expanding the tourism industry (e.g. eco-tourism with a low carbon footprint – paddling boat and wind surfing) should be considered – the atolls and their way of life could be a significant attraction to tourists seeking something different.
4. Climate change vulnerability should be built into all legislation and decision making.
5. Given the multiple use of nature and importance of the marine environment and resources to Tuvalu communities, there is a need for effective coordination of the activities by different departments and agencies responsible for the development and management of marine resources. For example, coordination of *TeKakeega II Strategic Area 7. Natural Resources: Agriculture, Fisheries, Tourism, and Environmental Management. Civil Societies, Private Sector, MDGs, National Ocean Policy. Need a coordination body for donor activities.*
6. Encourage stakeholder participation and local communities in decision making, development and management of marine resources. Use local committees, women, youth, churches and traditional leaders (Falekaupule).

NATIONAL LAWS

1. A number of national laws are out of date. As such, there is a need to review and update them so that they are relevant with prevailing circumstances and more importantly consistent with the requirements of regional and international agreements, conventions and instruments. In addition, there is a need to harmonize the fisheries laws, and improve enforcement. The marine Fisheries Act is more for tuna than reef resources. Providing incentives for those who follow the laws was suggested.

3.4 Tonga

3.4.1 Summary

During the discussion sessions, various needs were identified on the following subjects: legislation, stakeholder collaboration, research, education/awareness and climate change issues.

More research was needed on appropriate technology for alternative sources of protein and restocking areas that have been overfished.

More comprehensive information was needed on biodiversity and the decline in coastal fisheries needs to be addressed through implementation of the Fisheries Management Act.

Various categories of marine parks/reserves needed to be clarified in addition to the boundaries.

It was recommended that progress on Millennium Development goals pertaining to compulsory primary education, ensuring environmental sustainability and making global partnerships for development be considered.

It was also proposed that a clearing house for climate change information be established.

Education and awareness at the community level was emphasized.

In addition, more collaboration between the Departments of Environment and Climate Change with the Department of Fisheries was required.

3.4.2 Discussion of Reef Issues

Legislation – Marine management plan aims to include all policies and have only one national plan. Need to have nationwide projects that involve all relevant ministries; Implementation of international Conventions like UNFCCC, CBD, UNCCD. There's a possibility of having an integrated coastal management plan and need to address the issues of lack of capacity for enforcement of strategies, policies, plans and Acts.

Stakeholder consultation/collaboration- lack of interdepartmental collaboration. Need to ensure that all government departments and stakeholders work closely, information sharing and ensure that there is no overlap between activities. Resources and support should be available to all sectors.

Research - Research on technologies to assist in reducing pressure on natural resources such as restocking, aquaculture, mariculture with and for communities.

Education/Awareness - Also address education/ awareness and degree of community involvement; Community based initiatives (Special Managed Area) seem to work. Why aren't they being implemented widely? Need to identify alternative livelihoods.

3.4.3 Gap Analysis and Recommendations

Gaps and recommendations in the Tonga dossier were revised as follows:

FISHERIES

1. Tonga fisheries has now put in place new management measures to regulate turtle stock, such as size limit, season for harvesting, prohibitions on harvesting of females, nesting females and eggs. A turtle tagging programme is in place to determine movements of turtles.
2. There is a need to obtain more comprehensive information on the biodiversity of Tonga's reefs with the necessary scientific input. There is a recent report on Tonga's Biodiversity produced by the Ministry of Environment and Climate Change; it was suggested that the numbers of species reported are probably much larger than given in the report (e.g. 200 species of fishes for Tonga compared with ca. 1,000 for Samoa). It was agreed that resources are needed for the conduct of scientific research on biodiversity.
3. There is need for a plan to address the sharp decline in coastal fisheries. This is addressed in the existing fisheries management Plan. The implementation of this plan should be encouraged rather than developing a new plan.
4. There is a need for improved enforcement of the Fisheries Management Act but at the same time the capacity and resources of the enforcing department should be taken into consideration. New fishery regulations have been gazetted. It was agreed that communities should be encouraged to use a community-based approach to assist in enforcement and conservation efforts. Stakeholder involvement should also be encouraged, including public awareness and education. The devolution of enforcement authority was proposed, together with improvement of enforcement (need resources like boats, fuel, hefty fines). Enforcement should be made a money-generating activity and communities should get something out of enforcement income.

MARINE MANAGED AREAS

1. There should be a clear definition of what is meant by the various categories of marine parks, reserves, special management areas and marine protected areas, but this is clear at National level. But need to clarify boundaries of MPAs and SMAs. Physical markers, list of names of reserves. Parks, reserves and MPAs are no take, and SMA is multi use. Need to correlate definitions with international definitions.

Notes on the Parks and Reserves Act (MECC):

"All terrestrial and marine Parks and Reserves in the Kingdom of Tonga are designated under the Parks and Reserves Act 1979 (1988). For marine parks and reserves, coastal areas (Ha'atafu) are allocated as 'Beach Reserves', reefs fringing

islands that are protected areas (Monuafe & Malinoa) are allocated as 'Island Park and Reef Reserves', and other reefs (Hakaumama'o & Pangaimotu) are allocated as 'Reef Reserves'. All marine parks and reserves are designated as 'No-take' Marine Protected Areas (MPA). 'Mounu Reef Reserve' has been named but is not yet designated under the Parks and Reserves Act, when it is it will be an MPA. Fanga'uta Lagoon Reserve is designated under the Birds and Fish Preservation Act 1988 and is multi-use, not under the MPA category".

Special Management Areas - Fisheries Management Act

"All Special Management Areas are designated under the Fisheries Management Act 2002. They are only labelled with the name of the adjacent community (Ovaka, and are 'multi-use' areas including 'no-take' and fishing zones".

2. There is a need to clarify boundaries for MPAs (work with Ministry of Transport to address shipping issues). Place physical markers and change coordinates in legislations.
3. Designate new protected areas (propose to include Niua Island Group).
4. Need to put in place Enforcement officer as per requirements of the parks and reserves act, however need to review job description of the Officers. Possibility of police support during enforcement.
5. Public awareness by government departments (DoF, MECC, Tourism etc) and NGOs (Civil service, Tonga Trust, Va'va Environmental Protection Association etc). Incorporate into school curriculum. Main focus on marine resource users e.g. fishers
6. Develop better scientific monitoring methods
7. Should have a long term monitoring and also have a disaster response plan
8. Enforce legislation and amend old boundaries, designate new boundaries, as well as reviewing enforcement officer roles and responsibilities.
9. Stakeholder consultations (Ministry of Transport, Tourism, MECC, DoF, NGOs)
10. Look for funding options: Collaborate on cross-ministry funding, e.g. NOAA application.

CLIMATE CHANGE

1. It is recommended that progress on the following Millennium Development Goals (MDG) be considered.
 - G2 of MDG: Applicable to Tonga. Achieve universal primary education. Need for awareness at primary school level, and also need to ensure that all kids go to school.
 - MECC is in the process of finalising its 2nd report to MDG end of this month.
 - G7 of MDG: ensure environmental sustainability: a) Promote ecosystem-based adaptation to climate change in Tonga (GTZ, PACC); b) identify vulnerable

ecosystems through surveys and on-going monitoring; capacity building: community involvement needed, including incorporation of traditional knowledge.

- G8: Develop global partnerships for development; develop project proposals to address vulnerable areas; manage existing projects and ensure objectives are met; learning from Pacific Neighbours to assist Tonga to move forward; develop MDGs specific to Tonga.
2. It is recommended that a clearing house for climate change information exchange be established.

It was proposed that the clearing house on climate change should be at USP; using USP as a main centre of information has the advantage that USP hosts most Pacific Island students and these data would thus be available to all Pacific Islanders.; PACE-SD already has a proposal for this to the EU funding, but the project has not yet been activated. MECC has also requested funds for a national Climate Change (CC) database. A CC database should incorporate information from government and the private sector that is accessible to the public. The idea of a central location for each island was suggested.

3. Translate awareness material to community levels of understanding.

MULTI-SECTORAL AND MULTI-STAKEHOLDER CONSULTATION

1. There is a need to resolve ongoing issues regarding ownership of remote reefs (under UNCLOS), especially for the for the purpose of management of reefs. The cost of management of these reefs should be acknowledged.
2. A wastewater and sewage management plan is needed.
3. A future adaptation strategy is needed to address the results of the post tsunami report on Niuatoputapu available and brought into wider national disaster management plans.
4. The IDEC should consider inclusion of NGO and civil society representatives on the committee.
5. Existing mechanism should be strengthened and given more support in implementing the Environment Management Plans in a coordinated manner. MECC should work closely with Department of Fisheries especially in terms of coordination, implementation and management of projects, and data sharing.

6. A national marine awareness program on marine issues should be developed by all stakeholders. Environment and Department of Fisheries should work together in carrying out national marine awareness programmes, and should include NGOs if the ministries cannot perform this task.

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4.0 ANNEXES

ANNEX I. FIJI WORKSHOP PROGRAMME

Global Change & Coral Reef Management in the Pacific

Engaging Scientists and Policy Makers

June 9th – 10th, 2010

The University of the South Pacific

Marine Studies Centre, Room 107

Wednesday June 9th

Ms Shirleen Bala and Ms Prerna Chand, Institute of Marine Resources – Rapporteurs

Time	Presentation	Presenter
8.30am	Welcome; dedication	Maleli Qera, Econesian representative (USP)
9.00am	Programme Outline, Objectives and Outcomes	Dr. Joeli Veitayaki (Division of Marine Studies, USP)
9.15am	Fiji Coral Reef Monitoring Network	Cherie Morris (Inst. Of Marine Resources, USP)
9.30am	Socio economic and governance impacts of MMAs in Fiji	Sakiusa Fong (Inst. Of Applied Science, USP)
9.45am	Translating the regional ocean policy into a national action plan	Dr. Joeli Veitayaki (Division of Marine Studies, USP)
10.15am	Development of a national integrated coastal management plan for Fiji	Prof. Bill Aalbersberg (Inst. Of Applied Science, USP)
10.45am	MORNING TEA	
11.15am	Impacts of global change on Fiji's coastal communities	Leone Limalevu
11.45am	Status of policies and legislation in support of sustainable management of Fiji's coral reefs	Viliame Naupotu (Permanent Secretary, Ministry of Forests and Fisheries)
12.15pm	Discussion on the morning session	Dr. Joeli Veitayaki
1.00pm	LUNCH	
2.00pm	Break-out group discussion towards a coral	

	reef action plan for Fiji	
3.00pm	AFTERNOON TEA	
3.30pm	Plenary: Groups report on discussion	
5.00pm	COCKTAIL	

Thursday June 10th

Time	Presentation	Presenter
8.30am	Panel discussion: Science and coral reefs in Fiji and socio-economic and policy issues	Cherie Morris and Robin South as moderators
9.00am	Community-based management and fisheries protection	James Comley (Institute of Applied Science, USP)
9.30am	Sustainability issues in the aquarium trade	Walt Smith (Walt Smith International)
10.00am	Resilience of coral reefs in Fiji	Ed Lovell (Division of Marine Studies, USP)
10.30am	MORNING TEA	
11.00am	Science of climate change	Prof. Murari Lal (Pacific Center for Environment and Sustainable Development, USP)
11.30am	Physical oceanography and impacts on coral reef morphology and coral communities	Jens Kruger (SOPAC)
12.00pm	National biodiversity strategic action plan	Eleni Tokaduadua (Department of Environment)
12.30am	Environment Management Act on Environment Impact Assessment implications	Jope Davetanivalu (Department of Environment)
1.00pm	LUNCH	
2.00pm	Synopsis of the panel discussions and proposals for break-out group topics	
3.00pm	AFTERNOON TEA	
3.30pm	Break-out groups	
4.30pm	Plenary: Reports from break-out groups	
5.00pm	Wrap-up: the way forward	

6.00pm	COCKTAIL
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ANNEX II. SAMOA WORKSHOP PROGRAMME
Global Change & Coral Reef Management in the Pacific

Engaging Scientists and Policy Makers

August 11th - 12th, 2010

The University of the South Pacific

Alafua Campus Lodge Fale

Alafua, Samoa

Wednesday August 11th

Ms Cherie Morris, Institute of Marine Resources – Rapporteur

TIME	PRESENTATION	PRESENTER
8:30am	Welcome & Workshop Opening	Taulealeausumai Laavasa Malua (Chief Executive Officer, Ministry of Natural Resources and Environment)
9:00am	Program outline, objectives & outcomes	Prof G. Robin South (Institute of Marine Resources, USP Alafua)
9:15am	Status of reefs and impacts of global change in the Pacific	Clive Wilkinson (Global Coordinator GCRMN: Reef and Rainforest Research Center, Australia)
9:45am	Status of coral reefs in Samoa	Faleafaga Toni Tipamaa (Acting Chief Executive Officer, Department of Environment and Conservation)
10:15am	DVD: Coral reefs – A casualty of climate change	
10:45am	MORNING TEA	
11:15am	Impacts of global change on coastal communities	Leone Limalevu (Pacific Center for Environment and Sustainable Development, USP Laucala)
12:15pm	Translating the regional oceans policy into a national action plan	Joeli Veitayaki (Division of Marine Studies, USP Laucala)
12:45pm	Summary of morning session	Joeli Veitayaki
1:00pm	LUNCH	

2:00pm	Status of reef/coastal fisheries & management measures in Samoa	Olofa Tuaepepe Acting (Acting Chief Executive Officer, Fisheries Department)
TIME	PRESENTATION	PRESENTER
2:30pm	Status of fisheries from the private sector viewpoint	Kat Kapsch (AquaSamoa)
3:00pm	MPAs in Samoa	Malama Momoemausu (Ministry of Natural Resources and Environment)
3:30pm	AFTERNOON TEA	
4:00pm	Fisheries reserves from the monitoring perspective	Joyce Ah Leong (Inshore Fisheries Division, Ministry of Agriculture and Fisheries)
4:30pm	Round-up discussions of Day 1	Joeli Veitayaki (Facilitator)
5:00pm	CLOSE OF DAY 1	

Thursday August 12th

TIME	PRESENTATION	PRESENTER
9:00am	Workshop objectives of Day 2	Prof G. Robin South
9:15am	Coral reef management & climate change in American Samoa	Hideyo Hattori (Coral Reef Advisory Group, American Samoa)
9:45am	NGO Engagement with global change and management issues of coastal and reef habitats in Samoa	Tavita Faletoese (Principal Project Officer METI)
10:30am	MORNING TEA	
11:00am	Input from the participants on issues raised and on new issues	ALL
12:00pm	Synopsis of issues and discussions: Day 1 & 2	Joeli Veitayaki (Facilitator)
1:00pm	LUNCH	
2:00pm	Development of a coral reef action plan for Samoa	Group discussions
3:30pm	AFTERNOON TEA	
4:00pm	Plenary – Reports from group discussions	ALL
5:00pm	Wrap-up: The way forward	

5:30pm	CLOSING SESSION
6:00pm	COCKTAIL

ANNEX III. TUVALU WORKSHOP PROGRAMME
Global Change & Coral Reef Management in the Pacific

Engaging Scientists and Policy Makers

August 18th, 2010

Vaiaku Lagi Hotel Conference Room

Funafuti

Wednesday August 18th

Ms Cherie Morris, Institute of Marine Resources – Rapporteur

TIME	PRESENTATION	PRESENTER
8:30am	Dedication: Welcome & Workshop Opening	Hon Minister NRE: Tavau Teii
9:00am	Program outline, objectives & outcomes	Prof G. Robin South (Institute of Marine Resources, USP Alafua)
9:15am	Status of reefs and impacts of global change in the Pacific	Clive Wilkinson (Global Coordinator GCRMN: Reef and Rainforest Research Center, Australia)
9:30am	Status of coral reefs in Tuvalu	Tupulaga Poulasi (Department of Fisheries)
9:45am	Towards sustainable reef fisheries management in Tuvalu	Seve Lausavere (Permanent Secretary, Ministry of Natural Resources and Environment)
10:00am	DVD: Coral reefs – A casualty of climate change	
10:30am	MORNING TEA	
11:00am	Impacts of global change on coastal communities	Leone Limalevu (PACE-SD, USP Laucala)
11:15am	Climate change projects	Melton Tauetia (Climate Change Officer, Ministry of Natural Resources and Environment)
11:30am	Traditional marine resource management/ By-laws	Semese Alefaio, Civil Society
11:45am	Status of fisheries from the private sector	Semese Alefaio, Civil Society

12:00pm	Input from the participants on issues raised and on new issues	Joeli Veitayaki (Division of Marine Studies, USP Laucala)
TIME	PRESENTATION	PRESENTER
12:30pm	Translating the regional oceans policy into a National Action Plan	Joeli Veitayaki
12:45pm	Summary of morning session	Joeli Veitayaki
1:00pm	LUNCH	
2:00pm	Development of a coral reef action plan for Tuvalu	Group discussions
4:00pm	Synopsis of issues and discussions, together with afternoon tea	Joeli Veitayaki (Facilitator)
5:00pm	Round-up discussions	Joeli Veitayaki (Facilitator)
5:30pm	CLOSE OF DAY 1	
6:00pm	COCKTAIL (Blue Ocean)	

ANNEX IV. TONGA WORKSHOP PROGRAMME
Global Change & Coral Reef Management in the Pacific
Engaging Scientists and Policy Makers

August 3rd - 4th, 2010

The University of the South Pacific- Tonga Campus

Tuesday August 3rd (Afternoon)

Ms Shirleen Bala, Institute of Marine Resources – Rapporteur

TIME	PRESENTATION	PRESENTER
2.15pm	Welcome and Opening	Hon. Lord Ma'afu (Minister, Ministry of Environment and Climate Change)
2.30pm	Programme Outline, Objectives and Outcomes	Joeli Veitayaki (Division of Marine Studies, USP)
2.45pm	Status of policies and legislation in support of sustainable management of Tonga's coral reefs	Asipeli Palaki (Ministry of Environment and Climate Change)
3.15pm	AFTERNOON TEA	
3.45pm	Translating the regional oceans policy into a national action plan	Joeli Veitayaki (Division of Marine Studies, USP)
4.15pm	Impacts of global change on coastal communities	Leone Limalevu (PACE, USP)
4.45pm	Discussion	Joeli Veitayaki
5.30pm	Close of day 1	

Wednesday August 4th

TIME	PRESENTATION	PRESENTER
9.00am	Environmental issues in the sustainable management and development of Tonga's coral reefs, including current status of marine protected areas.	Kathy Zischka (Ministry of Environment and Climate Change)
9.30am	Current status of special management areas	Siola Malimali (Department of Fisheries)
10.00am	MORNING TEA	
10.30am	The importance of healthy coral reefs for the development of Tonga's tourism industry	Ms Akosita Tu'ihalamaka (Ministry of Tourism)
11.00am	DVD on coral reefs: a casualty of climate change	
11.30am	Discussion	
12.30pm	LUNCH	
2.00pm	Break-out group discussion	
3.00pm	AFTERNOON TEA	
3.30pm	Plenary: Reports of groups	
5.00pm	Recommendations and outcomes	
6.00pm	COCKTAIL	

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