

REPORT ON ADAPTATION CHALLENGES IN PACIFIC ISLAND COUNTRIES



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INTRODUCTION

This report is a case study which outlines current activities being undertaken in the region on adaptation. The report includes basic outlines of national priorities, activities implemented or planned in response, challenges and constraints, and successes and lessons learned.

The purpose of this report is to contextualize the adaptation challenges in Pacific Island countries for audiences that are not so familiar with the region, to highlight the efforts of the region in seeking to address climate change adaptation (using the Pacific Adaptation to Climate Change (PACC) project as an example) and to note the continuing challenges that the region faces. The report includes a discussion on how the PACC project has sought to address emerging issues.

It is specifically for a Pacific audience, primarily climate change officials, as well as community and local government actors interested in or active in climate change adaptation. The report will be distributed by electronic means primarily, with a small print run.



CONTEXT AND RELEVANCE

1. All Small Island Developing States (SIDS) are highly vulnerable to climate change and sea level rise owing partly to their small land masses surrounded by ocean, and their location in regions prone to natural disasters. Many SIDS are often characterized by having relatively large populations for the area they occupy with high growth rates and densities, particularly in capital areas, while some Pacific islands are threatened by depopulation. Many SIDS have poorly developed infrastructure and limited natural, human and economic resources, and have high dependence on marine resources for their livelihood needs, including for foreign exchange. Most of their economies are reliant on a limited resource base and are vulnerable to external forces, such as changing terms of trade, trade liberalization, and migration flows. These have been well documented for SIDS and have received international attention through the Barbados Programme of Action (1994) and the Mauritius Strategy for Implementation (2005). Given these existing challenges, Pacific SIDS already have a low adaptive capacity to climate change. The national communications of Pacific SIDS have highlighted many of these vulnerabilities and illustrate the urgent need to adapt to climate change. These vulnerabilities include the inundation of deltas, estuaries and coastal wetlands, destruction of benthic systems, especially sea grass beds, loss of productivity of coastal ecosystems, flooding in coastal plains and increased coastal erosion, increased saline intrusion causing freshwater contamination and loss of freshwater supplies, loss of coral reef and mangroves, damage and loss to coastal infrastructure and land, more frequent and intense weather events such as droughts and cyclones, and failure of subsistence crops and coastal fisheries.
2. Pacific Island countries have been reporting serious socioeconomic, environmental, physical, and cultural consequences of climate change. Numerous studies suggest that climate variability and change is likely to accentuate the spatial and temporal variations, including variability, which result from the El Niño Southern Oscillation (ENSO) events. Climatologists project that the Pacific region will experience the following changes:
 - Sea level rise of 0.19–0.58 meters (m) by 2100 resulting in accelerated coastal erosion and saline intrusion into freshwater sources;
 - Surface air temperature increases of 1.00–4.17 °C in the northern Pacific and 0.99–3.11°C in the southern Pacific by 2070, leading to increases in sea surface temperature of 1.0–3.0°C;
 - Acidification of the ocean through increased absorption of CO₂, causing pH to drop by an estimated 0.3–0.4 units by 2100 and adversely impacting coral growth rates;
 - Rainfall increases or decreases from –2.7% to +25.8% in the northern Pacific and –14% to +14.6% in the southern Pacific, causing worse floods or droughts; and

- Less frequent occurrences of cyclones, although these may be of a higher intensity, with increased peak wind speeds and higher mean and peak rainfall.

Building on the Intergovernmental Panel on Climate Change (IPCC)'s Fourth Assessment Report, a 2011 peer-reviewed publication reports the following key findings for the Pacific:

- The projected warming over the region is about 70% as large as the global average warming for all emissions scenarios. Regional warming is expected to be greatest near the equator. Large increases in the incidence of extremely hot days and warm nights are also projected.
- Increases in annual mean rainfall are projected to be most prominent near the South Pacific Convergence Zone (SPCZ) and Intertropical Convergence Zone (ITCZ), with little change expected for the remainder of the region. Little change is projected in the annual number of rainy days, except for increases near the equator. A widespread increase in the number of heavy and extreme rain days is projected.
- Increases in potential evaporation are expected. The ratio of annual average rainfall to potential evaporation decreases in most regions (increased aridity), except near the equator where the relatively large projected rainfall increases exceed the smaller changes in potential evaporation.
- Surface wind speed will generally decrease in the equatorial and northern parts of the region, while increases are indicated in the south, but these changes are projected to be relatively small in most locations.
- Projected changes in humidity and solar radiation are also relatively small (less than 5% by 2090).
- Sea surface salinity is expected to decrease in the West Pacific Warm Pool. The regional pattern of change closely matches projected changes in net rainfall (i.e. rainfall minus evaporation). The intensified warming and freshening at the surface is projected to make the surface ocean less dense compared to the deep ocean, so the ocean becomes more stratified.
- Sea level is projected to rise. However, improved understanding of the processes responsible for ice-sheet changes are urgently required to improve estimates of the rate and timing of 21st century and longer-term sea level rise. For the region, total sea level rise is projected to be similar to the global average.
- The projected growth in atmospheric carbon dioxide concentration is expected to cause further ocean acidification, leading to increasingly marginal conditions for sustaining healthy coral growth and reef ecosystems.
- The El Niño Southern Oscillation (ENSO) will continue to be a major source of climate variability. However, the impacts of climate variability and change on ENSO amplitude and frequency are unclear.

Consequences of Sea Level Rise

The IPCC has recognized that the Pacific developing member countries (DMCs) are at extreme risk from sea level rise. More than 50% of the population in the region lives within 1.5 km of the shore and many of these countries are less than a few meters above sea level. An increase of as little as half a meter, along with increased incidents of storm surges, would inundate many critical areas and threaten their populations. While the rate of sea level rise will vary from country to country, and even within countries, the uncertainties are generally too large for responses to be based on any value other than the regional projections given above. The one exception is where tectonic movement results in locally rising or sinking coasts. In general, the impacts of sea level rise differ between low (e.g. atoll) and high (e.g. volcanic) islands. This is especially the case for saltwater intrusion into groundwater and soils, generally making low islands more vulnerable. However, in many other respects, both low and high islands are equally vulnerable to sea level rise due to the concentration of human activity in coastal areas and the difficulty of relocating populations to the interior of high islands. Nevertheless, even perceptibly small changes in sea level will have impacts in several ways, for example, through the exponential relationship of sea level to wave heights.

Extreme Weather Events

Several well-documented recent events show an increase of extreme weather, such as tropical storms, cyclones, droughts, floods, and heat waves. In 2004, Cyclone Heta caused storm waves to rise over the 30 meter cliffs in Niue, leaving one person dead and many others homeless, and causing USD\$150 million (2004 figures) in damage. In another example, the Cook Islands experienced five cyclones within one month in early 2005, three of which were classified as Category 5. In prior decades, the Cook Islands could expect one storm of this magnitude approximately every 20 years. Storm surges and extreme high tides (king tides) have also been documented as causing widespread damage in Kiribati, Marshall Islands, and Tuvalu, and parts of Micronesia.

Changes in Mean Rainfall

Changes in rainfall can have wide-ranging and significant impacts, including effects on water supply, agriculture production (which is almost entirely rain-fed in the Pacific) and food security, and erosion. Rainfall is expected to become significantly more variable in various parts of the Pacific region, along with increased frequency, duration, and intensity of droughts and floods. During summer, more rainfall is projected, as are more frequent heavy rainfall events. An increase in drought conditions will significantly reduce the soil's ability to cope with a sudden intense rainfall, exacerbating flooding and erosion. These effects will also impact on communities, particularly those most dependent on rainwater harvesting for drinking water.

Impacts on Coral Reefs

Coral reef ecosystems are vital to all Pacific DMCs, providing at least one-quarter of the fish catch in most developing countries. They also provide one of the biggest tourist attractions in the Pacific. Increasing sea surface temperatures and rising sea level, damage from tropical cyclones, and decreased growth rates due to the effects of higher carbon dioxide concentrations are very likely to affect the health of coral reefs and other marine ecosystems that sustain island fisheries. Research conducted by the Secretariat of the Pacific Community (SPC) and the Forum Fisheries Agency (FFA) indicates that their possible destruction or degradation poses a threat to every Pacific country.

Fisheries

Climate change will affect the productivity and economic viability of both inshore and deepwater fisheries. Alterations in ocean temperatures and currents due to increased ENSO-like conditions will impact on coral reef areas, which serve as fish nurseries, and change the distribution and abundance of tuna, a significant fish harvest in the Pacific region. For example, the 1997-1998 El Niño event saw a significant westward shift of major tuna stocks. Increased incidence of bad weather is likely to increase costs of ocean fishing due to safety considerations and lost days at sea. Increased acidification of the oceans will have considerable impact on all marine ecosystems. Aquaculture, a developing industry in the Pacific region, will also face difficulties due to the effects of changing rainfall patterns (e.g. increased sediment and rainwater flooding of some ponds, and drought affecting others), as indicated by research carried out by SPC and FFA.

Agriculture and Food Security/Water Supply

Extreme weather events, irregular rainfall (with resulting floods and droughts), changing weather patterns, and saltwater intrusion will all have significant impacts on agriculture production and food security. These will, in turn, affect diet (with more reliance on imported, often less healthy, foods), income and the overall livelihood of families relying on agriculture for their existence. Some farmers have already been forced to grow crops (e.g. taro) in raised tin containers, and some of the smaller islands have lost coconut palms to saline intrusion. These changes also affect the secure supply of potable water. The combination of changes in rainfall patterns and saline intrusion has a large impact on freshwater supplies. Climate change models indicate that these effects will be more significant in the future. For example, a possible 10% reduction in average rainfall by 2050 for Kiribati would lead to a 20% reduction in the size of the freshwater lens on Tarawa Atoll.

Threats to Human Settlements and Infrastructure

The majority of human settlements and critical infrastructure in the Pacific DMCs are located in coastal areas. These include hospitals, schools, churches, power plants and distribution systems, fuel depots, telecommunication systems, disaster coordination centers, hotels and other tourist infrastructure, airports, wharves, and business structures. It is estimated that coastal flooding will potentially affect between 60,000 and 90,000 Pacific Islanders by 2050. Any factors that

impact coastal areas—such as extreme weather events, coastal erosion, and sea level rise—would have a very high human and economic toll. Climate change threatens some of the most fundamental needs of society: a safe place to live, access to water, health care (e.g. disease and nutrition), food supplies, and the ability to earn a living. When these needs are threatened, whole economies and societies are at risk. Building codes and other design standards for commercial and residential structures and many other infrastructure investments do not address climate change impacts (including return periods for extreme events, wind, and rainfall loadings to address more intense storm events). The assumed weather and climate conditions in many project designs will need to be adjusted to take better account of projected changes. Increased costs for infrastructure maintenance and rebuilding place a large burden on the limited resources and budgets of Pacific Island countries. Due to rising insurance costs for vulnerable coastal infrastructure, many critical infrastructure assets (airports, ports, jetties, roads, hospitals) are not insured, and their loss presents a setback to social development, economic growth, and business competitiveness.

Consequences on Human Health

Diseases that are sensitive to climate change are among the largest global killers. These include waterborne and vector-borne diseases, such as cholera, typhoid, malaria, and dengue. Occurrences and mortality rates of these diseases are likely to increase as the climate changes. Rising temperatures and increased humidity create perfect conditions for pathogens to grow and spread, resulting in increased incidence and prevalence of infectious diseases. Urban areas can expect more heat waves, the risks from waterborne diseases will rise due to increased flooding, and the areas susceptible to malaria, dengue fever, and other communicable diseases are expected to widen, as are injuries and other health impacts from extreme weather events.

Natural Disasters

Pacific Island countries rank among the most vulnerable in the world to natural disasters. Since 1950, natural disasters have directly affected more than 3.4 million people and led to more than 1700 reported deaths in the region (outside of Papua New Guinea). In the 1990s alone, reported natural disasters cost the Pacific Islands region USD\$2.8 billion (2004 figures). Between 1950 and 2004, extreme natural disasters (such as cyclones, droughts, and tsunamis) accounted for 65% of the total economic impact from disasters on the region's economies. Ten of the 15 most extreme events reported over the past half a century occurred in the last 15 years.

There has been a substantial increase in the number of reported natural disasters in the region since the 1950s, with a growing human impact per event. While this may be due to improved reporting, higher populations and increasing environmental degradation, there is no doubt that disasters in the region are becoming more intense and probably more frequent. Certainly, the number of hurricane-strength cyclones has increased in the southwest Pacific in the past 50 years, with an average of four events now occurring each year. Significant

wave heights of recent cyclones have exceeded even climate change model projections. With the climate trend for the Pacific pointing to more extreme conditions and increased climate variability in future, Pacific Island countries have little choice but to develop comprehensive risk management plans for the natural hazards they face.

3. In addressing climate change at the global scale, there have been two key pathways: adaptation and mitigation. Mitigation seeks to tackle the causes of global warming by reducing GHG emissions, as a result of human activity. Adaptation, on the other hand, is focused on adjusting behaviours so that people can cope with the effects of climate change (see PACE-SD, 2011; AOSIS, 2008). Although climate change is a global threat, adaptation has largely been occurring at the local level. Adaptation is a dynamic process that requires: awareness raising; community capacity building and training; the mainstreaming of climate change into government policies and plans; and acquiring knowledge and data, especially at the regional and local levels (Global Facility for Disaster Reduction and Recovery, 2009). According to the IPCC (2007), adaptation is “the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploit beneficial opportunities”. In this way, adaptation is made up of actions or activities that people or communities can take collectively to reduce the impacts of climate change on both human and/or natural systems.
4. Long-term climate change is likely to occur in the Pacific Islands region, as shown by impacts documented by PICs, and this is likely to increase the frequency and intensity of climate extremes such as tropical cyclones. Additional to these current climate risks are environmental stresses caused by changes in socio-economic conditions. Thus the human systems in the Pacific region are highly sensitive to changes in water supply and demand, land use, land use practices, and demographic changes. From the sustainable development perspective, the socio-economic dimensions of climate change are probably as important as the biophysical climatic factors.
5. During the last decade the region has experienced a variety of climate risks and extreme events, such as droughts and floods. This was demonstrated by adverse effects which resulted from extreme weather and climate events and the changes in sea level and temperature. A number of examples illustrate the severity of these events. In Fiji, drought wiped out approximately two-thirds of newly planted sugar crops in 1998 with an overall economic impact of equivalent to 3% of the gross domestic product (GDP). In Tonga, the squash crop which had been producing 50% of the country’s exports by value was more than halved. In Papua New Guinea, the Australian government spent more than AUD\$30 million delivering food aid to isolated areas of the highlands and low-lying islands affected by drought, with further losses in coffee production. In the Federated States of Micronesia (FSM), crops and water were severely affected and a national disaster was declared during which time food aid and water was delivered to all affected areas. In Samoa,

fires sparked by unusually dry conditions destroyed large areas of forest on the island of Savai'i. Tuvalu suffered three cyclones during this period resulting in loss of land, inundation of taro pits, destruction of houses and contaminated freshwater supplies.

6. The impacts of climate change which are already being experienced in the Pacific Islands region can be summarized as follows:
 - a) Climate change is affecting the physical and biological characteristics of the coastal areas, modifying their ecosystem structure and functioning. It is also affecting near-shore marine and coastal areas, many wetlands and coastal forests by changes in sea level and storm surges.
 - b) Climate variability and intensification of hurricanes pose a significant threat to the sustainable development of Pacific Island countries.
 - c) The sustainable development of all countries is highly dependent on their natural resource base which is being highly threatened by climate change and sea level rise.
 - d) The potential economic impact of climate change on the Pacific countries is estimated at US\$1 billion.
7. Climate change, climate variability and sea level rise are not just environmental, but also economic, social, and political issues for Pacific Island countries (PICs). The impacts, particularly economic and social, pose serious political and national financial management issues for Pacific Island countries. Climate extreme events can adversely affect gross domestic product, balance of payments, budget deficits, foreign debt, unemployment, and living standards. Many communities and the resources they depend on for their daily livelihood and income tend to be adversely affected by the changing climate. In some situations the very survival of communities is already seriously threatened. These concerns have reached the highest Government levels, including the Pacific Islands Forum Leaders meetings. With the Pacific's unique combination of geographical, biological, sociological and economic characteristics that can be found nowhere else in the world, the effects of climate change and extreme events are threatening the very existence of these vulnerable ecosystems and people. PICs have also raised the issue of climate change as a security threat at the United Nations (UN) Security Council, and have received assurances from the Secretary General that the issue will be kept at the forefront of UN work.
8. Despite support from the international community in helping the PICs to understand the short and long term impacts of changes in climate, PICs have identified many critical areas where better understanding and response interventions are necessary to cope with and adapt to the many changes which are likely to be exacerbated by atmospheric and oceanic changes. The reports of the regional technical meetings, activities, programmes and projects on climate change, climate variability and sea level rise in the Pacific region form a necessary point of reference since they contain a wide range of actions that are required in pursuit of sustainable development.

9. Reviews of previous assessments of vulnerability and adaptation to climate change, climate variability and sea level rise in the Pacific Islands region have highlighted the following:
 - a) Climate variability, development and social changes, and the rapid population growth being experienced by most PICs are already placing pressure on sensitive environmental and human systems. These impacts would be exacerbated if the anticipated changes in climate and sea level (including extreme events) did materialize.
 - b) The future health and productivity of coral reef and mangrove ecosystems will have a significant influence on the future well-being of many PICs – the anticipated detrimental effects on coral reefs arising from higher sea surface temperatures and CO₂ levels will be worsened by the degraded nature of these ecosystems.
 - c) Land-use changes, including settlement and use of marginal lands for agriculture, are decreasing the natural resilience of environmental systems and their ability to accommodate the additional stresses arising from changes in climate and sea level.
 - d) Given the limited area and low elevation of the inhabitable lands the most direct and severe effects of climate and sea level changes will be increasing risks of coastal erosion, flooding and inundation; these effects are exacerbated by the combination of seasonal storms, high tides and storm surges.
 - e) Other direct consequences of anticipated climate and sea level changes will likely include: reduction in subsistence and commercial agriculture production of crops such as taro and coconut; decreased security of potable and other water supplies; increased risk of dengue fever, malaria, cholera and diarrhoeal diseases; and decreased human comfort.
 - f) Groundwater resources of the lowlands of high islands and atolls may be affected by flooding and inundation from sea level rise; water catchments of smaller, low-lying islands will be at risk from any changes in the frequency of extreme events.
 - g) Climate and related oceanic variations already have significant impacts on fish catches, both subsistence and commercial; anticipated changes in climate and ocean conditions will reduce the security of this resource.
 - h) The overall impacts of changes in climate and sea level will likely be cumulative and determined by the interactions and synergies between the stresses and their effects.
10. The high vulnerability of PICs to the adverse impact of climate change has been elaborated above. At the same time, science is showing that these impacts are worsening, putting PICs in an even more vulnerable situation. Climate related impacts are having increasingly devastating impacts on PICs

economies. As a result, SIDS are having to put aside more of their national budgets to deal with climate related impacts. Not only did they do little to contribute to these impact, but SIDS have limited capacity to absorb these increasing costs. There are numerous examples of highly damaging extreme events in recent years that all contribute to the sense of urgency within the region, such as Cyclone Heta and its impacts on Niue.

11. Climate change presents an additional challenge to the development aspirations of PICs. At the same time, Pacific countries and other SIDS have limited insurance cover. What little insurance options exist in the region are increasingly being withdrawn by the private sector as the frequency of extreme events continues to increase. The small size of Pacific markets acts as a further barrier to private investment. As such, there is an absence of tools to measure the true economic costs associated with adaptation and address the loss and damage from the unavoidable consequences of climate change.
12. Recent scientific findings have indicated that climate is changing faster than projected and, under a high emissions scenario, a sea level rise of up to a meter or more is plausible. It has been noted (by the UN Secretary General's Climate Advisor) that low lying nations may become uninhabitable in a matter of decades, making the issue of a mechanism to address loss and damage a high priority. Rather than reliance on ad hoc relief, Pacific Island governments have identified the need for predictability and have called for an internationally agreed approach to manage these risks and address loss and damage.
13. The objective of the international mechanism is to assist particularly vulnerable developing countries address unavoidable and residual loss and damage from the impacts of climate change. It is envisioned that this would be under the United Nations Framework Convention on Climate Change (UNFCCC) with links to an adaptation finance window, and would also engage the assistance of expert advice from the private sector to develop such modalities in a transparent manner, with Parties defining needs.
14. Such an international mechanism would be made up of two main components:
 - insurance for extreme weather events underpinned by risk reduction and risk management
 - rehabilitation for loss and damage due to slow onset impacts
15. The insurance component would assist in the management of financial risks associated with increasingly frequent and severe climate-related extreme weather events, such as hurricanes, tropical storms, storm surge, floods and droughts. It would facilitate the development and implementation of financial risk management tools tailored to specific needs to help affordable, sustainable and equitable risk sharing and risk transfer mechanisms. The insurance component would also leverage private and public sector funds to enhance adaptive capacity.

16. It has been proposed that under this component a SIDS Insurance Facility be established, building upon the experiences of the Caribbean example.
17. The insurance component would encourage best practices in risk reduction and management, which would become criteria for access. It would provide advice and assistance on risk management techniques, facilitate support for collection of weather data and analysis, provide support to risk assessments, identify hazards, make recommendations on appropriate investments in risk reduction, assist with capacity to manage climate-related risk and reduce risk exposure, and provide technical and financial support to risk reduction efforts for climate-related extreme weather events.
18. The rehabilitation component would address the progressive negative impacts of climate change – i.e. sea level rise, increasing sea and land temperatures, and ocean acidification causing loss and damage (e.g. permanent or extended loss of land, damage to coral reefs, damage to water tables, loss of fisheries, etc.). It is proposed that rehabilitation payments would be triggered by changes in internationally developed standardised parameters relative to agreed baselines, for example sea level rise, sea surface/air temperature, precipitation, wind speed, soil salinity, and ocean acidity. The types of loss and damage would include: economic loss, property loss and damage, loss of life, environmental damage (e.g. coral reef damage, salt-water intrusion, loss of fisheries, ecosystem damage). Baseline data could rely on historical data, where available, established by Parties through risk assessments and based on data gathered by the international mechanism's technical advisory arm from objective sources. Rehabilitation would cover a portion of impacts, to minimize the need for a case-by-case requirement that each impacted country establish a causal link between emissions and impacts, or cover all projected impacts, depending upon the level at which triggers are set and the level of agreed payouts.
19. In response to the request made by Pacific and other SIDS governments, the Conference of the Parties to the UNFCCC (COP) at its 16th session agreed in December 2010 on the need to strengthen international cooperation and expertise in order to understand and reduce loss and damage associated with the adverse effects of climate change, including impacts related to extreme weather and slow onset events (decision 1/CP.16). The UNFCCC also agreed to establish a work programme in order to consider, including through workshops and expert meetings, as appropriate, approaches to loss and damage. This was further elaborated at COP17.
20. Given the foregoing concerns, there is a growing recognition among the PICs that climate change adaptation needs to be integrated into national development. In this context, the two most relevant approaches for integration of adaptation in the Pacific region are the 'hazards-based approach' and the 'vulnerability-based approach'. The hazards-based approach assesses current climate vulnerability or risk in the priority system and uses climate scenarios to estimate changes in vulnerability or risk over time and space. The vulnerability-based approach focuses on the characterization of a priority

system's vulnerability and assesses how likely critical thresholds of vulnerability are to be exceeded under climate change. Current vulnerability is seen as a reflection of both development conditions and sensitivity to current climate. The vulnerability-based approach can be used to feed into a larger climate risk assessment.

21. In recognition of the fact that climate change adaptation relates very closely to disaster risk management and reduction, the climate change adaptation (CCA) and disaster risk management (DRM) communities have increasingly started to work together in the Pacific, to produce what are known as Joint National Action Plans.
22. Many of the disasters experienced in the Pacific are climate related and will be further exacerbated by climate change. For example – extreme weather events such as storms, cyclones, droughts, floods, are all expected to worsen as impacts of climate change.
23. A Joint National Action Plan (JNAP) brings together the CCA and DRM sectors, to address risks to key development sectors in a coordinated fashion. To avoid duplication of efforts, and ensure a more efficient use of already scarce resources, the climate change and disaster management communities in many Pacific countries are working together to create coordinated national strategies. To date, JNAPs have been prepared by the governments of Tonga and Republic of the Marshall Islands. The Cook Islands, Niue, Tuvalu and Nauru are currently developing their own JNAPs.
24. The current JNAP process has regional organisations working side by side with national governments to support them in this process. A joint partnership arrangement exists between SPREP, SPC and UNDP, which has been supported through bilateral assistance from governments such as Australia.
25. PICs have often highlighted the need to pilot climate change adaptation implementation programmes and projects at regional and national levels. Most climate change projects implemented in the region since the early 1990s have largely concentrated on assessments and capacity building. Whilst these initiatives are highly commended, PICs have continued to call for urgent support for adaptation action so that planned adaptation is carried out to increase their resilience to more frequent and more intense extreme climate events. PICs further argued that adaptation implementation on the ground will allow for a better examination of inter-linkages between climate vulnerability, socio-economic conditions and sustainable development priorities not only in facilitating resilience-building but will also contribute significantly to the achievement of sustainable development. Several programmes have been implemented in the past years, such as the Capacity Building for the Development of Adaptation Measures in Pacific Island Countries (CBDAMPIC) project under SPREP, so there is a lot of experience in the region at present.
26. Past studies of adaptation options for small islands have been largely focused on adjustments to sea level rise and storm surges associated with tropical

cyclones. There was an early emphasis on protecting land through 'hard-shore' protection measures rather than on other measures such as accommodating sea level rise or retreating from it. So-called 'soft' options, while reported in anecdotal evidence, have not been actively promoted either. Vulnerability studies conducted for selected small islands (IPCC, 2001) show that the costs of overall infrastructure and settlement protection is a significant proportion of GDP, and well beyond the financial means of most small island states. More recent studies since the AR4 have identified major areas of adaptation, including water resources and watershed management, reef conservation, agricultural and forest management, conservation of biodiversity, energy security, increased share of renewable energy in the energy supply, and optimized energy consumption. Proposed adaptation strategies have focused on reducing vulnerability and increasing resilience of systems and sectors to climate variability and extremes through mainstreaming adaptation.

27. While it is clear that implementing anticipatory adaptation strategies early on is desirable there are obstacles associated with the uncertainty of the climate change projections. This has given rise to the suggestion that a better strategy for small islands is to enhance the resilience of whole island socio-ecological systems, rather than concentrate on sectoral adaptation. The need to implement adaptation measures in small islands was highlighted in the AR4 where it was suggested that risk-reduction strategies together with other sectoral policy initiatives in areas such as sustainable development planning, disaster prevention and management, integrated coastal zone management, water resources management, sustainable agriculture and food security, and health care planning should be employed.
28. An adaptation strategy for the PICs should include a strategy for precautionary adaptation since it is difficult to predict far in advance how climate change will affect a particular site, sector or community. Adopting 'no regrets' adaptation measures would be justified even in the absence of climate change, as this would more than likely lead to better management of natural resources and sustainable development.
29. Climate change is likely to become one of the most significant drivers of loss in ecosystem function, biodiversity and the sustainability of livelihoods in the future. The melting of polar ice caps and increase in sea temperatures would expand the oceans and sea levels will rise. Sea level rise is expected to worsen inundation, storm surge, erosion and other coastal hazards, thus threatening vital infrastructure, settlements and facilities that support the livelihood of island communities. There is strong evidence that under most climate change scenarios, water resources in small islands are likely to be seriously compromised (IPCC, 2007). The impacts of these climate events will worsen already stressed marine, freshwater and terrestrial environments. There may be increased intense precipitation and increased risk of drought. As a result of these changes, adverse effects on agriculture, human health, fresh water resources and coastal/marine ecosystems are some of the important sectors that have made PICs vulnerable to climate change.

RESPONSES FROM PACIFIC ISLAND COUNTRIES TO ADAPT TO CLIMATE CHANGE

30. As a consequence of the situational analysis above, the Secretariat of the Pacific Regional Environment Programme (SPREP) has undertaken numerous and extensive consultations with its member countries that are Pacific Island countries. With the exception of Kiribati, which initially declined to participate in this work given that they have their own national adaptation programme under the Global Environment Facility (GEF), all the other independent Pacific Island countries are participating in what is now known as the Pacific Adaptation to Climate Change (PACC) Project¹.
31. The overall strategy for implementing PACC is to improve the well-being and livelihood of the people, communities and villages through a range of activities that will enhance their adaptive capacity and resilience to the impacts of climate change and sea level rise. The project will focus on building resilience by involving local and national stakeholders and experts and with the support of regional and international stakeholders and experts. A number of strategies have been identified to facilitate the implementation of PACC at the local, regional and national levels and these include:
- a) Enhancing the resilience of communities and economies to the impacts of climate change;
 - b) Improving the capacity and ability to provide sustainably sufficient and adequate water supply and water systems under climate change and extreme events;
 - c) Improving and securing access to food quality and quantity through implementation of adaptation strategies; and
 - d) Strengthening the commitments by local, national, regional and international stakeholders and experts to improve ways to provide sustainable financing for adaptation in the PICs.
32. The proposed PACC project emanates from and has strong linkages to a number of recommendations from the international multilateral agreements such as the UNFCCC, the Millennium Declaration and the Millennium Development Goals, and the Barbados Programme of Action for Sustainable Development of Small Islands Developing States (BPoA).
33. At the regional level, the importance of integrating climate change adaptation into development planning processes has long been recognised by PICs. This has culminated in the development and adoption of the Pacific Islands

1 However, it should be noted that Kiribati will be participating in PACC+, the next phase of PACC, which has also opened up opportunities for Pacific Island Territories as Tokelau will be participating.

Framework for Action on Climate Change 2006–2015 at the 14th Meeting of SPREP, and subsequently endorsed by the 36th Pacific Islands Forum Meeting in 2005. Leaders of the Pacific islands region have recognised the importance of taking action to address climate change through their national development strategies, or their equivalent, which are linked to national budgetary and planning processes.

34. PACC is a project facilitating implementation measures designed to help Pacific communities mitigate the effects of climate change. PACC has been requested by leaders and environmental protagonists in the Pacific region since 2003 (i.e. *Pacific Forum Communiqués of 2003-2007; Pacific Regional Environment Programme decisions 2003–2006 and Reports of the 15th, 16th and 17th SPREP Meeting*).
35. The PACC brought a total of US\$13.125 million dollars into the 13 participating Pacific Island countries to start adaptation projects on the ground in three major climate change concerns; food security, water and coastal management.
36. The Secretariat of the Pacific Regional Environment Programme (SPREP) and the United Nations Development Programme (UNDP) have played an important role in facilitating a dialogue on this global issue and, in March 2005, formally introduced the Pacific Adaptation to Climate Change (PACC) Project concept to Pacific Island countries (PICs) at a workshop held in Suva, Fiji. The PACC Project concept was unanimously endorsed by PIC representatives.
37. Funded by the Global Environment Facility (GEF) and implemented by the United Nations Development Programme (UNDP), the PACC Project aims to adapt to climate change, including variability, in selected key development sectors.
38. Although the PACC Project is regional in scope, it is best described as an umbrella mechanism for nationally driven and implemented adaptation initiatives.
39. The regional component of PACC includes oversight of the project to ensure that the PACC objective is met, that technical support as requested by countries is provided, and that a platform for exchange of lessons learned and best practices between the countries and the wider global community is set.

The 14 Participating Countries and Territories:

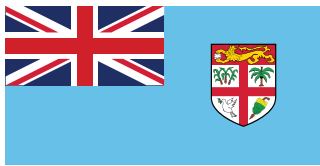
COOK ISLANDS



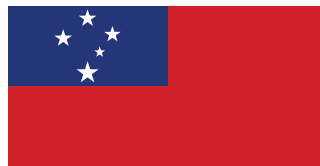
PAPUA NEW GUINEA



FIJI



SAMOA



FEDERATED STATES OF MICRONESIA



SOLOMON ISLANDS



MARSHALL ISLANDS



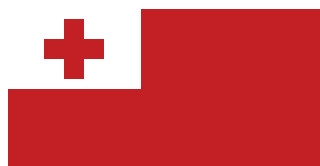
TOKELAU



NAURU



TONGA



NIUE



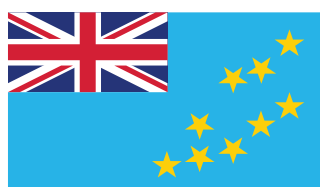
VANUATU



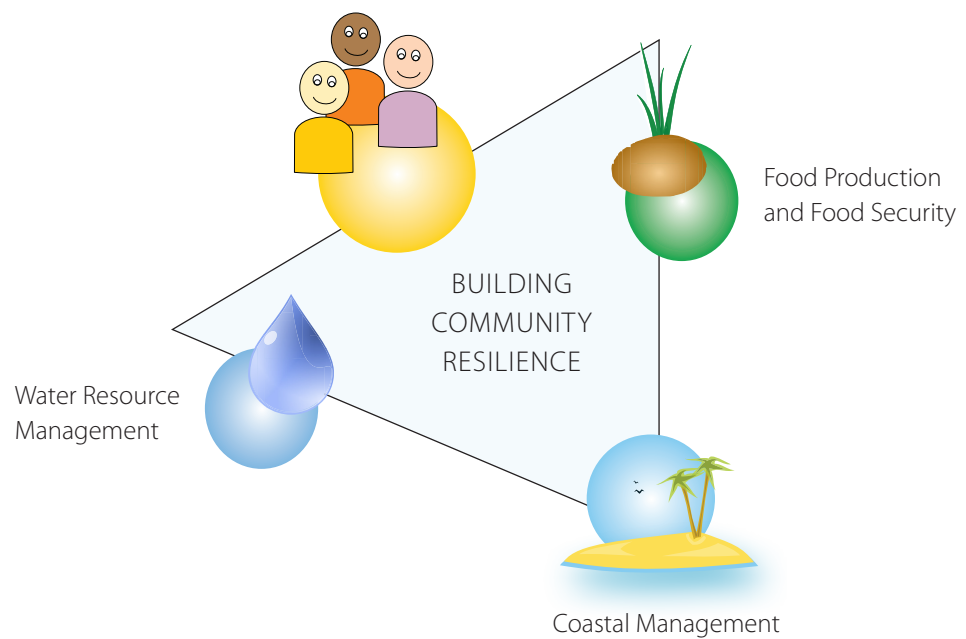
PALAU



TUVALU



40. The PACC's objective is to enhance the capacity of participating countries to adapt to climate change, including variability, in selected key development sectors.
41. This objective is based on national consultations with experts on climate change and development practitioners in the 14 participating Pacific Island countries/territories:



42. The PACC's outcomes are

1. Enhanced adaptive capacity in key development sectors.

Food production and food security

- Fiji
- Palau
- Papua New Guinea
- Solomon Islands

Coastal Management

- Cook Islands
- Federated States of Micronesia
- Samoa
- Vanuatu

Water Resource Management

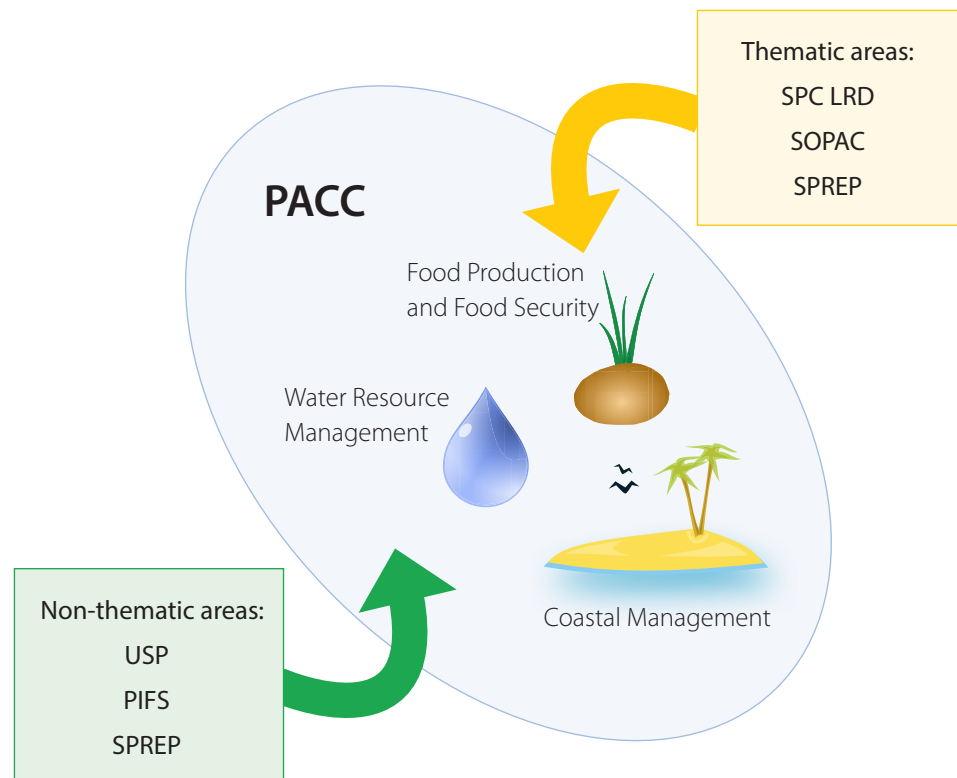
- Marshall Islands
 - Nauru
 - Niue
 - Tokelau
 - Tonga
 - Tuvalu
2. Adaptation to climate change priorities integrated in National Policies and Programmes in key development sectors
 3. Regional cooperation promoted between participating countries to share lessons learned and promote innovation in mainstreaming adaptation to climate change

Innovative Approach:

43. The PACC Project will be the first GEF project in the Pacific islands region drawing on the Special Climate Change Fund (SCCF) and focusing specifically on adaptation implementation in 13 countries simultaneously. It is based on country-driven priorities as articulated in national communications to the United Nations Framework Convention on Climate Change (UNFCCC), the National Adaptation Programme for Action (NAPA) for Least Developed Countries, as well as in the regionally and nationally endorsed Pacific Islands Framework on Climate Change (2006-2015).
44. The project will provide a substantive contribution in terms of the consideration of longer-term climate change risks in development and resource management planning, and in efforts to improve adaptive capacities and enhance livelihoods. It will make a significant contribution in the field of climate change impacts and adaptation through:
 - focusing on enhancing the resilience of current development activities to long term climate change;
 - incorporating adaptation to climate change risks and related vulnerabilities into existing institutional and decision-making processes ('mainstreaming'), at both the community level and the national planning level;
 - recognizing the role of gender-sensitive communities in resilience building resulting in community-relevant vulnerability assessment and gender-sensitive community-based ('bottom-up') adaptation options;
 - promoting real community engagement in the processes of improving capacity to deal with climate-related risks;
 - delivering tangible adaptation measures through practical demonstration; and
 - setting a foundation for a strategic approach to adaptation at the Pacific regional level.

PACC as a Partnership Framework:

45. PACC provides an ideal framework for delivering adaptation actions at the national and community level. The framework places national priorities in the context of relevant global and regional strategies and the national enabling environment. At the national and community level, the pilot demonstration measures will contribute to building the resilience of communities to climate related risks, improving livelihoods and alleviating poverty, in line with priorities of national governments.
46. It is recognised that the technical expertise required to achieve the objective of the PACC Project is spread across a number of intergovernmental regional organisations in the Pacific including the Applied Geosciences Division (SOPAC) and other divisions of the Secretariat of the Pacific Community (SPC). In line with the region's drive for more integrated planning, PACC also sources its technical support for countries from regional organisations. This demonstration of regional cooperation will be a new model for the delivery of GEF projects in the Pacific.
47. Technical support in non-thematic areas related to the PACC Project will also be provided by the Pacific Islands Forum Secretariat (PIFs), the University of the South Pacific (USP), and SPREP.



PACC achievements to date:

- Setting up of National PACC Project management units in 14 PICs completed and Memorandum of Understanding governing project management signed and in place;
- 14 PACC National Coordinators are already in place and spearheading the project at the national and community level;
- Technical training on vulnerability and adaptation assessment approaches and methods completed;
- A socio-economic assessment methodology [SEA-PACC] for the 14 PICs has already been developed;
- Two socio-economic trainings on the coastal and water sectors completed with the third and last training to be carried out in Palau. These trainings will equip coordinators and their counterparts with a tool that can complement their vulnerability and adaptation assessment work;
- Countries have nearly completed their vulnerability and adaptation assessments whereby key adaptation options have been identified and prioritised for implementation;
- A major area of PACC is mainstreaming and some countries are using PACC resources to develop their climate change policies e.g. Niue, Solomon Islands, Marshalls and Fiji. Others are working towards incorporating climate change into their sectoral policies.



RECENT DEVELOPMENTS IN PACC

48. PACC is not a stationary or rigid programme in Pacific Island countries. At various stages of implementation there will be a need to revisit certain elements and re-verify that the initial intent of activities will be met. One example is Niue, whose technical presentation during the 2011 PCCR meeting showed the need to complement national meteorology office's observational data with the latest information on climate change projections for the design of adaptation interventions at the local (individual, household), community and national levels. For example, this approach was applied to the design and costing of the water-catchment and storage facility in one of the households in Niue. It also raised the need to strengthen sector-tailored climate early warning and information services, particularly for agriculture, food security, food production and water resource management sectors.
49. The need to include certain gender issues was raised during the negotiation of implementation arrangements with UNDP. . The analysis of the Intergovernmental Panel of Climate Change indicates that the impacts will seriously affect the poorest regions and the poorest people who have the least resource for facing the changes brought by increasing droughts, floods or cyclones. Seventy percent of the poor are women. Current work in helping vulnerable populations, particularly women and children, adapt to climate change and variability has shown that the most vulnerable groups in the populace will be impacted the most and would likely face the most challenges adapting for climate change. Given the lack of human, financial and technological resources, partly due to their geography, accessibility, the smallness of the economic base and fragile economies vulnerable to external shocks, PICs' general ability to adapt to climate change remains a major challenge for sustainable development. Adapting to climate change will affect agriculture, food security and water management in low-lying atolls and coastal rural and urban areas in high volcanic islands of small island states. In the Republic of Palau, for example, the women are in charge of fields of taro plantations and taro production. Varieties of salt water-tolerant taros, with their ability to withstand coastal inundation can secure food production for the communities.
50. As part of the AusAID funding support to the PACC project, gender has been identified as an area that needs to be addressed in a systematic fashion. It comes with the recognition that women and children are the most vulnerable and that they are not usually involved in the mainstream decision-making processes in their societies. Through this initiative, the hope is that more attention and emphasis will be placed on identifying and determining the role of women, children and youths in increasing resilience to climate change.
51. A dedicated Gender Specialist will be deployed to some of the PACC countries to carry out an assessment of the gender needs of the PACC project and recommend practical applications of gender-responsive programming to

the PACC project. The Gender Specialist will be required to travel in-country to PACC countries, where they will peruse reports and project documents to ascertain gender needs. The Gender Specialist will work under the supervision of the PACC Regional Project Manager, SPREP and relevant UNDP Country Offices. The Specialist will also coordinate with the SPC Gender Specialist, UN Women, Pacific Climate and Gender Network and any existing gender capacity in the countries visited for consistency and applicability of the gender issues that would be recommended for the PACC project.

52. In terms of mainstreaming of climate change adaptation, PACC began tackling this issue early on in the process. Both PIFACC and the Regional Framework for Action on Disaster Risk Reduction and Disaster Management include strategies for mainstreaming climate change issues into national planning and budgeting processes, and improved sectoral decision making to ensure systematic and coordinated climate change programmes. In-country capacity to implement these regional initiatives, however, is limited and the Council of Regional Organizations of the Pacific (CROP) agencies and development partners have been requested to assist.
53. In response, PACC intends to assist Pacific small island developing states (SIDS) to implement mainstreaming strategies by developing a guide to incorporate climate change into development planning, policy development, national decision making, and budgetary planning processes at all levels. The mainstreaming guide will “help map out linkages between climate change vulnerabilities, adaptation measures, and major national goals and policies, taking into account social, economic, and environmental considerations.” It is to be accompanied by a training module with supporting material for testing through pilot workshops and fieldwork.
54. While the PACC project is targeted at 13 independent Pacific SIDS, this mainstreaming guide will also be of substantial benefit to Kiribati and the seven Pacific Island Territories.
55. Rather than making this a voluminous compendium of information, the intention is to provide an overall framework and point the reader to online and other resources. For Pacific SIDS with slow internet connections, the PACC Regional Project Adviser will assist with CD-ROM versions of these resources on request.
56. A practical example of mainstreaming in action can be found in Federated States of Micronesia (FSM), where Kosrae State have enacted new legislation of a kind that would underpin the PACC project and similar future activities. As part of its planned mainstreaming activity for the quarter, PACC FSM put forth a proposal in February to amend Titles 1, 5, 7, and 11 of the Kosrae State Code to add new definitions and requirements relating to climate change adaptation measures. As a result, the Law was passed on the 11 March 2011. This achievement contributes to meeting one of the targets of the objective of the overall PACC project. The following is a short excerpt from the press release found on the PACC website regarding this successful achievement:

“Amendments to the Kosrae State Code to recognise and incorporate climate change adaptation measures into designing and implementing public infrastructures, was passed by the 10th Kosrae State Legislature at the Federated States of Micronesia (FSM) on 11 March 2011...The New Law adopted comes under the Kosrae State Code Title 19 Environment, it is to recognise and define climate and climate change adaptation measures, and to require development activities in Kosrae State to take in account projected climatic changes, and to set the requirement for the design and implementation of public infrastructure such as roads and buildings to incorporate climate change adaptation measures. . . This is a first for the country to adopt a Legislative Law on Climate Change as leverage to the existing environmental statues in the Kosrae State, and incorporate Climate Change adaptation measures, and be considered under the Environment Impact Assessment (EIA) process given the impacts the country is currently undergoing... The new Law will require the Transportation and Infrastructure Department to consider weather extremes and climate change adaptation measures when designing public infrastructures, ensuring that it withstands the extreme climate conditions. For example, drainage networks will be designed to take on more extreme rainfall weather conditions...”

57. Other issues that have arisen once implementation begins include the following examples from Papua New Guinea (PNG) and Fiji.
58. An in-country mission to PNG was conducted with a two-fold background. Firstly, it had to meet with the national level personnel in governments to address the risks and coordination issues that had contributed significantly to stalling the progress of the project since the beginning of the project. Secondly it had to train and carry out the socio-economic assessment with the technical team and with the pilot site village communities of Kivori.
59. Meetings with the Secretary, Assistant Secretary, Finance Officer of the Department of Agriculture and Livestock (DAL); and a group meeting with all key officers, resulted in lowering the critical risks that were seen by the regional office to hamper the progress of the project. These included organizational, financial, and technical risks to the project. Key results from the discussions included (a) DAL's Land Use Section office – regarded as the implementing partner (IP) of the PACC project including handling the financials of the project. DAL's Science and Technology Services office was also to assist as one of the stakeholders of the project. (b) The matter of the 'frozen funds' that were with the CC Trust Fund Account of the Office of Climate Change and Environment Sustainability (OCCES) has been resolved. DAL created a new and separate PACC Project account within the Bank of the South Pacific. It agreed to deposit the equal amount of the 'frozen funds' to this account, with the understanding that it will settle the owed amount with the OCCES. DAL deposited half of this owed amount to the PACC project account – which the team put to good use during the regional team's country visit in February 2011.

60. The technical risks of the project were addressed during the in-country visit of the regional office team. A number of technical team meetings, meetings with the project coordinators, and trainings were carried out. Apart from operational and administration training on issues of process and content such as the FACE form, the regional office carried out the Socio Economic Assessment (SEA-PACC) training for the technical team before going out into the field (Kivori) to carry out the work. The trainings and advisory support provided by the regional team resulted in the successful implementation of the SEA PACC in the four village communities of Kivori. A de-briefing with the team back in Port Moresby provided a way forward including the analysis of results of the SEA PACC, a timeframe of when to complete the analysis and report, and planning for further technical assessment activities in the field within the next two quarters.
61. Much was also discussed at the community level with the four village communities of Kivori. It included some outstanding issues of coordination and ownership of the project. Social issues such as crime and the village court systems were raised as barriers to the success of the project. In special meetings with the leaders of the communities, including councillors and mayors, the technical team agreed to assign ownership of the project by individual community interventions – to which that particular community will be responsible. For example, in the village of Kivori Poe – they will be responsible for their own adaptation intervention of irrigation systems for their farming land. Kivori-Meauri, where irrigation may not be likely given their topography, situation and location, will be responsible for identifying their own activities in close coordination with the PACC technical team. Synergies will continue to be identified at all levels within the communities.
62. In the case of Fiji, the NPMU finalized its TOR for the assessment of climate change impacts on drainage networks and infrastructure during the quarter. It then requested SPREP, through the PACC regional office, to tender out the bids for carrying out this technical assessment package. Expressions of interests have already been received from companies in Australia and New Zealand.
63. A number of technical assessments in this USD\$250,000.00 package include (i) Climatology & Hydrology; (ii) Hydraulic Engineering; (iii) Storm & Wave Run Up I; (iv) Vulnerability and Adaptation; (v) Cost Benefit Analysis; and (vi) Drainage Design Guideline.
64. In other components, one of the PACC's major stakeholders, Fiji's Ministry of Environment, continues with the development of the National Climate Change Policy. The PACC continues to provide management and information support to the process. Community consultations and basic awareness programmes on climate change, its impacts, vulnerabilities and adaptation at the community level continued well into the quarter with close coordination with leaders of the village communities within the pilot sites. The NPMU is continuing with this programme well into the next quarter.

65. A further development has recently initiated work on cost benefit analysis of adaptation in the context of PACC. The objective of the economics of PACC sub-project is:
- to increase Pacific Island country capacity to undertake economic assessments of climate change adaptation both at the pilot project demonstration level and sectoral and national policy levels;
 - to complete cost-benefit analyses of the PACC demonstration projects
 - to undertake economic assessment of climate change in each country to help support national adaptation policies and implementation processes, and help countries to mobilize resources and seek additional funding to implement country-wide adaptation measures.
66. To achieve the stated objectives, two complementary work streams are proposed. These are (i) targeted in-country capacity development, and (ii) regional technical backstop support.
67. The rationale for this dual approach is to ensure that certain elements of the PACC project progress in a timely fashion and that sector and national level analyses will likely require discrete efforts from multiple people to do the work properly. The main purpose of the regional backstopping mechanism is to enhance national capacity, building on existing resources and expertise in each country, in a systematic fashion. The regional mechanism attached to the regional PACC framework will also ensure the exchange of experience and cross-fertilization between countries and sectoral applications. Each country will determine the degree to which they need regional support.
68. The work programme will focus on applying an 'action research and training' approach, including 'hands on' training and mentoring as agreed to during the 2011 PCCR. The details of this work programme have not yet been developed. This will be done through a technical working group discussed in the next section.



69. The work program will build on the following ideas:

a. In-country capacity development

Regional training sessions will be targeted to PACC National Coordinators and core technical teams, sectoral and national development planners and economic experts (e.g. from corresponding line ministries, planning and finance department, national research and education intuitions, as well as private sector).

Each participating country is expected to establish a national technical task team, involving relevant national institutions, and supported by 1-3 national experts with expertise in economics.

The training will aim to:

- complete economic analysis of demonstration projects;
- conduct economic sectoral analysis (to prepare for a second phase of PACC, referred to as PACC+, applications of funds and policy analysis).

Each country will identify 1–3 people from their nation to conduct economic analysis. Individuals ideally will have some economics background. Selection and working arrangements for these persons will be made on a case-by-case basis according to the particular circumstances of that country.

b. Regional technical support

Economic expertise from SPREP and possibly other regional organisations such as IUCN and SPC/SOPAC, will supplement the work activities of in-country personnel. The initial stages of the sub-project will include some of the ex-ante PACC assessments which are required to be done over the next four months that cannot feasibly be done by in-country personnel. Throughout the remaining stages of the sub-project, regional technical support may also be provided for a range of discrete activities according to country needs and subject to budget constraints.

A technical working group will progress the economics of PACC sub-project work. To start with, the technical working group will be responsible for developing a detailed work programme. The technical working group will also be responsible for overseeing implementation of the sub-project.

Membership on the technical working group will comprise SPREP, UNDP, other CROP agencies and economic expertise drawing from the Pacific Resource and Environmental Economics Network (PREEN).

CONCLUSION

70. The PACC project is meeting its objectives, but it is clear that technical and other unforeseen issues do come up in the process of developing and implementing programmes on this scale. There are also operational and administration challenges that add complex layers to the effective implementation of the project's activities. This is a significant challenge for a big regional project such as PACC. An iterative approach to dealing with new development is needed and was included in the planning framework for PACC. As can be seen, necessary revisions and refinements have been taken up by the project management.
72. It has also been recognized in this process that there is a need to identify vulnerable sectors that have either climate-change induced or human-induced stressors or vulnerabilities. This is partly due to the lack of capacity (human and institutional) to identify priority national plans and sectors that are vulnerable and appropriate techniques for adaptation. There are also downfalls from the short project durations, which impact on the ability of communities to enhance their capacity beyond the implementation period. The lack of proper education and awareness on climate change issues, vulnerability and impacts, as well as gaps between communication and coordination further complicates this issue. Through the cost benefit analysis work under PACC, SPREP is seeking to alleviate the lack of knowledge on cost effective and culturally appropriate robust technologies to enhance communities' resilience to climate-related risks.
72. The SPREP experience from PACC and other climate change projects shows that all climate change adaptation activities in the region need to utilise an open, transparent and highly-participatory process. This process needs to engage the community so that they can explore options and develop solutions to reduce vulnerability and effectively balance the needs and interests of a variety of stakeholders. There is also a strong need to increase people's skills and capacity in relation to climate change impacts and appropriate adaptation activities for long-term sustainability.



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