



PACIFIC ADAPTATION TO CLIMATE CHANGE

COOK ISLANDS

REPORT OF IN-COUNTRY CONSULTATIONS

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INTRODUCTION

1.1 The need for adaptation to climate change

1. Small island developing States (SIDS) such as the Cook Islands 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. SIDS are often characterized by having relatively large populations concentrated in coastal with high growth rates and densities; poorly developed infrastructure and limited natural, human and economic resources, and their high dependence on marine resources for their livelihood needs. 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. Adaptive capacity to climate change is generally low.

2. In the Pacific region where the Cook Islands (Longitude 175° East and 178° West and latitude 15° and 22° S) are situated, the climates are influenced by a number of factors such as trade wind regimes, the paired Hadley cells and Walker circulation, seasonally varying convergence zones such as the South Pacific Convergence Zone (SPCZ), semi-permanent subtropical high-pressure belts, and zonal westerlies to the south, with the El Niño Southern Oscillation (ENSO) as the dominant mode of year to year variability (Fitzharris, 2001; Folland *et al.*, 2002; Griffiths *et al.*, 2003). The Madden-Julian Oscillation (MJO) also is a major mode of variability of the tropical atmosphere-ocean system of the Pacific on times scales of 30 to 70 days (Revell, 2004), while the leading mode with decadal time-scale is the Interdecadal Pacific Oscillation (IPO) (Salinger *et al.*, 2001). A number of studies suggest the influence of global warming could be a major factor in accentuating the current climate regimes and the changes from normal that come with ENSO events (Hay *et al.*, 2003; Folland *et al.*, 2003).

3. Recent studies in the southern Pacific region show that the annual and seasonal ocean surface and island air temperatures have increased by 0.6 to 1.0°C since 1910 throughout a large part of the South Pacific, southwest of the South Pacific Convergence Zone (SPCZ) where as decadal increases of 0.3 to 0.5°C in annual temperatures are only widely seen since the 1970, preceded by some cooling after 1940, which is the beginning of the record, to the northeast of the SPCZ (Salinger, 2001; Folland *et al.*, 2003).

4. Analyses of trends in extreme daily temperature across the South Pacific for the period 1961 to 2003 show significant increases were detected in the annual number of hot days and warm nights, with significant decreases in the annual number of cool days and cold nights, particularly in years after the onset of El Niño. Extreme rainfall trends are generally less spatially coherent than were those of extreme temperature (Manton *et al.*, 2001; Griffiths *et al.*, 2003). The maximum number of consecutive dry days is decreasing and the number of heavy rainfall events is increasing which is consistent with changes reported from global analysis of daytime and night time temperatures.

5. Variations in tropical cyclones, hurricanes, typhoons in all small islands' regions are dominated by ENSO and decadal variability which result in a redistribution of tropical storms and their tracks, so that increases in one basin are often compensated by decreases in other

basins. For instance, during an El Niño event, the incidence of tropical storms typically decreases in the far western Pacific and the Australian regions, but increases in the central and eastern Pacific while during La Niña the trend reverses. The numbers and proportion of hurricanes reaching category 4 and 5 globally have increased since 1970, while total number of cyclones and cyclone days decreased slightly in most basins which is consistent with the trends observed in the Pacific islands region. Additionally, in the tropical South Pacific, the distribution of tropical storms and their tracks are dominated by ENSO and decadal variability, with small islands to the east of the dateline highly likely to receive a higher number of tropical storms during an El Niño event compared to a La Niña event and vice versa (Brazdil *et al.*, 2002).

6. 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, although the latter has become increasingly important on continental coasts. Particularly in the outer islands of the Cook Islands there has been no work on adaptation in coastal areas, the focus has been on cyclone recovery and reconstruction and disaster management rather than preparedness or climate change adaptation.

7. 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 TAR 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.

8. 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. To overcome this uncertainty, Barnett (2001) has suggested that a better strategy for small islands is to enhance the resilience of whole island socio-ecological systems, rather than concentrate on sectoral adaptation. Inhabitants of small islands, individuals, communities and governments, have continually adapted to inter-annual variability in climate and sea conditions, as well as to extreme events, over a long period of time. There is no doubt that this experience will be of value in dealing with the inter-annual variability in climate and sea conditions that will accompany the longer-term mean changes in climate and sea level.

9. The need to implement adaptation measures in small islands with some urgency has been recently reinforced by Nurse and Moore (2005), and was also highlighted in the TAR 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 and health care planning should be employed. Since then a number of projects on adaptation in several small island states and regions have adopted this suggestion. Projects aim to build capacities of individuals, communities and

governments so that they are more able to make informed decisions about adaptation to climate change and to enhance their adaptive capacity in the long run.

10. Given the urgency for adaptation in small island states there has been an increase in *ad-hoc* stand alone projects, rather than a programmed or strategic approach to the funding of adaptation options and measures. It can be argued that successful adaptation in small islands will depend on supportive institutions, finance, information and technological support. These issues are particularly applicable to small islands, which have a low capacity to deal with, or adapt to, such impacts.

11. Thus an adaptation strategy for the Pacific islands and indeed for Cook Islands 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. Thus adopting a “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.

1.2 Objective of Pacific adaptation to climate change (PACC)

12. Given the foregoing urgency for the need for adaptation to climate change in the Pacific island countries, Pacific Adaptation to Climate Change (PACC) has been developed to assist with the implementation of adaptation measures in 11 countries of the region. Cook Islands, as one of the participant countries will participate in the PACC to implement adaptation measures to enhance its resilience to the adverse impacts of climate change in the longer term.

13. The principal objective of the PACC is to facilitate the implementation of long-term adaptation measures to increase the resilience of a number of key development sectors in the Pacific island countries to the adverse impacts of climate change. A framework for PACC (PACC framework) will be developed through a consultative process involving all relevant stakeholders (including national governments and their respective agencies, institutions, departments and ministries, and non-government organizations, where appropriate, CROP agencies, donor partners, private sector, where appropriate, and others deemed necessary). The PACC framework will guide the implementation of the PACC at the national (including community and/or village) and regional levels.

1.3 Scope of the report

14. As one of the key outcomes of the in-country consultations is to determine detailed adaptation activities and baselines in each country, this report provides the outcomes of the Cook Islands in-country consultations on PACC which were held from August 14 to 18, 2006. The report is divided into five sections: section 1 outlined the urgency for adaptation to climate change in SIDS, building on the IPCC third assessment report; section 2 provides a general overview of the climate change and development situation (situation analysis) in the Cook Islands covering issues relating to assessment of impacts of climate change on the biophysical and human systems and stakeholder analysis; section 3 covers sectoral analysis

with regard to a methodology and/or a criteria used to select a priority sector for adaptation intervention, institutional and development baselines within the priority sector as well as the analysis of the impacts of climate change within the priority sector; section 4 provides information of the delivery mechanism for full-sized project implementation of PACC-Cook Islands and section 5 covers the project goals, outcomes, outputs and activities. The letter of endorsement for co-financing and list of individuals/experts and their respective institutions consulted during the in-country consultation are appended as annexes in section 6.

GENERAL OVERVIEW

2.1 Situation Analysis

15. The Cook Islands is made up of 15 islands spread out over an exclusive economic zone of about two million square kilometres in the Southern Pacific Ocean (Lat 21° 14'S, Long 159° 46'W). Total land area is less than 240 km² with Rarotonga the centre of Government and commerce. Geographically and to a certain extent culturally the nation is divided into two groups: the Southern Group comprising islands of Aitutaki, Atiu, Mangaia, Mauke, Mitiaro, Rarotonga, Manuae (an uninhabited atoll) and Takutea (an uninhabited sand cay); and the Northern Group islands of Manihiki, Palmerston, Penrhyn, Pukapuka, Suvarrow (atolls) and Nassau which relatively isolated and less developed (Figure 1). The total length of the coastline is 120 km.

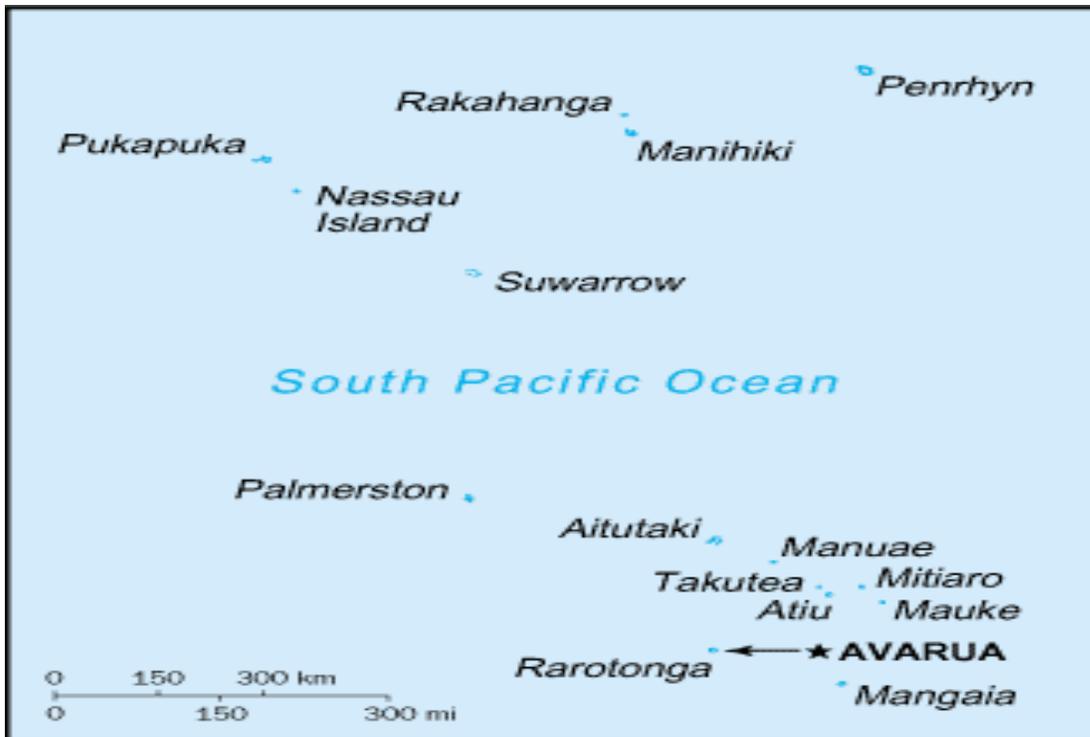


Figure 1: Location of Cook Islands

16. The Cook Islands lie within the extensive and persistent trade wind zone of the South Pacific. It has a tropical mild maritime climate with a pronounced wet season (i.e. hot wet) during the months of November to April where two-thirds of the annual rain falls and a dry season (i.e. cool dry) from May to October. The hot wet season coincides with the cyclone season for the Pacific Region. Thus the climate is dominated by easterly trade winds and has an annual rainfall of 2000mm. The average temperature ranges from 21°C to 28°C throughout the year. The climate is often strongly influenced by the large inter-annual variation and El Nino-Southern Oscillation (ENSO) phenomenon.

17. Tropical cyclone season usually start from November and end in April. During this period cyclones tend to form to the far west of the Northern Cook Islands and migrate towards the south reaching latitude 15⁰ S in a south-easterly track. During ENSO the Southern Cook Islands experiences a reduction of rainfall sometimes by up to 60% of the annual rainfall while in the Northern Cook Islands rainfall increases in excess of 2,300mm annual rainfall (i.e. over 200% change). The situation reverses during the La Nina phase.

18. On average the Cook Islands experiences about three cyclones every two years interspersed by cyclone-free seasons. Cyclone Sally in 1985 was only a Category 1 storm but caused immense damage as it hit Rarotonga directly. Tropical Cyclone Martin caused extensive damage and human suffering through loss of lives during the 1997/98 ENSO while Tropical Cyclone Pam also occurred during ENSO but with minimal damage to property and infrastructure. In 2005 a total of five cyclones affected the Cook Islands within one month.. Discussion of the effects of these cyclones is provided in section III of this document.

19. The last census in 2001 in the Cook Islands had a total population of 18,027, with residents making up 13,900 of that total. The 2001 Census report show all islands except Rarotonga suffered a decline of population with Atiu, Mangaia, Nassau, Rakahanga and Penrhyn all experiencing declines of over 30% in their population when compared to census reports in 1996. The outer islands collectively account for 37% of resident population with the balance living on Rarotonga. Aitutaki is the most populous outer island in the southern group and has maintained more of its population, reflecting the impact of the development of the tourism industry on that island. Pukapuka remains the most populous island in the northern group. The census report also shows the recovery in the population of Manihiki following a forced evacuation in November 1997 as a result of the devastating effects of Cyclone Martin.

As with other small islands developing States, the Cook Islands' economic development is hindered by the isolation of the country from foreign markets, limited size of domestic markets, lack of natural resources, periodic devastation by natural disasters, and inadequate infrastructure. Tourism provides the economic base of the country with aquaculture and agriculture exports made up of black pearls, trochus, noni, chilli and pawpaws. Trade deficits are offset by remittances from emigrants and by foreign aid from New Zealand. Between 1980 and 1996 the country maintained a bloated public service and accumulation of large foreign debt. This culminated in sale of public assets, strengthening of economic management, encouragement of tourism, debt restructuring which have in the main contributed to investment and growth. Thus, the economy is currently growing by 2.8% annually in real terms for the period 1982-2002

Ratification of the UNFCCC

20. Similar to other Pacific Island Countries (PICs), Cook Islands is very much aware of and concerned about environmental degradation and global warming and their detrimental effects. Ratification of the UNFCCC was one step forward in terms of Cook Islands' commitment to addressing climate change and related issues.

21. Cook Islands ratified the UN Framework Convention on Climate Change (UNFCCC) on 16 March 1993, and has submitted its Initial National Communication (INC) to the UNFCCC on 30 October 1999. The country has also ratified the Kyoto Protocol on 15 November

2000. Following the preparation of its INC (under the Pacific Islands Climate Change Assistance Project (PICCAP) and Phase II Enabling Activities), the country has initiated efforts to create an institutional set-up that seeks to integrate climate change issues into the national legal frameworks. Moreover, its INC provides compelling evidence that, by global standards, Cook Islands is one of the nations most vulnerable to climate change and sea-level rise.

22. Cook Islands is also a Party to many other UN conventions, including: biological diversity, biosafety, persistent organic pollutants, ozone depleting substances and combating desertification. Environmental and climate change issues are at the forefront of the Government of Cook Islands reporting requirements under the WSSD, ten-year review of the Barbados Programme of Action (BPoA+10) and Millennium Development Goals (MDG) processes.

National Sustainable Development Strategy

23. In addition, a number of national environmental and related policies have been prepared and adopted by the Government, to guide the implementation of initiatives that address environmental issues, including impacts of climate change. The government's attitude towards environmental concerns presents a positive support through the endorsement of four National Environment Strategic Action Framework (NESAF) policies last year. These are to (1) Enhance the management, protection and sustainable use of natural resources, (2) Reduce and prevent environmental degradation from waste and all forms of pollution; (3) Increase resilience by strengthening national capacities for addressing climate change adaptation and mitigation; and (4) Improve institutional support and implementation mechanisms to manage the environment in a sustainable manner.

24. All these policies promote sustainable development in a manner that minimizes any adverse impacts on the natural, social and cultural environment. The NESAF also identified eight target environmental components (TECs) within each of the NESAF policies that will be implemented over the next five years (2005-2009). Embedded in these policies is the desire by the Government of Cook Islands to take a holistic approach in creating cooperation between government agencies, non-government organizations, communities and the private sector in implementing and managing eight priority environment issues.

25. The vision for sustainable development in the Cook Islands is "to enjoy the highest quality of life consistent with the aspirations of our people, and in harmony with our culture and environment." This vision is underpinned by a primary objective which is "to build a sustainable future that meets economic and social needs without compromising prudent economic management, environmental integrity, social stability and the needs of future generations." Additionally, eight national development goals have been outlined in the national sustainable development plan (NSDP), three of which are very relevant to PACC-COOK ISLANDS component namely: Goal 4 sustainable use and management of natural resources and environment, Goal 5 strengthened and affordable basic infrastructure, transport and utilities to support national development.;, and Goal 6 a safe, secure, and resilient community.

2.2 Stakeholder Analysis

Process and approach used

26. The consultations on Pacific Adaptation to Climate Change (PACC) were conducted by the PDFB team¹ and involved eleven stakeholder consultations, meetings and a workshop. Three approaches were used to inform stakeholders about the PACC projects, its objectives, and outputs and the type of activities the project would support at the country level. The meetings were also used to solicit and collect information from the relevant ministries, agencies, institutions of government and non-government organizations, where appropriate:

- a) Gathering of information (including policy documents) relating to the activities, programmes and projects from various government ministries, departments and agencies,
- b) Meetings/consultations and workshop held with representatives of relevant ministries, agencies and institutions of government and non-government organizations,
- c) A national consultation/wrap-up workshop on PACC-COOK ISLANDS priorities.

27. The consultations were focused on the activities relating to adaptation and other relevant issues such as institutional arrangements, and opportunities for promoting synergy between the various activities and organizations, priorities for PACC activities, consistent with the UNDP and GEF guidelines/criteria for adaptation activities. Specific topics covered in the meetings and consultations included all elements of project implementation including policy/regulatory framework to integrate adaptation within the design and implementation of development activities; institutional framework; information and knowledge; stakeholder involvement and co-financing possibilities.

Institutions and individuals involved/consulted

28. Eight government ministries, departments and agencies, one non-government organization and one private coastal zone consultant, altogether involving 21 experts were consulted during the in-country consultations and workshop. These consultation meetings were focused on identifying adaptation activities that could be funded under the PACC project within the coastal zone management and associated infrastructure thematic area. This thematic area was selected by the National Climate Change Country Team during their meeting on August 08 2006 over water resources management and food production and food security themes for a number of compelling reasons:

- a) In the area of water resources management, several activities are already likely including the Ninth European Union Development Fund water sector support programme (WaSSP) and SOPAC's Integrated Water Resource Management (IWRM) project.
- b) In the case of food production and food security programme, a Technical Cooperation Programme (TCP) of FAO and SPC's Development of Sustainable

¹ Chief Technical Adviser, UNDP Programme Officer and GEF Expert Consultant

Agriculture in the Pacific (DSAP) projects are already providing support in addressing food security issues for the Cook Islands.

- c) Many coastal communities, socio-economic infrastructure and activities face serious coastal erosion problems caused by storm surges and coastal flooding relating to tropical cyclones. Five cyclones in 2005 have caused severe damage to coastal infrastructure (e.g. wharves and airports) in the Cook Islands which are the focus of a Cyclone Emergency Assistance Loan programme funded by the Asian Development Bank (ADB).
- d) There is high potential for co-financing of PACC activities within coastal zone management and associated infrastructure as indicated by support from NZAID Cyclone Recovery & Reconstruction Programme (CRRP), Outer Islands Development Partnership Arrangement, Cook Islands Investment Corporation, and the ADB supported Preventative Infrastructure Master Plan Programme.
- e) Coastal management and associated infrastructure was identified as the highest priority area during a May 2006 Climate Change in the Cook Islands- Kia Vai Teateamamao- (Be Prepared!) workshop on involving over 80 stakeholders organized by WWF South Pacific and NES.

29. Given that thematic area for adaptation intervention was identified and selected already by the National Climate Change Country Team, the PACC team concentrated their efforts in identifying additional/adaptation activities within the coastal zone management and associated infrastructure in consultation with the stakeholders. Adaptation activities are outlined in section III of this report.

Meetings with stakeholders

30. The PACC Consultation Team (PCT) first met with the (Climate Change Coordinator CC Coordinator) and Climate Change Technical Adviser (CCTA) of the National Environment Service (NES). The PCT briefed the CC Coordinator and CCTA on PACC priorities, consultations and activities for adaptation intervention. PCT also emphasized the need for implementation of adaptation measures to increase the resilience of development sectors in Cook Islands. The CCC and the CCTA informed the PCT about the outcomes of the NCCCT meeting that was held on August 08 2006 in preparation for PACC consultations. They further informed the PCT that the NCCCT meeting had already endorsed coastal zone management and associated infrastructure to be the focus of adaptation intervention in the Cook Islands. It was agreed that it would therefore be important for further consultations to focus on priorities relating to coastal zone management and associated infrastructure.

31. In endorsing coastal zone management and associated infrastructure as the focus for adaptation intervention two options were considered by the NCCCT. First option was to focus on climate proofing the construction of the Avatiu Breakwater in Rarotonga which had been the focus of a number of studies/assessments undertaken by the NES, Ministry of Works (MOW), the Cook Islands Investment Corporation (CIIC), Cook Island Ports Authority (CIPA) and the recently completed Asian Development Bank Climate Adaptation project (CLIMAP). The second option was to consider climate proofing in redesign and redevelopment of coastal infrastructure (harbour, roads, airport) on an outer island either in the Southern or Northern Groups of Islands. However, the decision on which of the options to focus on had to be made during the PACC consultations based on a number of issues including the UNDP-GEF criteria for project selection.

32. Thus further consultations were focused on identifying the pilot site where adaptation activities relating to coastal zone management and associated infrastructure would be carried out. In this context a meeting with the Cook Islands Investment Corporation and Aid Management Division was held to introduce the PACC project and more importantly to identify the island or the pilot site where PACC-COOK ISLANDS would be implemented.

33. The PCT was informed that many of the islands in the Southern and Northern Groups are included in the Cyclone and Emergency Assistance Project of the Asian Development Bank, which was also supporting development of a 20 year Preventative Infrastructure Master Plan. Additionally, islands of the both groups were going to benefit from the Cyclone Recovery and Reconstruction Programme (CRRP) to be funded by the New Zealand Agency for International Development (NZ Aid). A number of assessments were being carried out for baseline infrastructure costs for the CRRP, and CEAL ADB Preventative Infrastructure Master Plan programme

34. The total cost of redevelopment of each harbour including wharf infrastructure was estimated at an average of between NZD1.9million to NZD2.4 million, and for the airports redevelopment costs ranged from 1.6 to 6 million. Thus plans were underway to start redevelopment of this infrastructure. PCT emphasized that based on the information and feasibilities being carried out on the harbour redevelopment it would be possible to focus on one of the islands in the Southern Group which had a greater potential for co-financing. Similarly the planned redevelopment of the Northern Group airport on Manihiki island fit well with the time lines of the project.

35. As many of the outer islands of the Cook Islands fall under the responsibility of the Office of the Minister for Island Administration (OMIA), it was necessary to consult with the Head of OMIA to inform and to seek guidance on where PACC activities could be piloted. OMIA outlined number of activities that are being carried out in the outer islands. These include the provision of technical support and services in the area of energy, infrastructure and island councils. OMIA also indicated that water resources is a critical issue for outer islands and stressed that the island of Mangaia has had no harbour since it was destroyed by tropical cyclones early in 2005 but a recent feasibility study indicated that construction of a new harbour would be completed by middle of 2007. He also described government plans to create a hub on one of the Northern group islands consolidating a maintenance depot, fuel storage, healthcare, harbour, and airport facilities due to the challenges of south-north shipping and air travel.

36. Further consultations were held with the Manager of the Cyclone Recovery and Reconstruction Programme. The CRRP is focusing on improving housing standards, rehabilitation of coastal forests and identification of hazard areas. In addition the CRRP is overseeing the NZD6.0 million investment for development of cyclone centres/shelters for all islands in the Northern Group of the Cook Islands. The CRRP will also facilitate development of policy guidance on recovery from natural disasters such as tropical cyclones as there is no such policy in existence at present. Some mapping or topographical survey is being carried out on the island of Pukapuka (worst hit by Cyclone Olaf) in the Northern Group. The PCT was also informed of the SOPAC project on Island Vulnerability under European Development Fund 9 (EDF9) which focuses on aggregates, water and sanitation, islands system management and geographical information systems. In the Cook Islands a

country intern has been appointed to manage EDF9 activities which include capacity-building and training in GIS applications in coastal management planning and bathymetric surveys.

37. A meeting was also held with Acting CEO of the Ministry of Agriculture (MOA) mainly to inform the Ministry of the proposed PACC project for the Cook Islands. MOA, while outlining its activities stressed that climate change issues have not been considered in its operational programmes but environmental issues in general are incorporated in agricultural activities. From the analysis of impacts, it appears that agricultural crops suffer severe damage and loss from extremes associated with climate. However, it was pointed out that while climate change issues are not necessarily incorporated into agricultural programmes, many of the activities which are currently being funded and supported by FAO/Technical Cooperation Programme and DSAP could be considered as adaptation measures.

38. The PCT met with the representatives of the Ministry of Works (MOW) who also work very closely with OMIA on infrastructure in the outer islands based on a Memorandum of Understanding between the two organizations. MOW provides specialist technical services especially in the area of aerial mapping, data gathering, satellite imagery, energy and water distribution systems on some islands.

39. The focus of discussions with the Cook Islands Ports Authority (CIPA) was to ascertain if the redevelopment/improvement of port facilities to allow for berth of larger ships would include the construction of the breakwater which had been recommend to be climate-proofed in an earlier study conducted by the ADB. However, the PCT was informed that there were no immediate plans to construct the breakwater as had been recommended. With respect to port facilities, the PCT was informed that due to smallness of port facilities the international freight charges remain very expansive in the Cook Islands. While the desire to redevelop the port facilities by the government remains strong there is however no commitment or investment by the government or donors to further develop the port. Thus Avatiu Breakwater development protecting the Avatiu port infrastructure remains only as a plan. The only further work being undertaken on the port facilities is its extension into the western basin in order to reduce current congestion of the harbour.

40. Consultations with Emergency Management Cook Islands (EMCI) and the Cyclone Emergency Assistance Loan (CEAL) Programme indicated that a total of USD2.8million is being expended on the development of the Preventative Infrastructure Master Plan. This is a 20-year plan covering transport, power sector, water supply, sanitation, waste and telecommunications. Aid Management Division provides oversight to CEAL which include projects that help establish a siren system for early warning in Aitutaki and Penrhyn Islands and airport redevelopment in Penrhyn, Manihiki and Pukapuka.

41. A further meeting was held with the Office of Prime Minister (OPM) to inform them of the PACC project and also to ascertain the likely policy underpinnings for PACC implementation in the Cook Islands. It appeared from the ensuing discussions that a National Sustainable Development Plan 2005-2010 (NSDP) has now been completed and one of the important issues reflected in the NSDP is the importance of climate risk proofing.

42. A meeting was held with Islands Sustainability Alliance Cook Islands (ISACI) who outlined their activities which included environmental advocacy, awareness on pesticide use,

organic farming techniques (also piggeries and water use), pollution and impacts on health. PCT made a brief presentation on the PACC activities and the potential thematic focus for PACC-COOK ISLANDS. It became clear that ISACI may be able to provide services in awareness-raising relating to the implementation of PACC activities in the Cook Islands.

43. The last formal meeting was held with Mr. Don Dorrel, a coastal engineer and an entrepreneur. The PCT made a brief presentation on the purpose and goal of the PACC project and the thematic area for adaptation implementation in the Cook Islands. In response, Mr. Dorrel emphasized that there is need to know more about wave climatology and wave state before, during and after tropical storm/cyclone in order to understand the effects of wave damage and to design such infrastructure as harbours or airports to cope with waves of 50 or 100 year magnitude.

Institutions and stakeholders consulted

<i>Institution</i>	<i>Stakeholders interests/responsibilities</i>	<i>Relevance to climate change/reasons for inclusion</i>	<i>Role in consultation process</i>
GOVERNMENTAL INSTITUTIONS			
National Environment Service (NES)	<p>Implementing agency and operational focal point of the GEF, including UNFCCC, UNCCD and CBD and other MEAs.</p> <p>Responsibilities:</p> <ul style="list-style-type: none"> - management of the state of the environment; -national coordination of activities and programmes related to MEAs including implementation, monitoring and evaluations -issuance and vetting of projects including permits and environmental impact assessments -Liaising with relevant national agencies for assistance to ensure the Cook Islands effective representation at meetings of the Parties to the Convention and other relevant meetings; - Liaising with relevant regional and international bodies to ensure that the representation of the Cook Islands at any meeting concerning a Convention is informed and effective; - Managing or participating in any project, or part of a project, aimed at implementing any aspect of environmental concerns - Disseminating information to local stakeholders and creating public awareness on environmental concerns - Preparing reports, and information papers for the Minister and Cabinet in relation to the implementation of any Convention; -review and improvement of regulations, policies and strategies for implementing environmental concerns. - Provide technical support to any other relevant government department or agency) to implement any obligation under a Convention. 	<ul style="list-style-type: none"> - Operational focal point of the UNFCCC and the GEF - Climate Change officers, coordinating the UNFCCC Second National Communications project under the NES. - National Climate Change Country Team (NCCCT) is established under the auspices of the NES with administrative and management support from Climate Change officers. - Responsible for preparation of the INC and its submission to the COP - Responsible for preparation of the draft National Implementation Strategy (NIS) in collaboration with other relevant agencies - Responsible for the preparation of the NESAF 2005-2009 - Responsible for the NCSA. - Responsible for preparation of the National Biodiversity Strategy and Action Programme under the CBD - Responsible for preparation of the National Action Plan NAP under the CCD 	<ul style="list-style-type: none"> - Consultations on national priorities, Mainstreaming of climate change in national environmental strategies, programmes and other documents, and on current and planned projects. - Regular consultations with the UNFCCC partners for discussion of the proposal of the 2NC in terms of technical issues, opportunities for synergy among various projects and institutional arrangements. - Regular consultations on the needs and priorities for capacity-building - Regular consultations on the implementation of the NESAF, NBSAP and the formal adoption of NIS. - Possible pilot sites for PACC theme on coastal zone management and associated infrastructure - secretariat of the national Climate Change Country Team - organized and coordinated all stakeholder consultations on PACC
Ministry of Agriculture	Ministry responsible for development of agriculture products for export and local markets.	<ul style="list-style-type: none"> - Member of the NCCCT - Collaboration with NES on policy and strategies on 	- Consultation on data needs for V&A assessment regarding agricultural crops including issues

<i>Institution</i>	<i>Stakeholders interests/responsibilities</i>	<i>Relevance to climate change/reasons for inclusion</i>	<i>Role in consultation process</i>
		agricultural developments as they relate to crop productions, food security, land-use, resources management, vulnerability and adaptation assessment, use of chemicals and inorganic fertilizers, mitigation and other relevant climate change information and data.	related to invasive species, chemicals usage, and policies review and development. - Food security issues are critical as food production is an important development sector
Office of the Prime Minister	- Responsible for WSSD, MDGs and development of the National Sustainable Development Plan. - National Policy Coordination Unit.	- Member of the NCCCT	- Consultation with regard to integration of climate change issues into national strategies and policies including sustainable development programmes - Data and information needs for PACC activities relating to coastal zone management and associated infrastructure.
Office of the Minister for Islands Administration	- Responsible for administration and technical support to Outer Islands administrations.	- Proposed member of the National Climate change country Team	- Consultations on effects of climate change on resources and infrastructure in the outer islands and data needs - Mangaia harbour redevelopment to be completed by mid-2007 - Airport hub in northern group -
Meteorological Services	- Responsible for providing national meteorological services to the public	- Chair and Member of the NCCCT	- Consultations on strategies to enhance capacity-building on climate-related activities including data management activities and technologies including research and systematic observations applications
Ministry of Works, Energy, and Physical Planning	- Responsible for design and development of infrastructure of public works and services in communities, roads, bridges, drainage, water works, energy inspection, and development, coastal zone protection and management, building standards and control, land survey information, and waste management.	- Member of the NCCCT -	- Undertakes climate change vulnerability and adaptation assessments, environmental impact assessment work, resource investigations and studies including mapping and planning, development of resources management policies, plans and regulations
Cook Islands Investment Corporation	- Responsible for the management of government assets especially housing and state-owned enterprises along with lagoon floor.	- Potential role in energy efficiency and increasing resilience of infrastructure.	Consultations on strategies for cyclone reconstruction efforts, reviews on building codes and standards and including legislations, and national GIS mapping project as well as the ADB TA for infrastructure planning.

<i>Institution</i>	<i>Stakeholders interests/responsibilities</i>	<i>Relevance to climate change/reasons for inclusion</i>	<i>Role in consultation process</i>
Emergency Management Cook Islands and Cyclone and Emergency Assistance Loan Project	<ul style="list-style-type: none"> - Responsible for the national disaster management office and national emergency operations centre - Developing a 20-year Master Plan for Preventative Infrastructure. 	<ul style="list-style-type: none"> - Member of the NCCCT - Responsible for pre disaster and emergency preparedness, 	<ul style="list-style-type: none"> - Consultations on post disaster response and relief operations and potential for trainings and educational and awareness, including vulnerability and adaptation assessments, and hazards risks assessments. - Infrastructure on outer islands
Aid Management Division (Ministry of Finance and Economic Management)	<ul style="list-style-type: none"> - Responsible for administration of foreign aid funding and TA projects in the Cook Islands - Responsible for Cyclone recovery and Reconstruction Programme 	<ul style="list-style-type: none"> - Responsible for administration and disbursement of project funds and for recovery work in the country 	<ul style="list-style-type: none"> - Consultations on the impacts of climate change on the national economy and needs for data - Possible pilot sites for PACC project - Possibilities for co-financing
PRIVATE SECTOR CONSULTANT/ENTREPRENEUR			
Mr. Don Dorell	<ul style="list-style-type: none"> - Provides scientific/technical/policy advise and guidance on coastal management issues. 	<ul style="list-style-type: none"> - Assists government on scientific/technical and policy issues relating to coastal zone management and infrastructure development on the foreshore 	<ul style="list-style-type: none"> - Guidance on wave climatology and design infrastructure for harbour & airport redevelopment - Review of consultant's report on Avatiu Harbour Breakwater feasibility study
NON-GOVERNMENT ORGANISATIONS (NGOs)			
Island Sustainability Alliance Cook Islands (ISACI) and Climate Action Network (CAN)	<ul style="list-style-type: none"> - Responsible for facilitating numerous community based environment programmes and assisted in the initiation of a Climate Change Action Network - Advocacy on environmental issues 	<ul style="list-style-type: none"> - Climate Change Action Network member to promote awareness and dissemination of information. - Assisted Cook Islands in the preparation of Initial National Communication - A member of CIANGO and Assisting the Cook Islands to prepare community vulnerability assessments, - Awareness-raising, education and training 	<ul style="list-style-type: none"> - Consultations on strategies for climate change community awareness; training programmes relating to PACC implementation

2.3 Climate change programmes, projects and activities

44. A number of climate change programmes, projects and activities have been carried out in the Cook Islands since the entry into force of the UNFCCC. Cook Islands was one of ten countries of the Pacific who participated in the Pacific Islands Climate change Assistance Programme (PICCAP) from 1997 to 2001. PICCAP was a multi-country regional enabling activity project funded by the GEF, implemented by UNDP and executed by SPREP to assist participating countries to prepare their initial communications under the UNFCCC. Cook Islands prepared its initial national communication and submitted it to the COP in November 1999.

45. The second major climate change programme implemented in the Cook Islands a project titled “Capacity-building for Development of Adaptation Measures in Pacific Islands Countries (CBDAMPIC)”, which was also implemented in three other countries: Fiji, Samoa and Vanuatu. This project, funded by the Canadian International Development Agency through its Climate Change Development Fund, enabled Cook Islands to undertake participatory community vulnerability and adaptation assessment and implement adaptation measures in communities on the island of Aitutaki relating to their water resources management.

46. Cook Islands also participated in a regional mitigation project “Pacific Islands Renewable Energy Project” (PIREP) which helped facilitate the development of a full-size project known as Pacific Islands Greenhouse Gas Abatement and Renewable Energy Project” (PIGGAREP) involving 11 countries.

47. The country has recently begun a programme of activities relating to the preparation of its second national communication under the UNFCCC, national capacity self-assessment, and sustainable land management under the UNCCD with funding support through the enabling activities of the Global Environment Facility.

48. Cook Islands, along with Federated States of Micronesia, also had the benefit of an Asian Development Bank Technical Assistance programme of Climate Adaptation in the Pacific Islands (CLIMAP). CLIMAP was designed to assist the Cook Islands to adapt to current and future climate risks through use of the Climate Change Adaptation through Integrated Risk Reduction (CCAIRR) framework and methodology, to demonstrate a risk-based approach to adaptation and to mainstreaming adaptation. A number of case-studies were carried out in the Cook Islands to show why and demonstrate how reducing climate-related risks is an integral part of sustainable development. Climate-related risks are already high for communities and infrastructure and these are likely to increase considerably with climate change, variability and climate extremes. CLIMAP studies have shown that for infrastructure projects, it is possible to avoid most of the damage costs attributable to climate change, and to do this in a cost-effective manner, if climate proofing is undertaken at the design stage of the project.

49. Cook Islands also participated in a global programme on Assessment of Impacts of and Adaptation to Climate Change in Multiple Regions or Sectors (AIACC). The aim of this project was to develop a second generation of integrated assessment methods and models, including the incorporation of ‘human dimensions’ of vulnerability and adaptation options

and economic evaluation procedures. Cook Island nationals were supposed to have been trained under this programme to use these new integrated assessment model scenarios of coastal inundation on Aitutaki with financial support from the Global Environment Facility (GEF), through the System for Analysis, Research and Training (START) programme, the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Environment Programme (UNEP).

50. A number of smaller projects relevant to or focusing on climate change are currently under way in the Cook Islands including the Red Cross Capacity & Vulnerability Assessment aiming for better disaster preparedness, along with the aforementioned SOPAC EDF9 and ADB projects coordinated by the newly Emergency Management Cook Islands office and developing capacity and legislation for climate related disaster risk reduction in country. There is also the Cook Islands National Environment Service/ WWF South Pacific joint climate change project titled 'The UNFCCC: Facilitating Implementation and Participation in the Pacific' with the objective of strengthening the ability of developing countries to effectively participate in and to foster the implementation of the UNFCCC by building government capacity and by mobilizing relevant and influential stakeholder groups in key countries.

51. Finally there are a number of ongoing activities providing important information for assessment of climate change impacts and adaptation needs particularly for coastal management including NTF Sea Level Monitoring Project, NIWA Island Climate Update, AusAID Seasonal Climate Forecasting (SCOPIC). SOPAC Marine Resources Monitoring and Bathymetric Surveys for the Pearl Industry in the Northern Group, and Cook Islands Marine Resources Institutional Strengthening project.

Vulnerability and adaptation

52. The first vulnerability and adaptation assessment (V&A) in the Cook Islands was carried out as part of the preparation of initial national communication. Vulnerability assessment highlighted the following key sectors which have been affected by climate change and sea-level rise: coastal zone and coral reefs; agriculture and food security; marine resources; water resources; and biodiversity. Some example of the effects included a decline in pawpaw production and low export sales due to drought and low rainfall in 1999 and loss of agricultural land due to intrusion of sea-water through flooding, inundation, and coastal erosion in the Northern group atoll islands.

53. The potential impacts on coastlines is likely to be more dramatic than the consequent sea-level rise because of the dominance of unconsolidated and permeable beach rock which can be easily eroded by high-energy waves or storm surge. Coral reefs not only suffer from overexploitation but also are affected occasionally by episodic warming of the sea water column. Most of the economic activities, infrastructure and human settlements are located in the coastal areas especially in the Northern Group.

54. Recent years have seen an increase in both intensity and frequency of extreme climate events. Cyclone Sally extensively damaged Rarotonga in January 1987. In November 1997 Cyclone Martin destroyed about 90 percent of the houses and killed 19 people on Manihiki atoll. Since 1998 the Cook Islands has experienced more intense storms, flooding, and wave surge damaging

coastal infrastructure. Most notable was the unprecedented five cyclones within one month in Feb/March 2005, with three of the cyclones reaching Category Five status as they passed through Cook Islands waters. During El Niño the Southern Cook Islands have experienced severe drought conditions and many households have been without water for periods ranging from several weeks to some months. Agriculture has also been severely affected. During the contrasting La Niña phase, flash flooding is a frequent problem for the volcanic and makatea southern group islands, while the northern group islands suffer drought.

55. In addition, human activities have contributed to pressures on the environment that could worsen the effects of climate change and sea level rise. Pressures that must be considered and may be difficult to overcome include:

- a) Soil erosion and lagoon sedimentation as a result of poor land management
- b) Liquid and solid waste, where effluent seeps into the lagoon from rubbish dumps, household septic tanks, tourist resorts and pig and chicken farms, and makes reefs less resilient to coral bleaching
- c) Over-harvesting of certain species including clams, reef fish, and coconut crabs.
- d) Mining of sand coral and gravel aggregates from the beaches for construction contributing to coastal erosion and lagoon sedimentation.
- e) Foreshore development, resulting in reclamation of land for construction and inappropriate sea walls.

Adaptation

56. A range of adaptation measures have been identified as key responses to increasing the resilience of communities and sectors over the long term. These measures have been assessed based on economic and the environmental cost, cultural suitability and practicability:

- a) Improved understanding of the circulation within the lagoons and the interactions between marine flora and fauna;
- b) Improved understanding of the coastal processes;
- c) Development of legislation and regulations for foreshore development;
- d) Development of salt-tolerant cultivars and/or plant species;
- e) Increase water storage capacity and examine use of groundwater sources;
- f) Monitoring and surveillance of diseases, and pests – development of early warning systems;
- g) Restoration, protection and management of forest catchments

Disaster and Risk Management

57. The Cook Islands approach to disaster management in recent years has shifted focus from recovery and response to preparedness and risk reduction with a large input from the private sector and the community. This is important given the geographic isolation of the outer islands, transport and infrastructure limitations on those islands and cost.

58. Emergency Management Cook Islands (EMCI) (formerly Cook Islands National Disaster Management Office) has recently adopted a regional approach to managing national hazards and risk, under the Comprehensive Hazard and Risk Management (CHARM) strategy. Thus effective response and recovery mechanisms need to be balanced through strategic efforts to avoid risk through precautionary approaches.

59. Government is improving infrastructure and construction standards as preventative measures against disasters. Construction of community cyclone shelters, seawalls, better harbours especially in the Northern Group islands (atolls) is continuing. PeaceSAT/HAM radio communication systems are still maintained by both government and private citizens as backup to Telecom's satellite communication systems in the outer islands. A small search and rescue unit has been formed made up of police, community volunteers, and specialists to deal with rescue emergencies.

60. EMCI is based within the Office of the Prime Minister and responsible for the development of policies relating to disaster preparedness, risk reduction, coordination and is secretariat to the National Disaster Management Committee made up of the Police Department, Telecom Cook Islands, the Meteorological Service and Office of the Prime Minister.

SECTORAL ANALYSIS

61. The principal objective of Pacific Adaptation to Climate Change (PACC) is to facilitate the implementation of long-term adaptation measures to increase the resilience of a number of key development sectors in the Pacific island countries to the adverse impacts of climate change. The development sectors are food production and food security, water resources management and coastal zone management and its associated infrastructure. Given limited financial resources and the need for cost-effectiveness, the countries have been encouraged to

focus only one of the three development sectors where adaptation intervention would be essential. Thus in-country consultations would also determine detailed adaptation activities and baselines in each country.

3.1 Methodology/criteria for selection of priority sector

62. Given the rationale for supporting adaptation activities in one of the three main development sectors of food production and food security, water resources management and coastal zone management and associated infrastructure it was necessary to select one of these priority areas for adaptation intervention. In order to facilitate the selection of the priority area the following criteria was used for PACC priority sector. That the selected adaptation project or activities should have:

- a) A strong fit/alignment with the Cook Islands Government's existing programmes
- b) All necessary baseline assessments have been carried out, and additional activities are ready for implementation, and,
- c) Ability to co-finance and ability to deliver.

63. Preliminary findings of the PCT based on stakeholder consultations were presented to the National Climate change Country Team. In the presentation the PCT emphasized the importance of the consultations process, the issues discussed, priorities indicated and the possible focal areas for adaptation intervention. The PCT also drew attention of the NCCCT to the application of the UNDP-GEF criteria for project development (as outlined above in para. 57). Based on the three criteria and the recommendations made on the focus of adaptation intervention by the stakeholders during the various meeting, and on all information the PCT had before it, Mauke Island Harbour Redevelopment was proposed as PACC project for adaptation intervention. However feedback from consulting engineers GHD recommended against this due to limited feasibility of climate proofing the technical specifications, meaning one of the criteria -ability to deliver- would be compromised.

64. The PCT then allowed time for further discussion as the pilot site was suggested as a proposal and it was the prerogative of the NCCCT to decide whether or not that site was consistent and aligned with the government's cyclone recovery and rehabilitation efforts. One of the issues raised was that given the requirement of GEF-funded projects for co-financing there was not enough flexibility to carry out adaptation activities in a sector or sectors or location other than where co-financing was already available, which may be more vulnerable and are of higher priority. Co-financing requirements undermine implementation of adaptation in sectors which may be highly vulnerable but which do not have sufficient co-financing.

65. The PCT explained further that while co-financing might be a limitation in proposing adaptation activities for GEF funding in other areas, PACC pilots would provide valuable lessons which can be incorporated into adaptation activities in other areas of priority in the future. PCT further indicated that opportunities exist for developing further proposal for possible funding through various adaptation funds established by the UNFCCC and managed by the GEF.

Focal area for adaptation intervention

66. Based on these three criteria and on the stakeholder consultations (see section 2.2) coastal zone management and associated infrastructure was selected as a sector for adaptation intervention in the Cook Islands under the PACC project. Under this theme, a number of locations were considered, climate proofing of Rarotonga-Avatiu Breakwater, Mauke or Mangaia Harbour development and coastal zone management, Manihiki Airport redevelopment and coastal zone management and integrated coastal zone management of Pukapuka Island.

67. Based on consultations, criteria and requirements for selection of pilot project activities and sites, it appeared that climate change adaptation would be piloted in Manihiki Island through a project titled “Climate Proofing of Manihiki Coastal Zone Management and Airport Redevelopment.” This project would focus on enhancing, and where necessary, developing protective measures (hard and soft solutions) in vulnerable sites on coastal areas of Manihiki Island. The project would entail an assessment and identification of measures that would be necessary to increase the resilience of the socio-economic infrastructure and activities thereby enhancing the adaptive capacity of coastal communities to impacts of climate change and sea level rise in the long term. The proposal to locate the PACC project in Manihiki Island where adaptation activities will be implemented to increase the resilience of an airport (a major lifeline coastal infrastructure) around which many other socio-economic activities are based has been endorsed by the NCCCT.

68. However, during the intervening period between the time the Manahiki project was endorsed and the logical framework analysis meeting held in Nadi, Fiji from November 27 to December 01 2006, an alternative pilot site was proposed by the NCCCT, based on advice from a GHD Consulting Services who had been working closely with AMD to redesign and redevelop in coastal infrastructure in the Southern and Northern Groups of the Cook Islands. The alternative coastal infrastructure and pilot site proposed were to climate proof the airport redevelopment on Manihiki Island because according to the GHG Consulting Engineers climate-proofing the Mauke harbour would mean that the original design platform and hardstand would have to be raised by at least one metre to allow for the structure to withstand a 60-year return interval storm event. The raising of the platform would make it highly impractical and (to some extent dangerous) for berthing by small boats and for unloading and handling cargo due to its steep gradient. With this background in mind the NCCCT accepted and endorsed an alternative pilot site of Manhiki Island where adaptation activities will be implemented to increase the resilience of an airport (a major lifeline coastal infrastructure) around which many other socio-economic activities are based.

3.2 Assessment of priority sector for adaptation activities

69. Human activities in the coastal environment, including sand extraction and mangrove removal has increased the sensitivity of these important coastal buffers to climate and sea level variations. These activities may compound the affects of sea level rise. Vulnerability assessments carried out as part of the preparation of initial national communication has identified coastal zones as highly vulnerable to effects of sea-level changes and storm surge

and wave overtopping. Coastal erosion not only affects the immediate coastline but also reef flats, coastal vegetation and infrastructure.

70. Much of early work has focused on vulnerability and adaptation assessments, which identified a number of critical actions, and measures that could contribute to enhancing adaptive capacity and towards achieving adequate adaptation to climate change. The preparation of the INC, and the activities of the Phase II enabling activities (top-up) have highlighted the following needs and concerns relating to vulnerability and adaptation in the coastal zones in the Cook Islands:

- a) Monitoring of beach profiles and coastal erosion.
- b) Improved understanding of the effects of coastal development and structures on the coastline.
- c) Improved understanding of coastal processes and effects of sea-level rise.
- d) Development and enforcement of legislation relating to coastal zone management.
- e) Implementation of integrated coastal zone management.
- f) Improved understanding of the various options for coastal protection and management
- g) Enhancing networking and information sharing/exchange amongst all stakeholders i.e., NGO's, private sector, Government, communities and the general public to develop appropriate measures to address coastal problems.
- h) Strengthening the institutional arrangements and enhance capacity to support efforts in addressing issues and concerns relating to coastal zone management.
- i) Reviewing of existing laws and legislation to assess their appropriateness in accommodating vulnerability and adaptation to climate change and climate variability for key sectors and communities.
- j) Promoting integrated planning or zoning on coastal zones as well as using traditional management systems like rau'i.
- k) Improving climate monitoring, research and systematic observation, develop and manage databases necessary for vulnerability and adaptation assessment and to enhance the capabilities and capacities of experts and institutions in the use and applications of analytical, integrated and process-based methods and tools for assessment work in the coastal zones.

3.3 Current institutional and development baseline

71. As with many small island developing States, Cook Islands is concerned about the impacts of future climate change and sea level rise given the exposure of main socio-economic and cultural activities and infrastructure being located on or near the coastline. Given the high priority placed on the coastal infrastructure, socio-economic, cultural activities and communities, the Government of Cook Islands (GOCI) with support from the Asian Development Bank (through a loan) initiated the "Strengthening Disaster Management and Mitigation" Technical Assistance (TA) Cyclone Emergency Assistance Loan (CEAL) Programme. The TA was in response to devastation caused by no less than five tropical cyclones in the Cook Islands during the months of February to March 2005.

72. Between 4 February and 8 March 2005, the Cook Islands experienced five damaging cyclones, four of which were assigned a severity rating of Category 5 and caused damage to homes and essential public infrastructure. The Government and its agencies provided early

warning information dissemination, evacuation and emergency relief to the affected population with the support of international and regional relief agencies. Following the cyclones, the Government assessed the physical damage but it lacked all of the capacity and resources to finance the immediate recovery and reinstatement of basic services.

73. On 30 June 2005, the Asian Development Bank (ADB) approved a loan for the Cyclone Emergency Assistance Loan (CEAL) Project for the sum of US\$2.85 million, effective from 14 July 2005. The loan was to mitigate the social and economic impact of the cyclone damage by providing the necessary concessional resources to assist the Government implement a comprehensive recovery program. The total cost of the CEAL Project is estimated at US\$7.9 million.

74. The 2005 cyclones highlighted the need for a long-term national climate change adaptation strategy and an integrated infrastructure development plan, which incorporates climate change adaptation concepts. The strategy and plan should include policies and priorities both to support economic and social development and protect the country's basic infrastructure against weather-related impacts.

75. As with most Pacific island states, the Cook Islands' social infrastructure is ill prepared against weather-related vulnerability, as highlighted under the Climate Change Adaptation Project for the Pacific (CLIMAP). The inherent geographical vulnerability of the country to climate change can be ameliorated by initiating integrated infrastructure and social development, including human resources development. Consequently, there is a need for 'climate proofing' the country. That is, for enhancing the country's adaptive capacity and resilience to climate change, including the impacts of extreme events. Strengthening disaster management and mitigation capacity will help to ensure that future social and infrastructure programs will incorporate climate change adaptation and mitigation strategies.

76. Cyclone Emergency Assistance Loan project is being implemented to enhance the economic, environmental and social sustainability of transport and coastal infrastructure assets, and to manage those assets, natural resources and disaster risks through an effective partnership with private sector stakeholders.

77. The CEAL Project involves three implementing agencies; the Ministry of Finance and Economic Management (MFEM), Aid Management Division (AMD), Emergency Management Cook Islands (EMCI), the Cook Islands Investment Corporation (CIIC), Ministry of Works, Energy and Physical Planning (MOWEPP), and the Office of the Minister for Island Administrations (OMIA) and the Office of the Prime Minister (OPM) as well as other stakeholders. CEAL Project is coordinated through a Project Management Unit (PMU) and liaises with the MFEM in the overall monitoring of the project. The project is administered through a Steering Committee comprising of CEOs and Assistant CEOs from several government ministries/department and the private sector.

78. The AMD is also implementing the Cyclone Recovery and Reconstruction Programme supported by NZAID, AUSAID and the GOCI to strengthen the resilience of coastal communities and groups vulnerable to the impacts of natural hazards by supporting local community groups, NGOs, and other eligible entities to carry out non-structural and practical interventions at the community levels; and to provide opportunities for direct community involvement in coastal hazard management.

79. Coastal zones in the Cook Islands are often subject to adverse impacts of climate change and variability including extreme events such as tropical cyclones. Adverse impacts result from land loss due to inundation, coastal erosion, saltwater intrusion as a result of wave-overtopping and sea water flooding of both infrastructure and socio-economic activities. In the outer islands of the Cook Islands (Northern and Southern Groups), coastal zones provide a lifeline infrastructure including harbours and airports to much of their economies.

3.4 Impacts of climate change on the priority sector

80. The Climate Risk Profile (CRP) of Cook Islands has identified the following as potential sources of risk: extreme rainfall events; drought; high sea levels and extreme wave heights; strong winds; and extreme high air temperatures (ADB 2005). Projections of future climate-related risks are based on the output of global climate models, for given emission scenarios and model sensitivity. The CRP for daily rainfall indicates that a daily total of over 200mm is a relatively rare event in Rarotonga, with a recurrence interval of 11 years. However observational records show that the frequency of extreme rainfall events has increased markedly since 1929. GCM model outputs indicate that global warming will significantly alter the return periods of extreme rainfall, as exemplified by an increase in the likelihood of a daily rainfall of 200mm over the next fifty years.

81. Drought conditions in the Cook Islands appeared to have increased since the 1930s. Thus a high number of months with rainfall below the five percentile coincides with El Nino events. GCM output indicates prolonged and more intense periods of drought are to be expected over this century.

82. With respect to high sea levels and extreme wave heights in the Cook Islands, there is high interannual variability in sea level. Observational data on sea levels also indicate exceptionally high sea levels associated with the occurrence of tropical cyclones. Further analysis of the recurrence intervals of extreme high sea levels, it appears that even more extreme high sea levels occur for time scales less than a day. GCM output indicated increases in sea level over the next century influenced by global and regional changes in mean sea level as a consequence of global warming.

83. Tropical cyclones occurring in or around the Cook Islands appear to have increased during the last century. The record for the last few decades is more significant and has doubled in decadal frequencies between the 1950s and the 1990s. The frequency of occurrence of tropical cyclones is consistent with more frequent episodes of ENSO. Thus, the period 1990-95 saw an unprecedented occurrence of ENSO in the climate record of the past 124 years. Another consequence of El Nino occurrence as it relates to the Cook Islands is the apparent intensification of tropical cyclones, as reflected in upper ten percentile heights of open water waves associated with tropical cyclones occurring within the vicinity of Cook Islands, e.g. Tropical Cyclone Heta generated open water wave height of 17 metres in 2004.

3.5 Method of assessing priority sector

84. Coastal zones in the Cook Islands are often subject to adverse impacts of climate change and variability including extreme events such as tropical cyclones. Adverse impacts result from land loss due to inundation, coastal erosion, saltwater intrusion as a result of wave-overtopping and sea water flooding of both infrastructure and socio-economic activities. In the outer islands of the Cook Islands (Northern and Southern Groups), coastal zones provide a lifeline infrastructure including harbours to much of their economies. The harbours in the outer islands usually comprise of a channel cut through the reef flat to a small basin containing a dock area and small boat ramp with concrete seawalls to provide a measure of protection to the channel and basin. The dock area often comprises of a concrete paved quay and a small handstand area. Cargo is usually transferred from the ship berth on the quay line wall and is unloaded with pallets which are then moved to a nearby storage shed. This configuration of harbours applies to all the Southern Group islands and Northern Group islands of Manihiki and Rakahanga.

85. Penrhyn (Northern Group) has the only harbour directly accessible by ship. Ships enter the lagoon through a passage and berth alongside the quay and unload cargo directly onto the quay pavement. Pukapuka has a narrow, shallow channel cut through the reef into the lagoon where cargoes are unloaded from the barge at a beach in front of the storage shed.

86. As part of the Outer Islands Development Partnership Agreement (DPA) the government through AMD and NZAID plan to repair and improve harbour and airport facilities in the outer islands. To this end AMD has retained the services of GHD Consultants of New Zealand to (1) investigate the condition of all the outer island harbours and airports excluding Aitutaki, (2) review works completed to date and prepare feasible concepts for upgrading works, and (3) prepare indicative cost estimates in advance of further detailed engineering survey and design stages. GHD visited the southern group in April 2006 and the northern group in August 2006. Draft reports on the southern group islands were submitted in July 2006 and reports on the northern group were submitted in October 2006.

87. Based on information provided by the GHD consultants, the Cook Islands Climate Change Country Team selected the Manihiki Island Airport as the pilot site for climate change adaptation because it is aligned with the government's Preventative Infrastructure Master Plan developed with support from the Asian Development Bank (ADB). Two adaptation options were considered: one is to climate proof and protect the "ocean side" of the airport; the other is to build a drainage system to protect the airport from storm surge and wave-overtopping.

88. The population of Manihiki as reported in the 2001 Census is 515. The island is situated about 1200km north-west of the capital Rarotonga. In the absence of any mode of sea transport in the alternative, the community is totally dependent on air transport as the only and most efficient means of transportation and particularly for provision of humanitarian services during the hurricanes and cyclones. Subsistence farming and fishing, along with black pearl cultivation for export is the common activity within the community.

89. Climate proofing the airport will pave the way for a least cost design and implementation procedure integrated or mainstreamed into existing planning, design and implementation processes that take into account increased risk from climate change. The

consequences of inaction or not taking into account climate change risks in an already vulnerable situation will result in high overall costs, including any rehabilitation costs which are likely to occur during the lifetime of the airport. This would enhance the livelihoods, improve adaptive capacity and foster sustainable development in the long term. Initially, PACC will enable the integration of climate change adaptation into the design criteria of airport redevelopment. The activities may include engineered design criteria that would allow for a 60-year storm event with particular wave heights for seawalls, hardstand/surface, retaining walls as well as a breakwater for dissipation of wave energy.

90. Other adaptation activities will include construction of coastal/flood protection/defence systems, gravelling and upgrading of seawall/access roads, strengthening of surface area and climate proofing drainage and other protective infrastructure.

91. Given that climate change and sea-level changes affect coastal zones and resources including harbours it is important to consider additional adaptation activities that encompass integrated coastal zone management and the protection of coastal zones using both soft and hard solutions such as sea walls, revetments, bulkheads, break-waters and jetties particularly in the vicinity of the airport.

3.6 Determination of additional adaptation activities

92. The main objective of PACC-COOK ISLANDS is to increase the resilience of coastal zones and its associated infrastructure to the impacts of climate change. This would enhance the livelihoods, improve adaptive capacity and foster sustainable development in the long term. Initially, PACC will enable the integration of climate change adaptation into the design criteria of harbour redevelopment. The activities may include engineered design criteria that would allow for a 60-year storm event with particular wave heights for seawalls, wharf hardstand, quay and retaining walls as well as a breakwater for dissipation of wave energy.

93. Other activities will include construction of coastal/flood protection/defence systems, gravelling and upgrading of seawall/access roads, strengthening of dock area and climate proofing the storage shed and other related infrastructure.

94. Given that climate change and sea-level changes affect coastal zones and resources including critical infrastructure such as airports it is important to consider additional adaptation activities that encompass integrated coastal zone management and the protection of coastal zones using both soft and hard solutions such as sea walls, revetments, bulkheads, break-waters and jetties particularly in built-up areas and in areas where critical infrastructure and activities are located.

DELIVERY MECHANISM FOR FULL-SIZE PROJECT

4.1 Institutional arrangements

95. All climate change programmes, projects and activities have been coordinated by the International Division of the National Environment Service (NES). The International Division currently has two staff that facilitate tasks/activities relating to climate change in the country such as the preparation of climate change enabling activities (e.g. second national communication) and other climate change-related projects (e.g. AIACC). The International Division also serves as a secretariat for the National Climate Change Country Team. CLIMAP and PIREP were coordinated through the Ministry of Works, Energy, and Physical Planning (MOWEPP) as NES policy is to delegate coordination of projects to other relevant agencies wherever possible in order to mainstream the climate change issue.

96. Under the PACC-COOK ISLANDS project, the International Division will continue to facilitate climate change activities relating to PACC. However, given that PACC is focused on implementation of adaptation activities primarily related to 'climate proofing' the airport in one of the outer islands, Manihiki, the implementing agency for PACC-COOK ISLANDS will be OMIA in close collaboration with CIIC, AMD and the Airport Authority.

97. In addition to the implementation of PACC-COOK ISLANDS, OMIA, will host at least two full-time staff that will provide the day-to-day operation of the PACC activities. These two full-time staff will be part of the PACC Project Management Unit (PMU) and will be directly responsible to the head of OMIA.

98. At the national level, PACC-COOK ISLANDS will be implemented by various stakeholders within their respective mandates while scientific, technical, policy and management oversight will be provided by the National Climate Change Country Team (NCCCT). The NCCCT comprises representatives from various government ministries, agencies and institutions and the private sector who will also be partners in the PACC project.

99. OMIA will assist the International Division of the NES by serving as secretariat, to a designated subgroup of the NCCCT on issues relating to the implementation of PACC-COOK ISLANDS. The PACC-NCCCT will also need to work closely with a pilot island specific Core Working Group comprising representatives of the Island Council, Traditional Leaders, Manihiki public service and affected land owners.

4.2 Assessment of existing and potential barriers to adaptation implementation

100. The GOCI is currently implementing the CEAL and CRRP with the aim of enhancing the economic, environmental and social responsibility of transport and coastal infrastructure assets, and to manage those assets, natural resources and disaster risks through an effective partnership with the private sector. This programme is jointly managed and implemented by ADM, OMIA, NES, MOWEPP, ADB, CIIC, NZAID and the Ministry of Finance and Economic Management (MFEM).

101. A number of climate change enabling activities (e.g. national communication) have also involved numerous organizations, institutions and individuals in carrying out various tasks and activities. These activities have been supported by the NCCCT through the provision of scientific, technical and policy oversight and guidance. Thus many of the roles and

responsibilities have been clarified. However some barriers still remain and will have to be overcome in order to improve delivery of the PACC-COOK ISLANDS. Some of these barriers include, competing demands on staff time, inadequate staff resources, equipment, and lack of incentives.

102. Costing of Manihiki airport and harbour adaptation component within ADB master plan based on risk and percentile estimation of baseline costs rather than itemised costing, so more project design needed. Land issues and community buy in will need to be addressed as part of the project

103. Lack of capacity (human, systemic, institutional, financial and technical) constrains the sharing of information and knowledge particularly of climate change and adaptation issues which limits the integration of climate change adaptation into sustainable development. A project of this kind will more than likely make the integration of climate change into sectoral planning possible.

EXPECTED GOAL, OUTCOMES, OUTPUTS AND ACTIVITIES

Goal:

104. The main goal of this project is to enhance the capacity of the Cook Islands to adapt to climate change, including variability, in selected key development sectors.

Objective:

105. The main objective of this project is to “increase the resilience of coastal zones and its associated infrastructure”. This goal will be achieved through a project “Piloting climate change adaptation in coastal zone management and airport redevelopment in Manihiki Island, Cook Islands.” This project will also focus on enhancing, and where necessary, increasing the resilience of coastal communities, socioeconomic infrastructure and activities in a small island.

Specific Outputs

Output 1.1: Relevant plans and programmes incorporate climate risks in the coastal sector in the Cook Islands.

Output 2.1: Guidelines to integrate coastal climate risk management into relevant plans and programmes.

Output 2.2: Trained staff in key agencies to respond to impacts of storm surges and rises in sea surface temperatures on coastal food production systems.

Description:

Output 1.1: Relevant plans and programmes incorporate climate risks in the coastal sector in the Cook Islands.

This will include integrating climate change into key development sectors that are highly vulnerable to climate change which include; agriculture, water, and coastal management. At the national level, work in climate variability and change is still the 'domain' of Meteorology Services, Environment Departments and National Disaster Agencies but the impacts are being felt by other agencies e.g. Fisheries, Agriculture, Forestry, Physical Planning, and Public Works. To mainstream key climate change issues into development plans of government sectors, a number of critical steps would be followed, which requires collaborative analytical and policy inputs from a number of different technical experts and domestic partners. Critical components of mainstreaming include: review of the NSDS and its role in national development; the identification of the strengths, weaknesses, gaps, responses to strengthen specific sectoral management (problem tree analysis and objective/ solution identification); the review of the link between sectoral plans and NSDS and the relationship between sectoral medium term budget and the medium term national fiscal expenditure and revenue budget; and strengthening of sector level budgeting that reflects outcome focused priorities and national development goals.

Specific activities to be undertaken would include:

- Promote and support dialogue, exchange of information and coordination amongst early warning, disaster risk reduction, disaster response, development and other relevant agencies and institutions at all levels, with the aim of fostering a holistic and multi-hazard approach towards disaster risk reduction.
- Development or customizing of a mainstreaming methodology that takes into consideration climate change technical and policy frameworks and issues;
- Forming of a Mainstreaming Team to work with key government sectors to mainstream climate change issues into key sectoral plans and policies;
- Countries to form V&A Teams comprising people in various agencies and institutions who can collaborate, integrate their work and be the main contact points in the various agencies to champion adaptation approaches and initiatives. Once the teams are formed a range of capacity building initiatives to be developed in the next component can be implemented.
- Mainstream climate change risk considerations into planning procedures, especially for major infrastructure projects, including the criteria for design, approval and implementation of such projects and considerations based on social, economic and environmental impact assessments.

Output 2.1: Guidelines to integrate coastal climate risk management into relevant plans and programmes.

Output 2.2: Trained staff in key agencies to respond to impacts of storm surges and rises in sea surface temperatures on coastal food production systems.

This output would provide key stakeholders in Manihiki, a small atoll in the Cooks group comprising 40 tiny islets encircling a 4km wide lagoon the opportunity to develop and evaluate measures to reduce the impacts of storm surges of the scale anticipated for a 25year return tropical cyclone to coastal areas in the vicinity of the Manihiki airfield.

According to national reports on climate change vulnerability, ensuring the resiliency of the airfield infrastructure of isolated atoll islands are key to increasing the adaptive capacity of the people from climate change impacts. Given small outer island communities isolation from the rest of the main centers of Cook Islands, much needed assistance would be transported to people by air therefore the need to maintain this important means of communication. The government is currently investing in the redevelopment of the airport in line with the Preventative Infrastructure Master Plan developed with support from the Asian Development Bank.² The cost of redevelopment of the airport adjacent to the ocean, to be borne by the government and assistance from the New Zealand Government. The redevelopment plans are based on feasibility assessments³ approved by the Ministry of Finance and Economic Management. This output will focus on innovative ways to address coastal erosion measures through the involvement of key stakeholders in particular the community. Specific activities to be undertaken would include:

- Participatory assessment of the vulnerability of Manihiki communities and a small island airfield to climate change using climate change models and scenarios.
- Use participatory methodology to develop guidelines to integrate coastal climate risk management into relevant plans and programmes;
- Use participatory methodology to evaluate and develop appropriate coastal support measures (modern and traditional) including community participation in the development of management plans to reduce coastal vulnerability and enhance the resilience of small island airfields to the impacts of climate change
- Strengthen capacity to develop an integrated coastal management plan for the Airfield that takes into consideration traditional coastal and marine resource management measures
- Based on assessment findings and recommendations design and develop training programs on CC and adaptation strategies/measures for coastal systems.
Conduct training/workshops for coastal managers & practitioners (including aid donors & consulting engineers) on CC and adaptation strategies/measures.
- GIS mapping and database developments

² Pacific Region Environmental Strategy 2005-2009: Volume II: Case Studies, Mainstreaming the Environment in Development Planning and Management, Published in January 2004

³ GHG Consultants and Aid management Division 2006.

PROJECT LOG FRAMES AND INDICATORS

Project Log Frame and indicators for Cook Islands would be finalized during the inception meeting of the PACC project.

	72100	Contractual Services - Co								0
Subtotal			20,000	4000	4000	4000	4000	4000	4000	20,000
Outcome 4	71300	Local Consultants	88,768	17754	17754	17754	17753	17753	17753	88,768
Subtotal			88,768	17754	17754	17754	17753	17753	17753	88,768
Total			918,768	191,754	257,854	212,354	141,453	115,353	115,353	918,768

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ANNEXES

Letter of Co-Financing

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