



## **PACIFIC ADAPTATION TO CLIMATE CHANGE**

**VANUATU**

**REPORT OF IN-COUNTRY CONSULTATIONS**

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## I. INTRODUCTION

### 1.1 The need for adaptation to climate change

1. 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. SIDS are often characterized by having relatively large populations for the area they occupy 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 Vanuatu chain of islands is 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 the 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 rainfall and 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 Nino, with extreme rainfall trends 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 nighttime 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 Nina 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 Nino 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. 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.

7. While small islands must adapt to the consequences of climate change, their adaptive capacity is limited and is being further eroded by external factors such as the internationalisation of economic activity and internal population pressures. People in small islands have historically adapted to variability in climate and sea conditions. It is not clear how valuable this experience will be in dealing with the longer-term mean changes in climate and sea level, especially since traditional mechanisms for coping with environmental hazards are being lost in many islands.

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. Thus an adaptation strategy for the Pacific islands and indeed for Vanuatu 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)**

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

12. 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**

13. As one the 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 Vanuatu in-country consultations on PACC which were held from August 01 to 04 2006. The report is divided into five sections: section I 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 Vanuatu 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 the Vanuatu component of the PACC 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.

## **II. GENERAL OVERVIEW**

### **2.1 Situation Analysis**

14. Vanuatu is an archipelago of volcanic islands and submarine volcanoes stretching from 13.2° to 20.5° S to 166.2° to 170° E , some 1,300 km from north to south in the Western Pacific Ocean (Figure 1). It comprises over 80 islands which have a combined land area of 14,760 km<sup>2</sup> and a maritime exclusive

economic zone of 680,000 km<sup>2</sup>. The two largest islands, Espiritu Santo and Malekula comprise almost 50% of the total land mass. The total coastline is about 2,528 km long.

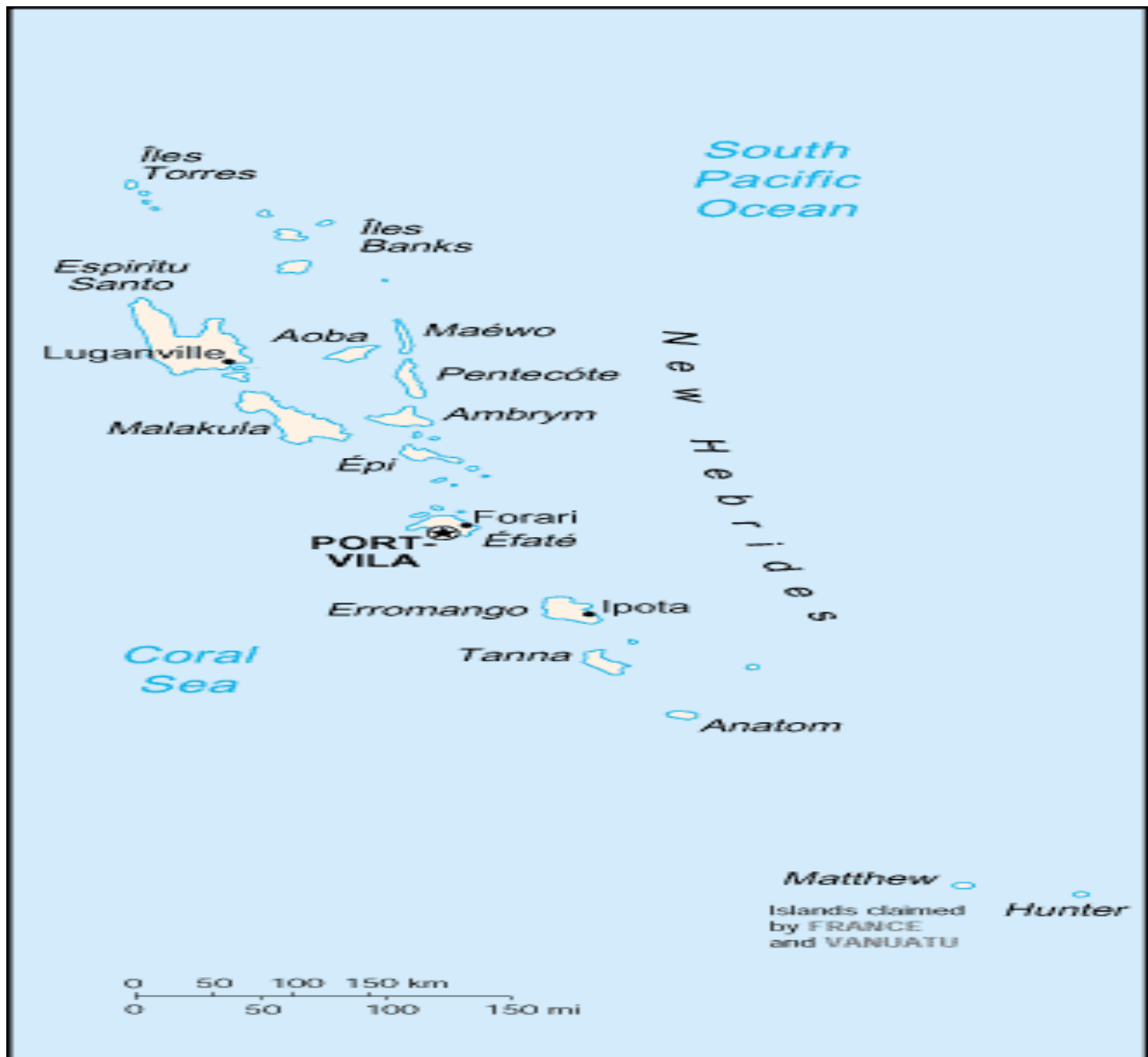


Figure1. Location of Vanuatu

15. The estimated population of Vanuatu is 208,869 (mid-2006 estimate) but the national census in 1999 had a population of 186,678 people, of which 29,356 (16%) people lived in Port Vila, the capital city, and 10,738 people (6%) in Luganville (Statistics Office, 2000). The remaining 70% of the population live in rural villages ranging from one family to several hundred people. Almost 80% of the population live on seven islands: Efate, where Port Vila is located; Santo, the largest island and where Luganville is located, Tanna, Malekula, Pentecost, Ambae and Ambrym.

16. Travel and communications between and within islands is difficult and expensive. Within islands the rugged terrain and tropical forest isolate villages from each other. Telephone communications reach most large islands, and many small ones. However there may be only 2 or 3 telephone sets on an island. Tele-radios are unreliable and there are at most only a few receivers on any island.

17. Most rural villagers' only regular communication with outside areas comes as public radio broadcasts. The limited road networks are mainly on the lowland areas of larger islands, as the highly dissected terrain of inland areas creates problems for road construction. Coastal shipping services the central islands regularly, but the outer islands very irregularly. Vanair provides daily passenger and cargo flights between Efate, Tanna, Malekula and Santo, in 18 seater planes, but many smaller or more remote islands are served only 2 or 3 flights per week. Smaller islands may not have airstrips.

18. The climate is characterized by high rainfall and humidity and high temperatures which remain generally uniform throughout the year. However, the country experiences severe tropical cyclones during the summer months of December to February, and is also vulnerable to anomalously long dry spells associated with the El Nino (warm) phase of the El Nino-Southern Oscillation (ENSO) phenomenon. Vanuatu is also highly vulnerable to other extreme climate events including, for example, coral bleaching associated with high ocean surface temperatures and/or extremely low tides. The impacts of climate-related events are felt right across the nation's economic, social and environmental systems, thus making future changes in climate, including extreme events, an issue of great concern nationally.

19. Vanuatu also experiences frequent earthquakes and seismic activity due to its location along the "Pacific Ring of Fire." The entire island chain is affected by the convergence of two tectonic plates at a rate of 9 cm per year. This gives rise to Vanuatu being uplifted at a rate of 4 cm per year. Thus volcanic eruptions are frequent spewing out thick ash which is often cemented by rainfall. Thus the geology of Vanuatu is basically basalt resulting from the build up of shield volcanoes and lava flows, with outlays of limestone from coral buildup and compacted volcanic ash.

20. The economy of the country can best be described as dualistic, with a large smallholder subsistence agricultural sector and a small monetized sector. Thus island economy is based primarily on small-scale agriculture which provides for over 65% of the population. Fishing, offshore financial services and tourism also provide much of the government revenues. National gross domestic product in 2003 was estimated at US\$580 million with per capita GDP at US\$2,900. As a proportion of GDP, agriculture provides 26%, industry 12% and services 62%. The main agricultural products are copra, coconuts, cocoa, coffee, taro, yams, fruits and vegetables, beef and fish.

21. Agriculture and tourism are the principal productive sectors and nearly all domestic exports are primary goods such as copra (26% in 2003) and cocoa (11% ). Cocoa exports however declined from 7% in 2003 to 3% in 2004 reflecting the damage to tree crops caused by Cyclone ivy in early 2004. Tourism is an expanding industry as tourist arrivals increased by 25% in 2003 from 1997 levels. This increase was partly due to increase in airline capacity in 2004.

22. In terms of infrastructure, Vanuatu has 31 airports (3 paved and 28 unpaved) and approximately 1,070 km of roadways (i.e. 256 km paved and 814 km unpaved), and three main ports and terminals, Forari, Port Vila and Santo.

#### Ratification of the UNFCCC

23. Vanuatu ratified the UN Framework Convention on Climate Change (UNFCCC) on 09 March 1993, and has submitted its Initial National Communication (INC) to the UNFCCC on 30 October 1999. 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 mainstream climate change issues into the national legal frameworks. Moreover, its INC provides compelling evidence that, by global standards, Vanuatu is one of the nations most vulnerable to climate change and sea-level rise.

24. Ratification of the UNFCCC is one step forward in terms of commitment to addressing climate change and related issues. Vanuatu is also a Party to many other UN conventions, such as those, among others: biological diversity, biosafety, persistent organic pollutants, and combating desertification. The country has also ratified the Kyoto Protocol on 17 July 2001.

25. Since the completion and submission of the INC, Vanuatu has embarked on the implementation of sustainable development programmes which have strong linkages to its reporting commitments under other multilateral environmental agreements. These reports include its contribution to World Summit on Sustainable Development (WSSD) and Johannesburg Plan of Implementation (JPOI), Barbados Programme of Action for Small Island Developing States (BPoA) and the International Meeting on the Review of the Barbados Programme of Action (IM), National Strategy and Action Plan (NBSAP) under the Convention on Biological Diversity (CBD).

26. It is currently implementing a programme to identify its urgent and immediate needs for adaptation to climate change which will culminate in a National Adaptation Programme of Action (NAPA). With the support of the GEF, Vanuatu has also embarked on the identification of its capacity building needs relating to the implementation of the UNFCCC, CBD and the UNCCD through National Capacity Self-Assessment.

#### SUSTAINABLE DEVELOPMENT STRATEGY

27. The Government of Vanuatu (GOV) has adopted a Comprehensive Reform Programme (CRP) in 1997 to pursue improvements in governance and strengthen institutions which culminated in the development of Priorities and Action Agenda (PAA) for the country in 2003. The PAA was developed to integrate and prioritize actions identified within the CRP. The PAA has the following priorities:

- a) Improving the lives of the people in rural areas by improving service delivery, expanding market access to rural produce, lowering of credit and transportation, and ensuring sustainable use of natural resources;
- b) Raising private investment by lowering obstacles to growth of private enterprise including lowering costs of doing business, facilitating long-term secure access to land, and providing better support services to business;
- c) Increasing equity in access to income and economic opportunity by all members of the community. Specific areas of focus include: enabling universal; access to primary education by school-age children, universal access to basic health services, and inducing increased employment opportunity for those seeking work;
- d) Improving governance and public service delivery by providing policy stability and fiscal sustainability via a strengthened law-enforcement and macroeconomic management capacity and a small, efficient, and accountable government; and



- e) Enabling greater stakeholder participation in policy formulation by institutionalizing the role of chiefs, non-governmental organisations, and civil society in decision-making at all levels of government.

28. The PAA prioritizes actions covering all the main development sectors, including:

- a) Agriculture, forestry and fisheries
- b) Tourism
- c) Manufacturing and Private sector development
- d) Investment, Trade and Ni-Vanuatu Business Development
- e) Geology and Mines
- f) Meteorological Services
- g) Health
- h) Education
- i) Police and Vanuatu Mobile Force
- j) Immigration
- k) Transport
- l) Utilities: Electricity and Water, Telecommunications
- m) Population
- n) Environment
- o) Disaster Management and Risk Reduction

## **2.2 Stakeholder Analysis**

### Process and approach used

29. The consultations on Pacific Adaptation to Climate Change (PACC) were conducted by the PDFB team<sup>1</sup> and involved eight stakeholder consultations and workshops and several focus group meetings. Three approaches were used to solicit and collect information from various ministries, agencies, institutions of government and non-government organizations:

- 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 institutions of government and non-government organizations,
- c) A national consultation workshop on PACC priorities.

30. The consultations were focused on the activities relating to adaptation and other related 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 issues 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

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<sup>1</sup> Chief Technical Adviser, UNDP Programme Officer and GEF Expert Consultant

31. A total of nine ministries, agencies and institutions of government in Vanuatu involving 21 experts were consulted during the in-country consultations and workshop. These consultation workshops provided the opportunity for all individuals and organizations to be informed about PACC objectives, priorities and activities and also to consider some of the common elements or priority activities for adaptation implementation. The consultation meetings were usually carried out over 1-2 hour sessions. Thus, in total 12 hours of consultations were held spread over five days.

32. The PACC Consultation Team paid courtesy visits to the Chair and Vice Chairman of the National Advisory Committee on Climate Change, Mr. Ernest Bani (Director of Environment) and the Mr. Jotham Napat (Director of Meteorology). Briefing from the PACC Team emphasized the need for Vanuatu to firm up very early in the week on the priority thematic area for PACC it would like to focus on. The PACC project focuses on three thematic areas (water resource management, coastal management and infrastructure and food production and food security) and Vanuatu was encouraged to choose a thematic area it would like to work on under the PACC so that consultations would be much more focused.

33. Following some discussion on the thematic areas it was suggested that given the information and other sustainable development projects that are currently being implemented in Vanuatu PACC should focus on coastal management and associated infrastructure. This recommendation was based on the following considerations:

- a) In the area of water management, several donors are already providing support in that area. The Japanese government, NZAID as well as SOPAC's Integrated Water Resource Management (IWRM) will be supporting the water sector.
- b) In the case of the food production and food security programme of government, the Technical Corporation Programme (TCP) of FAO, SPC's DSAP project, the Chinese government support on off-season vegetable production and the EU support on cassava to flour programme are some of the donor funded programmes addressing the issue for Vanuatu.
- c) The infrastructure has just recently got some funding from the USAID Millennium Development Fund to support infrastructure programmes in Efate and a few small islands.
- d) Majority of the outer islands of Vanuatu are facing serious coastal erosion problems particularly on infrastructure caused by storm surges and coastal flooding;
- e) Public Works Department have done assessments of the storm damages on their outer islands infrastructure and the vulnerabilities that the people are facing; and
- f) Co-financing of PACC activities can easily be solicited from their current and future rehabilitation budgets.

34. Mr. Bani informed the PACC Team that it would be important for a programme to address integrated water resource management for Vanuatu. Most of the programmes that are currently implemented in the water sector focus mainly on getting water to the people but not addressing issues such as deforestation in the watershed area, encroachment of agriculture into the watershed etc.

35. The PACC Team informed the NACCC Chair and Vice Chair that to avoid duplication of efforts, it was suggested that the issue of watershed management and integrated water resource programme be raised with SOPAC's Integrated Water Resource Management project team for their consideration. They

would be carrying out national visits shortly to develop project activities that look at how water can be managed better from the watershed to the coast.

## **Public Works Department**

36. A preliminary meeting was carried out with Mr, Denis Alvos a road engineer with the Public Works. He informed the PACC Team that the Public Works had carried out a national inventory of the status of outer island roads and have found that most are in need of serious rehabilitation. PWD have over the years set aside Vatu 1 million for coastal infrastructure rehabilitation and it is a continuous effort. In some of the islands, whole sections of the road were already washed away due to high-energy wave actions that accompany cyclones and storms.

37. Given the focus of the PACC, they suggested that coastal management and infrastructure is an important area that needs a lot of support particularly with the damage caused by strong wave actions on the coastal roading infrastructure. There is not much support currently given to the coastal infrastructure area for Vanuatu by international donors and they believe it is about time given the problems the coastal infrastructures are already facing. It was only recently that the Government was able to secure about USD 65.69 million under the Millennium Development Challenge Fund that will be supporting roading infrastructure in the Island of Efate, Luganville and Malekula. The rest of the islands of Vanuatu will not covered by these programmes whilst they are also very much in need for support.

38. National roads around Epi are foreseen to suffer from the impacts of climate change such as increased precipitation and flooding, intense wave action and coastal erosion as a result of sea level rise. Currently, the adverse effects of climate change on the roads are starting to be seen and felt as roads are becoming more and more impracticable and eroded, despite regular maintenance and rehabilitation by the government. Due to its critical economic value and crucial role as a lifeline for vulnerable communities along Epi's coastline, the national road in Epi has been suggested as a priority area for the PACC focus in Vanuatu.

39. It has been agreed that the proposed focus for Vanuatu is to increase the resilience of coastal roads, resources and human settlements to the impacts of climate change with the proposed pilot to be located in Epi, Shefa province. Lessons learned from the pilot, recommendations and design of follow-up projects will complement the pilot and will produce recommendations and follow-up schemes for Vanuatu for potential replication on a wider scale and integration of climate change risk management in coastal road design and planning.

**STAKEHOLDERS AND INSTITUTIONS CONSULTED**

Institution	Stakeholders interests/responsibilities	Relevance to climate change/reasons for inclusion	Role in the Consultation process
<b>GOVERNMENTAL INSTITUTIONS</b>			
<p>MINISTRY OF INFRASTRUCTURE AND PUBLIC UTILITIES- VANUATU METEOROLOGICAL SERVICE</p>	<p>Operational focal point of the UNFCCC.</p> <p>Responsibilities:                      - Monitoring of past and local weather and climate conditions                      - Provide meteorological information – warnings on severe weather or climate conditions,</p>	<p>Climate Change Unit, established within VMS.</p> <p>Secretariat to National Advisory Committee on Climate Change.</p> <p>Responsible for preparation of the INC and SNC and its submission to the CoP</p> <p>Responsible for NAPA preparation in collaboration with other relevant agencies</p>	<p>Consultations with the UNFCCC focal point for discussion of PACC priorities for Vanuatu in terms of technical issues, opportunities for synergy among various projects and institutional arrangements.</p> <p>Consultation on the provision of climate data and information as well as on the needs for capacity-building, training and research (collection, analysis and archiving) and dissemination of information</p> <p>Consultations on issues relating to technologies data and information for research and systematic observations (contribution and participation in global research and observing.</p> <p>Consultations on arrangements for stakeholder consultations on PACC priorities.</p>
<p>MINISTRY OF LANDS, GEOLOGY, MINES, ENERGY, ENVIRONMENT AND WATER RESOURCES</p>	<p>Operational focal point of the GEF</p> <p>Responsible for land management and all matter relating to land, natural resources and environment</p>	<p>Environment Unit placed within ministry</p> <p>Member and Chair of the National Advisory Committee on Climate Change</p>	<p>Consultations on national priorities, mainstreaming of climate change in national environmental strategies, programmes and other documents, as well as on current and planned projects.</p>
<p>MINISTRY OF AGRICULTURE, FORESTS AND FISHERIES</p>	<p>It is in charge of issuing identification documents; performing inspection over the work of the entities in the communal area, issuing building permits, and preparation of regulation related to isolation</p>	<p>In charge of sustainable transport, preparation of new standards for efficient building, and relayed issues that will be used in the GHG Abatement in the residential and commercial sectors.</p> <p>Member of NACCC</p>	<p>Consultation with regard to the issues related to agriculture, forestry, fisheries.</p> <p>Consultation on data needs food production, food security and import/export substitution regarding agricultural crops, forest and fisheries.</p>

<b>Institution</b>	<b>Stakeholders interests/responsibilities</b>	<b>Relevance to climate change/reasons for inclusion</b>	<b>Role in the Consultation process</b>
			Consultations on identifying synergy with other projects such as DSAP and TCP/Food security projects and possibilities for co-financing
MINISTRY OF HEALTH	Responsible for surveillance and early warning for vector-borne and water-borne diseases  The relationship between climate change (rainfall and temperature) and the incidence of vector-borne and water-borne diseases  Mosquito (malaria) monitoring programme	Member of the National Advisory Committee on Climate Change  Has collaborated with VMS on public awareness on the effects of climate variability and extremes as well as community vulnerability and adaptation assessments.	Consultations on information and data on the health effects of changes in rainfall and temperature  Provision of health statistics relating to climate-related stresses (diseases).
MINISTRY OF FINANCE AND ECONOMIC MANAGEMENT	Responsible for integrating climate change issues and concerns into national planning	Member of NACCC  Developing a national climate change policy	Consultations on the progress made on national climate change policy and priority action agenda for the government and on potential co-financing from other projects
MINISTRY OF TRADE AND INDUSTRY – CHAMBER OF COMMERCE	Responsible for advising and/or creating business opportunities for the private sector	Assist agriculture and forest sectors on agroforestry and reforestations programmes	Consultations on the provision of data and information on land use and forestry
MINISTRY OF FOREIGN AFFAIRS	Responsible for multilateral environmental agreements,  National Focal Point for the GEF and UNFCCC	Member of NACCC	Consultations on role of GEF and UNFCCC Focal Points in implementation of the PACC activities.
PUBLIC WORKS DEPARTMENT	Responsible for infrastructure development and planning (roads, bridges, wharves, airports, port facilities, etc)	Involved in rural road projects and other infrastructure projects	Consultations on data and information on the status of coastal roads in the outer islands of Vanuatu.  Possible project priority identification – suggesting PACC to focus on road redesign and redevelopment on Epi Island.  Further consultation on fieldtrip to Epi to collect information and data for the road and coastal zone management project as part of PACC activities.  Discussions on possible co-financing opportunities
NATIONAL DISASTER AND EMERGENCY MANAGEMENT OFFICE	Responsible for disaster relief, preparedness and management	Member of NACCC	Consultations on information and data on climate-related disasters and post-disaster assessments

40. In order to collect more information on the road infrastructure on Epi Island a field trip to Epi Island was conducted with personnel from the Public Works Department (PWD) and the Meteorology Department from August 09 to 11, 2006. The purpose of this Epi field trip was to gather detailed information on the proposed pilot. Based on maps and preliminary information, a relocation of a portion of coastal roads in Epi has been proposed as the PACC pilot for Vanuatu. Further details on Epi's coastal roads and adjacent coastal zones would be needed to further design this pilot.

41. While coastal infrastructures in Epi may be the focus of the PACC in Vanuatu, it has been noted that a holistic approach is to be taken to ensure that the resilience of coastal infrastructures and the adjacent vulnerable communities are synergistically addressed. Soft accompanying measures are required to ensure this synergy and ensure the sustainability of the road relocation pilot.

### **Disaster Management**

42. The discussion with the Disaster Management Officer (Job) provided a snapshot of the programmes of the disaster office in Vanuatu. From the discussions held it was clear that the disaster community is slowly moving into disaster risk reduction now instead of focusing largely on rehabilitation. Reactive approach has been a practice for a long time and it is about time that more effort is put into preparedness. He informed the PACC Team that a disaster management high-level advocacy team consisting of representatives from the World Bank, regional organisations; SOPAC, FORSEC, and SPREP and other consultants visited the Prime Minister of Vanuatu and carried out a week-long meeting on mainstreaming of disaster risk management. As a result, it was agreed that a parallel paper on disaster risk reduction would be developed to accompany Vanuatu's Priority Action Agenda (PAA) 2006-2015.

43. Mr Job indicated that there can be a close working collaboration between the PACC project and the disaster management programme in the area of risk mapping. This was an area that they have expertise on and could provide technical support to the PACC. This was very much welcomed by the PACC Team and they would work on developing activities for the pilot sites taking into consideration the suggestion made by the Disaster Management Office.

### **Economic Planning**

44. Discussion was also held out with Mr. Jerry from the Economic Planning Section of Government who informed the PACC Team that the current Priority Action Agenda (PAA) for Vanuatu has been developed and about 5,000 copies had been printed. The new PAA according to Mr. Jerry focuses on macro-level policy issues while the details on sectoral programmes will have to be included in the sectoral policies of line ministries.

45. Mr. Jerry also pointed out that there will be a rolling Mid-Term Strategic Framework (MTSF) to be developed which will focus on the development programmes in a strategic fashion. The current MTSF is only for 2004-2005. He pointed out that it would be important to mainstream climate change at the MTSF as well as the sectoral plans in more details.

## **Agriculture Department**

46. A meeting was also held with Ms Annick Stevens, Food Security Officer of the Agriculture Department. She is charged with coordinating the food security programme especially the conduct of awareness and training programmes at the community or inter-departmental levels. The Agriculture Department hosts three main donor-funded programmes: Development of Sustainable Agriculture in the Pacific (DSAP), supported by the Secretariat of the Pacific Community under funding from the European Union. DSAP focuses on sustainable agriculture; a Chinese government-funded programme on vegetable production focusing on improving the longevity of vegetable growing seasons; and the Food and Agriculture Organization's (FAO) Technical Cooperation Programme (FAO/TCP) focusing on food security through building of storage infrastructures and food preservation to minimize wastage.

47. Ms Annick pointed out that there are two main issues that she feels has a climate change angle and that is drought and increase in the incidences of pests. She feels that there is an increase in pest and diseases right now but she believes the Chinese vegetable programme and FAO/TCP programme are already covering this area sufficiently at present. However, in the case of lack of precipitation (drought), she believes this is a gap that needs some support.

## **Health Department**

48. The PACC Team also met with Mr. Morris Amos, the Public Legislation Officer for the Health Department. He indicated that for the Health Department, they have a disaster response plan in place that covers all aspects of hazards. He pointed out that their current Malaria programme has a climate angle. It is a disease that correlates well with precipitation and currently they are carrying out a Japanese funded programme to look at eradication on the island of Aneityum which is close to what is termed technically as a 'Baxton Line' or breeding zone of Anopheles or malaria carrier mosquitoes.

## **Wrap up meeting in Vanuatu with the NACCC**

49. The PACC team presented their findings at a luncheon meeting with the NACCC. The agenda focused mainly on the proposed focus for Vanuatu as well as the proposed institutional arrangements. Issues that have been raised and agreed upon included:

- a) The endorsement by NACCC to focus on Coastal Zone Management and its associated infrastructure thematic area for PACC in Vanuatu as well as the proposed pilot location in Epi. It has been noted that as Epi is fast growing, addressing the proposed road relocation project is an urgent priority for Vanuatu;
- b) The appreciation of NACCC that this pilot project will focus on actual implementation of adaptation activities rather than further assessment work as with many enabling activities in currently being conducted in the country;
- c) The expected size for Vanuatu's pilot is around USD750,000.
- d) The expected ratio for co-financing to be applied in this pilot project is 1:4 (i.e. for every dollar of the GEF resources there should be four dollars from other sources).
- e) On institutional arrangements, the NACC has endorsed that the project management unit be set up directly under the PWD, with the NACCC as the advisory body on technical and management issues. The terms of reference (TOR) for the PMU and management

arrangements will be developed and will include a provision for the PMU to be accountable to the NACCC, UNDP and SPREP for the project.

### **2.3 Climate change programmes, project and activities**

50. A number of climate change programmes, projects and activities have been carried out in Vanuatu since the entry into force of the UNFCCC. Vanuatu 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. Vanuatu prepared its initial national communication and submitted it to the COP in November 1999.

51. The second major climate change programme implemented in Vanuatu was part of a project titled Capacity Building for Development of Adaptation Measures in Pacific Islands Countries (CBDAMPIC), which was also implemented in three other countries: Cook Islands, Fiji, and Samoa. This project, funded by the Canadian International Development Agency through its Climate Change Development Fund, enabled Vanuatu to relocate a village community from the coastal zone affected by sea-level rise and coastal erosion and flooding from storm surges to an in-land location.

52. At present Vanuatu has been preparing its national adaptation programme of action and the national capacity self-assessment to identify its capacity needs relating to individual, institutional and systemic capacities to implement the UNFCCC, CBD and the UNCCD. NAPA will help identify urgent and immediate needs for adaptation to climate change that will be implemented with funding support from the least developed countries fund.

53. Vanuatu has also participated in the international negotiations on climate change since 1989 when the council of ministers adopted a resolution to establish a National Advisory Committee on Climate Change (NACCC). This constituted body provides scientific, technical, and policy guidance to and oversight on various aspects of climate change programmes, projects and activities in the country.

54. Given that the threat of climate change for Vanuatu is no longer an issue for the future as extreme climate related events are being faced today in climate sensitive sectors, a project titled Vanuatu Climate Change Adaptation Project (VCCAP) has been developed to improve and strengthen capacities and capabilities of rural communities to adapt to the adverse impacts of climate change consistent with its sustainable development policies. Funding for this project is being sought from the government of Australia through its Australian Agency for International Development (AusAID).

#### **VULNERABILITY AND ADAPTATION**

55. Within the context of Vanuatu's initial national communication a vulnerability and adaptation assessment was conducted to determine what is known about the possible effects of climate and sea-level change, possible adaptation to these effects and the resultant vulnerabilities in Vanuatu; identify gaps in knowledge in determining climate and sea-level change effects, adaptation options and vulnerability; and identify national needs and priorities to prepare for climate and sea-level change.

56. Climatic scenarios for Vanuatu have been modeled on the SCENGEN scenario generator with two Global Circulation Models: HADCM2 and CSIRO9M2. The model results were compared with



analogue predictions based on observation of past trends. The two climate change scenarios predict increases in temperature of between one and two degrees up to the year 2050. However they present quite different scenarios with respect to rainfall while the accepted sea-level increase is 50 cm over the next 100 years.

57. Observational data for Vanuatu is limited but records essentially began about 1949 for Efate and 1973 for Luganville, the country's two urban centre. Trends suggest a gradual increase in temperature that is more marked in the south. Records from both centres suggest a gradual decline in rainfall. There has also been a significant increase in the frequency of tropical cyclones in the country as a whole over the record period, although this trend could be influenced by improved recording of such events since the introduction of satellite tracking technology.

58. Since 1939 a total of 124 tropical cyclones had affected Vanuatu, 45 (36%) of these were categorized with hurricane force winds (64+ Knots), 26 (21%) were of storm force winds (48 to 63 Knots) and 25 (20%) were of gale force winds (34 to 47 Knots). Additional 28 tropical cyclones were not categorized. Over six decades since 1939, the number of tropical cyclones in Vanuatu area has increased significantly from 9 to 29, consistent with evidence of increasing frequency of tropical cyclones.

59. On the basis of climate scenario modeling and historical/observational trends it is reasonable to assume that climate change over the next century will lead to warmer and drier conditions in much of Vanuatu with the size of the change increasing away from the equator. However the possibility of increased rainfall should not be dismissed. These effects will be accentuated by more frequent and severe cyclone events. Heavy rainfall is a normal component of cyclonic storms so a greater proportion of rain will be associated with the passage of storms. The HADCM2 model indicates there may be more frequent El Nino type conditions associated with prolonged dry seasons.

60. Vulnerability and adaptation assessments were carried for the following development sectors pertinent to PACC project in Vanuatu: agriculture, water resources, and coastal environments. Agriculture often relies on rain-fed agricultural production systems. Thus, changes in rainfall, and in particular the projected scenario of overall rainfall decline, a greater proportion of rain falling in association with high intensity storm events during the wet season, increased evaporation and more pronounced dry seasons, could have severe impacts on agricultural production. Intense rainfall in planting seasons could damage seedlings, reduce growth and provide conditions that promote plant pests and diseases. More pronounced dry seasons, warmer temperatures and greater evaporation could stress plants reducing productivity and harvests.

61. Vanuatu has limited surface water and villagers on many islands and residents of both urban areas are dependent of ground water. Increased temperatures are likely to increase the demand for potable water. However increased heat, greater run-off from high intensity rainfall events, decreased rainfall and an associated increase in evaporation could reduce the rate of ground water recharge and decrease surface water flows. Water shortages already apparent in dry seasons would become more pronounced and may require more sophisticated water distribution networks to maintain human populations in severely affected areas. Higher intensity rainfall events could increase turbidity in surface waters decreasing their suitability for domestic purposes.

62. Any increase in sea level could cause salt-water intrusion into the shallow ground water lens in coastal areas, particularly if ground water recharge was reduced or water over-extracted. This affect

would be most problematic in small low-lying islands that are dependent on shallow ground water aquifers.

63. National investments in infrastructure and agriculture are primarily in low lying coastal areas around the perimeter of the major islands. The commercial centres of both Luganville and Port Vila in particular are both built on land only a few metres above sea level. The infrastructure and fixed assets of both centres are vulnerable to cyclone damage and associated storm surges, and may be affected by quite small increases in sea level or increased frequency and intensity of tropical cyclones.

64. 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 effects of sea level rise. A map of coastal areas less than 3 metres above sea level was not available for this report but can be determined using data held in the Lands Survey Department. Localized areas thought to be of particular concern include:

- a) the low-lying islands of the Torres Group of Islands; areas such as Mele on Efate island where sand extraction from coastal dunes and development pressures has increased the potential for impacts through coastal erosion;
- b) areas such as east-Ambae where localized subsidence has led to salt water flooding of low-lying coconut plantations;
- c) Areas already experiencing coastal erosion such as the Shepherds Islands.

65. While there is inadequate climate and economic data to quantify the socioeconomic impacts of climate change the physical effects described above raise a number of concerns: Food security, Vanuatu's high rate of population growth is increasing demand for both subsistence and commercial agricultural production. Climate change impacts on crop growth and productivity could have locally severe implications for food security and human nutrition and health. It will also affect Vanuatu's agriculture based export earnings.

66. Population growth, particularly in urban areas, has already placed pressure on water resources and supply services. Climate change is likely to increase demand for water and yet reduce the quality and affect water sources. This has implications for water source management, the development of human populations and human health and wellbeing. It must also be considered in planning for industrial development, as most industrial activities are heavy water users.

67. Projected climate change scenarios are likely to lead to increases in a number of tropical and vector borne diseases, and increased health problems through contamination and deterioration in water quality. Health services are already a major expense item for government.

68. Damage to public infrastructure and fixed assets - Replacement and maintenance of public infrastructure and fixed assets in coastal areas could become a costly burden to Vanuatu's small economy and a hindrance to social development.

69. Ni-Vanuatu society and culture is based on a complex environmental and social inter-relationship. Changes to this traditional social system, coupled with any decrease in food security and water availability, could lead to deterioration of social systems and law and order.

70. The affects of climate change on agriculture production, human health and well being will have the consequences of decreasing national income while increasing key social and infrastructure costs. This negative economic impact will flow through to affect all aspects of the private and government sector.

#### ADAPTATION

71. Subsistence and commercial agriculture are based on a small number of commodities. Diversification of crops will help increase the resilience of agricultural systems to climatic extremes. b. In general commercial horticultural and livestock species are relatively well understood, whereas the productivity, growth requirements and pathogens of the varieties of different subsistence food crops are poorly understood. Better understanding of the horticulture of subsistence food crops will provide a foundation for adaptation by enabling the selection and promotion of crop varieties suited to changed climatic conditions or resistant to particular pathogens. Crops of particular interest include yam, taro, manioc, kumara, banana and island cabbage. Such work would have the added benefit of increasing food security and identifying new market opportunities.

72. Rural families rarely purchase seed or propagation material. Rather they select good seed or propagation material from one year's plantings to store and plant the next growing season. This ongoing process of crop selection strengthens the capacity of ni-Vanuatu agriculture to adapt to gradual changes in climate such as may be expected under GHG scenarios. It can also help to foster the development of new more productive crop varieties.

73. Management of water catchments so as to maintain water quality and maximize groundwater recharge will minimize climate change impacts on water resources while providing immediate human benefits in areas that already suffer seasonal shortages and helping to maintain environmental quality. This could be achieved through integrated planning efforts involving rural landholders, provincial authorities, and departments of lands, agriculture, forestry, mines, water supply and environment or by legal or administrative restrictions on activities impacting on water catchments. Catchment management initiatives would have wider environmental benefits, including reduced erosion and soil loss, maintenance of biodiversity and land productivity.

74. Improved management and maintenance of water supply networks to reduce wastage will also reduce vulnerability in both urban and rural areas. This will require training in maintenance of taps, tanks and pipes and access to appropriate hand tools.

75. Extension initiatives that promote water conservation and moderate usage, while raising awareness of the importance of water resource management, will also help to maintain long-term water supplies. Introduction of policies to extract freshwater from coastal aquifers only where there are no feasible alternatives would reduce the vulnerability of coastal communities and reduce the need to replace infrastructure should salt water intrusion occur . Expansion of rainwater storage capacity, frequently through the installation of water tanks will reduce the vulnerability of communities in times of water shortage.

76. Land use and physical planning mechanisms provide a means for municipal and provincial governments to minimize the impacts of climate change and sea level rise on infrastructure, human settlements and agriculture.

- a) Modeling of the storm surge zone, taking into consideration possible sea level rises, provides a powerful tool for reducing vulnerability. Planning mechanisms can be used to direct all new

- investments in infrastructure, housing construction and agriculture outside this zone to minimise vulnerability, reduce repair costs and decrease disruption to economic activities.
- b) Planning initiatives could require that infrastructure, including bridges, roads, wharves, communication services etc., be engineered so as to withstand cyclone, high floodwater flows and high intensity rainfall.
  - c) Exclusion of extractive activities from the coastal zone, including sand extraction and mangrove enables these areas to provide a protective buffer from impacts of coastal erosion. Replanting littoral vegetation in cleared or degraded areas would restore their coastal protection benefits.
  - d) Disaster planners can help communities prepare for worst case impacts by identifying coping strategies. This will require identification of locations of high vulnerability, awareness raising initiatives to help local communities make appropriate decisions about their own futures and technical planning for relocation should this be required.

77. Vanuatu's vulnerability to climate and sea-level change will be determined by the decisions that are made today with respect to the management of resources and the nature of social and economic development, as much as the magnitude of effects and the effectiveness of specific adaptation measures. Vanuatu is in a position to adopt pro-active adaptation strategies that can be implemented immediately and sustained over coming years to effectively reduce vulnerability to the future impacts of climate change.

78. The statement above is consistent with the statement made by the President of the Republic of Vanuatu in opening the first National Conference on National Adaptation Programme of Action in January 2005. Most pertinent in his speech is the following statement: "By reducing the vulnerability of Vanuatu's vital sectors and communities now to current climate-related risks should place the country in a better position to cope with future climate change and to build sustainable ni-Vanuatu communities. The ideal approach to adaptation in Vanuatu is a pro-active, no-regrets approach which encompasses measures and strategies which can be implemented in the present with the aim of reducing vulnerability in the future. A no-regrets approach is one which would be beneficial to Vanuatu even in the absence of climate and sea-level change." A pro-active, no-regrets approach to adaptation will be the basis for adaptation implementation under PACC in Vanuatu.

### **III. SECTORAL ANALYSIS**

79. 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 the countries have been encouraged to focus only one of the three development sectors where adaptation intervention would be essential. The in-country consultations would also determine detailed adaptation activities and baselines in each country.

#### **3.1 Methodology/criteria for selection of priority sector**

80. Given that PACC would only support 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 Vanuatu 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.

81. Based on these three criteria and on the stakeholder consultations (see section 2.2) coastal zone management and its associated infrastructure was selected as a priority sector for adaptation intervention in Vanuatu under the PACC project. Under this theme, an adaptation project entitled "*Piloting climate change adaptation in the coastal zones in Vanuatu*" was proposed. This project would focus on enhancing, and where necessary, developing roading infrastructure design on Epi Island, Shefa Province. The basic tenet is that the current road design infrastructure on Epi Island not able to cope with changes in rainfall regimes and sea-level changes leading to damage by coastal erosion thereby affecting the transport of agricultural produce to markets as well having adverse effects on livelihood of communities on the island.

82. At present there is limited integration of climate change adaptation into sectoral development planning and budgeting processes relating coastal zone management and its associated infrastructure and it is hoped that a project such as this will sensitize decision-making that will integrate climate change concerns into planning and budgetary processes over the long term.

### **3.2 Assessment of priority sector for adaptation activities**

83. As was indicated earlier, most of the national investments in infrastructure and socio-economic activities are primarily in low lying coastal areas around the perimeter of the major islands. The commercial centres of both Luganville and Port Vila in particular are both built on land only a few metres above sea level. The infrastructure and fixed assets of both centres are vulnerable to cyclone damage and associated storm surges, and may be affected by quite small increases in sea level or increased frequency and intensity of tropical cyclones.

84. 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 a number of low-lying areas which would be under serious threat from sea-level changes including the low-lying islands of the Torres Group of Islands; areas such as Mele on Efate island where sand extraction from coastal dunes and development pressures has increased the potential for impacts through coastal erosion; areas such as east-Ambae where localized subsidence has led to salt water flooding of low-lying coconut plantations; and areas already experiencing coastal erosion such as the Shepherds Islands.

### **3.3 Current institutional and development baseline in priority sector**

85. As with many countries, roads are the primary and preferred mode of transport to access basic facilities (including health and education), and for providing transport routes to markets for cash crops

and small rural enterprises in Vanuatu. However, given the sparsely populated nature and topography of Vanuatu, a comprehensive road network for all communities is not realistic. The Ministry of Infrastructure and Public Utilities (MIPU) is responsible for the construction, supervision and maintenance of all public infrastructures.

86. Major (national) roads (including construction and maintenance) are the responsibility of the Public Works Department, MIPU. Road network has grown little since 1989 although several donor-funded road projects have been undertaken during the same period. Some roads have been built without economic or social justification which means they were not likely to bring the economic or social returns.

87. Further, while roads continue to be constructed yet there is no up-to-date list of road assets of the country. Updating of this inventory together with an assessment of the rehabilitation or ongoing requirements is a priority in the development of Vanuatu Infrastructure Masterplan. Adequate maintenance of roads is often constrained by the uncertainty over who is responsible for road maintenance. National roads in major urban and rural areas are considered to be under the responsibility of the PWD and secondary and feeder roads are thought to be the responsibility of Provinces and Municipalities. Thus a clear declaration needs to be made as to who is responsible for which road, or section of road. An additional constraint to maintenance is the small size and remoteness of most roads in the islands.

88. Government policies and strategies in the road transport sector<sup>2</sup> emphasize the need to maintain the road network and to construct new roads with demonstrable economic benefits. Thus government will:

- a) Declare which roads constitute the national road network, and are therefore the responsibility of the National Government, which roads are the responsibility of the Municipalities, and which roads are the responsibility of the Provincial Governments;
- b) Develop a national road maintenance programme with priorities set according to the expected economic benefit from maintenance;
- c) Provide adequate funds through the recurrent budget for such a road maintenance programme and explore the possibility of a road maintenance fund;
- d) Assist municipalities and Provincial Governments to develop similar maintenance programmes; and
- e) Build new roads where there is a demonstrated economic and socio-cultural need; when there is capacity to allocate adequate resources for their maintenance; and when a new road would provide greater benefit than maintenance or reconstruction of an existing road.

89. Additionally, the rural road sector is being examined as part of the outer island infrastructure development study<sup>3</sup>. The study will, among others, examine the need for new construction or priorities existing maintenance needs for road networks that directly support economic developments.

90. Vanuatu is the only Pacific island country recipient of the USD 65.69 million Millennium Challenge Corporation (MCC) funds which will focus on overcoming transport infrastructure constraints to poverty reduction and economic growth, specifically for rural areas. Under the MCC the funds will help fund eleven infrastructure projects including roads, wharves, airstrip, warehouses, institutional strengthening initiatives for enhanced maintenance capacity and help rural agricultural producers and

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<sup>2</sup> Public Road Act is yet to be passed by Parliament.

<sup>3</sup> The study had not started at the time this document was prepared.

providers of tourist-related goods and services by reducing transportation costs and improving the reliability of access to transportation services.

91. The island of Epi where the pilot adaptation to climate change project is set will benefit from the upgrading of Lamén Bay wharf and the construction of a warehouse through the MCC funding. Road construction or maintenance on Epi will not be covered by MCC. Thus, total funding by components include: transport infrastructure project US\$54.47 million; institutional strengthening for sustainability/maintenance US\$6.22 million and programme administration and audits US\$3.63 million over five years.

92. In terms of the impact of transport infrastructure project it is expected to increase average income per capita by US\$200, or 15% of current income per capita, by 2010, while GDP is expected to increase by an additional 3% a year as a result of the programme. The programme can be expected to benefit over 65,000 people living nearby and using the roads to access markets and social services (including education and health). The tourism sector will expand by 15% as a direct result which translates into 280 additional formal sector jobs and estimated 25 new locally-owned businesses each impacting on the lives of 1,300 people.

93. The economic internal rate of return for the overall programme is estimated to be 25% calculated over a 20-year time horizon. Expected benefits include; increased agricultural and fisheries production, induced tourism investment and expenditures, reduced transport operating costs, reduced infrastructure closure, reduced freight spoilage, value-added from storage warehouses, and maintenance cost savings. The upgraded roads transport network is expected to improve the quality of life of ni-Vanuatu living within the vicinity of the roads by improving access (lower costs and shorter travel times) to social services such as health centres and schools.

94. In an effort to apply the principles of the Comprehensive Reform Programme (CRP) a Shefa Provincial Rural Economic Development Initiative (Shefa REDI) was developed to promote economic growth in the provinces. This five-year plan focuses on commercial economic development (economic sectors) that will bring about significant economic growth in the cash economy of Shefa Province, building on a number of strategies including in partnership with the people of Shefa, Shefa Provincial Government, Central Government, investors, donors and NGOs. For example, if local cocoa producers want to get their crop to market they rely on the Department of Public works for the road, the Provincial Government for a business license, the Department of Agriculture for technical advice and the Department of Cooperatives and Business Development for marketing advice. They will also work with the Chamber of Commerce and possibly a producer's association. REDI provides a focal point for all of these different agencies so that they can ensure that their services reach the producers.

95. One of the main priorities of Shefa REDI is to “establish and maintain necessary infrastructure to boost rural economy. Communication development is crucial to facilitate trading between areas, islands and with other provinces. Thus one of the strategies is to develop and improve infrastructure, including coastal shipping, airstrips, wharves and jetties, new roads and maintenance of existing roads, community involvement in road building and maintenance, build airstrip in South Epi and construct new roads with Epi ring road and an air terminal at Valesdir on Epi Island.

96. Under Shefa REDI infrastructure development strategy construction of a wharf at Lamén Bay, road from Port Kwemi to Filakara, Port Kwemi to Nul and from Nikaura to Mate as well as bridges for a number of locations and maintenance of agricultural feeder roads on Epi Island are among action priorities for the Shefa Province. The construction of a wharf at Lamén Bay on Epi will be constructed

with funding from the Millennium Challenge Corporation, while additional funding either from donors or from government recurrent budget.

### **3.4 Impacts of climate change on the priority sector**

97. Vanuatu experiences on average 2.6 cyclones per year. A total of nine tropical cyclones have either directly or indirectly affected the infrastructure on Epi Island since 1941. In the event of extreme events (tropical cyclones, ENSO-related events) can set the economy of Vanuatu back by 5 years, as much of the funding and assistance is diverted towards national recovery. The rural sector is often affected most severely given their high dependence on their immediate environment. The most comprehensive assessment was conducted for Cyclone Ivy in 2004 which estimated a total cost at VT427.6 million. Cyclone Ivy affected 50,000 people and one fatality. 90% of water resources, 70% of roads, 60% of health infrastructure, 112 schools and over 80% of food crops were damaged. The assessment was focused on getting relief supplies and needs for communities met after the Cyclone Ivy so no indirect or macroeconomic impacts were estimated.

98. According to an analysis of insured losses from the private sector due to cyclone Uma in 1987 the losses were estimated at AU\$25 million while damage to government infrastructure was estimated at AU\$25 million. The flow-on effect on government finances increased fiscal deficit from Vt 635million (AU\$8.5 million) in 1986 to Vt797million (AU\$10.6 million) in 1987 due to high imports for reconstruction following Cyclone Uma.

99. As at June 2005, based on the short-term sea level rise analyses performed by the National Tidal Centre using the Port Vila SEAFRAME data, a rate of +4.5 mm per year has been observed. Accounting for the inverted barometric pressure effect and vertical movements in the observing platform, the sea level trend is +3.4 mm per year. By comparison, the Intergovernmental Panel on Climate Change (IPCC) in its Third Assessment Report (IPCC TAR, 2001) estimates that global average long-term sea level rise over the last hundred years was of the order of 1 to 2 mm/yr, significant lower than sea level trend in Vanuatu.

100. The effects of sea level change on the coastal sector are very obvious along the country's coast line and the increasing threat to human lives and vital coastal infrastructure such as roads cannot be overstated. The sea level change effects and threats are further enhanced by extreme events such as cyclones and associated storm surges. Recently, Vanuatu relocated an entire settlement in the extreme north of the country on the island of Tegua due to increased incidences of inundation, land loss and coastal erosion with assistance funding from the Canadian International Development Agency and the Secretariat for Pacific Regional Environment Programme.

101. Projections for future climate change in Vanuatu indicate that temperature will increase by 1.6°C by 2050 and by 2.5 °C by 2080, while rainfall will increase by 5% by 2050 and 7% by 2080. tropical cyclones are likely to become more frequent and more intense and ENSO-related events will become more intense. Sea-level is projected to rise between 9 cm and 88 cm by 2100.

102. In light of the current and projected impacts of climate and sea level change, the effects and the socio-economic costs for Vanuatu will be great in the absence of prior sound planning. Such can only be achieved through the incorporation of climate and sea level change considerations into national and sectoral planning and budgeting processes.



### 3.5 Methodology for assessing priority baseline

103. During the Vanuatu country consultation by the PACC team, it has been agreed to focus adaptation intervention on increasing the resilience of coastal roads, resources and human settlements to the impacts of climate change with the proposed pilot to be located in Epi, Shefa province. Lessons learned from the pilot, recommendations and design of follow-up projects will complement the pilot and will produce recommendations and follow-up schemes for Vanuatu for potential replication on a wider scale and integration of climate change risk management in coastal road design and planning.

104. A fieldtrip was organized and conducted by personnel from the Department of Public Works and Department of Meteorology on Epi Island. The purpose of this Epi field trip was to gather detailed information on the proposed pilot. Based on maps and preliminary information, a relocation of a portion of coastal roads in Epi has been proposed as the PACC pilot for Vanuatu. Further details on Epi's coastal roads and adjacent coastal zones are needed to further design this pilot.

105. National roads around Epi are foreseen to suffer from the impacts of climate change such as increased precipitation and flooding, intense wave action and coastal erosion as a result of sea level rise. Currently, the adverse effects of climate change on the roads are starting to be seen and felt as roads are becoming more and more impracticable and eroded, despite regular maintenance and rehabilitation by the government.

106. The fieldwork was conducted to ascertain the following:

- a) Climate Data in Epi, Shefa, rainfall data for the last 10 years with projection for the next 30 years and estimate of sea level rise in the next 30 years;
- b) Delineation of the sections to be relocated (no more than 10 km in total) using criteria such as impacts of climate change on the portion: what are the seen and foreseen impacts on the road given the climate data above, presence of human settlements: number of vulnerable communities along the sections to be delineated, crucial economic value: use as a lifeline for transports of goods, services and people and basic necessities, feasibility of the relocation and/or redesign with a drainage system capable of withstanding the expected increase in precipitation (with reference to climate data above)
- c) Activities and Costs- cost of original road section to be relocated (original costs from government allocation / donor funding), rehabilitation costs of the road section to be relocated for the last 5 years, estimated rehabilitation costs for the next 5 years
- d) Techniques of relocation/ redesign: what is proposed to be done to accommodate the impending effects of climate change (with reference to climate data above), cost of this relocation / redesign technique if applied to the road section;
- e) Cost of damage to the portion of road due to climate change and sea-level rise (i.e. during storm events, tropical cyclones and resulting storm surges/flooding);
- f) Accompanying measures - number of communities in the vicinity and estimates of population that will benefit from the road relocation, proposed community participation / contribution in the proposed road relocation e.g provision of materials such as sand, provision of labour;
- g) Proposed community activities to enhance the benefits of road relocation e.g: coastal afforestation;
- h) Proposed adaptation activities for at risk communities: e.g: village relocation, market relocation;

- i) Any community lifelines or businesses that will be improved, e.g. transport, church, schools and health centres/medical clinics, etc.

107. The information collected from Epi Island is presented below.

108. The island of Epi, the northern most island of the Shefa province, with a total land area of 446 sq km, lies in the central part of the Vanuatu archipelago flanked by the Shepherds group and Efate (seat of main urban center) to the south and the islands of Paama, Ambrym and Malekula of the Malampa province to the north.

109. Epi is home to a population of 4554 people with an annual growth rate of 3.3%. By comparison, the national average growth rate is 2.6%. The islands population is mostly distributed along the coast with the most populated area on the north eastern coast (Lamen Bay ) and the southeast being the least populated area. 77% of the population (working age) is engaged in subsistence/semi-subsistence farming with the main products being root crops, fruits, vegetables, kava, peanuts and cattle. At a provincial level (Shefa province), Epi produces the bulk of the province's kava (41%) compared to other islands. The island's cattle also contribute significantly to the province's outputs. Owing to its volcanic origin, the island is endowed with fertile land and the potential for greater commercial agricultural activities exists.

110. Though there is immense potential, only a handful of people are involved in fisheries and tourism activities. Most commercial retail activities are conducted by established cooperative societies on the island however, many locals own small shops in communities that sell basic essential goods.

111. There are 9 primary schools around the island and a secondary school at Lamen Bay. A referral hospital is located at Vaimali which also functions as the main medical center for all near by islands in the Shepherds group.

112. There are two airstrips on the island with regular flights connecting to other islands, one on Lamen Bay (Northwest) and Valesdir (Southwest). Though there are anchorage sites around parts of the island, the best anchorages are situated on the sheltered west coast with a wharf located at Lamen Bay.

113. Epi is connected by 20 km of gravel surfaced roads and 46 km of earth roads a total of 66km that run mostly along the island's coast line and through most communities. The existing road network currently connects communities in the south from Votlo, all communities on the western coast through to the north and northeast as far as Prilmalko (Tavio 2). The island's road network plays a vital role in linking communities to essential services (airport, shipping, hospital, schools & commercial centers) especially connecting farmers to the main market center of Port Vila on nearby Efate island.

114. In the absence of specific climate data for Epi island, analogous data from Efate ( Port Vila & Bauerfield observatory ) will be utilized to discuss the island's climate baseline. Epi receives a sub-tropical climate with an average annual temperature of 25.1 °C and average monthly mean maximum and minimum temperatures of 25.8 °C and 24.1 °C respectively. Annual total rainfall average is 2128.9mm. Annual mean average temperature records from 1948 to 2005 show an increasing trend at a rate of 0.0167 °C per year. Mean maximum and minimum temperature records are both increasing at rates of 0.0211 °C and 0.0041 °C respectively. Annual precipitation records on the other hand show a decreasing trend at a rate of 6.5579mm from the period 1953 to 2005. However, by comparison, the Bauerfield observatory with an annual rainfall average of 2244mm, demonstrates a marked increase at a rate of 3.9588mm per year from the period 1972 to 2005. The latter observatory site is independent from urban structures likely to influence rainfall readings.

115. At the current rate of increase, the average temperature for Epi in 30 years will be 25.6 °C, while, annual rainfall totals will be around 2362.8 mm. Sea level will have risen by 102mm in 30 years.

### Coastal Infrastructure

116. This road commences north of Epi (i.e. Prilmalko Village the north east coast of Epi). Where route follows the coast southwards and terminates at the Votlo area south of the Island. The existing road was followed for the whole of the route, however erosion by successive cyclones has resulted in this road running on the beach in places.

117.

118. For these sections the road will have to be diverted inland. In most locations this can be achieved relatively easily except in some locations where major diversion will be necessary around a beach front cliff, Villages and other features that may become obstacles for the diversion route alignment.

119. The principal coastal infrastructure on the island that falls under the jurisdiction of the PWD includes the existing road network constructed originally before Independence partly constructed by Plantation owners and the joint English and French Government. After Independence in 1980, The Vanuatu Government upgraded and rehabilitated the road network in Epi. The first Major Works was done in 1982 at a cost of 30,000,000 vatu (USD 277,213) and the second major works was in 1996 at a cost of 22,000,000 vatu (USD 203,289).

120. The road network is predominantly coastal with significant stretches immediately along the coastline running at an average of 24 meters from the High Water Mark (HWM). Flooding/inundation associated with storm surges during cyclone events are common and as a result the road structures are progressively eroded away. Reef debris is also deposited over the roads and flooding usually extends right into village compounds. The island's coastline has receded significantly and as a result has increased the vulnerability of the road infrastructure. According to anecdotal evidence (*Prilmalko pers com 10/08/2006 & Nikaura pers com 10/08/2006*), the coastline has receded by over 20 meters in the last 20 to 26 years. The road infrastructure plays a vital role in the socio-economic livelihood of the island as it provides links to market access and essential services for the people. Impacts of extreme climate events on the roads cut access to other parts of the island and disrupt socio-economic activities.

121. A number of sections of the Epi roads (7km) urgently require relocation and redesigning to enhance resilience to climate related risks while other sections could be improved by re-vegetation. Common native coastal species already lining the coasts that could be utilized include *Barringtonia sp*, *Casuarina sp*, *Acacia sp*, *Henandia sp* and *Pandanus sp*.

122. The Lamien Bay airstrip has also suffered extensive erosion. A 100 meter stretch of the southern end of the airstrip is undergoing significant erosion from wave activity while an original stretch of 90 meters of the airstrips northern edge has receded significantly inland towards the active runway. Adaptation interventions are of utmost urgency to curb coastal erosion and wave activity. Details of road infrastructure requiring relocation and other adaptation activities are outlined in a table below.

123. The total estimated cost of the relocation of the sections of roads on Epi Island to increase the resilience of infrastructure to adverse impacts of climate change and related extreme events is approximately VATU 77,121,600 or USD712,637 (see table below). The total cost of budgetary support for PWD is estimated at Vatu 309,500 for fiscal year 2005-2006 and the Shefa PWD allocation is Vatu

54,200 for the same fiscal year. Direct budgetary support for the priority sector is likely to decline in the near term.

124. The types of road to be constructed have been classified as Road Type F for the sections replacing the existing track and type B for the diversion sections of the road (drawings are available in PWD office). The terrain over which the existing track travels is undulating with no gradients exceeding 15%. The diverters will often have to be cut into steeper terrain where volcanic rocks and boulders are evident along the whole route in the existing alignment. The construction materials are readily available on beaches immediately to seaward of the route. Coral rubble and volcanic rocks and stones are evident.

### 3.6 Determination of additional adaptation activities

125. The table below shows a number of adaptation activities which will be carried on Epi Island under the PACC-Vanuatu component. The focus on coastal zone management and associated infrastructure is consistent with the GOV policy infrastructure development on outer island and rural areas with the aim of improving the livelihoods of rural and outer island communities.

126. Additional adaptation activities (as outlined in the table below) will increase the resilience of 163 households to climate change and its adverse impacts, improve an estimated 7 kilometers of roads and will likely increase agricultural production on the island. Adaptation activities were determined on the basis of the policies and programme priorities of GOV, climate change impacts, need for adaptation, and ability to co-finance and ability to deliver the implementation of such activities.

#### Details of Road Infrastructure & Airport Impacts

Road Section & Detail	Impacts	Adaptation Activities	Estimated Cost
Prilmalko to Lokoboe Dist – 3 km, Hslds – 20 Use – Transport of kava, root crops & peanuts	Erosion	Relocated 3km	25,200,000
Nikaura, 584 meters, Hslds – 54 Use - Transport of kava, root crops & peanuts	Erosion Cyclone Flooding	Relocate 584 meters of road	4,905,600
Nivenue - 422 meters, Hslds – 30 Use - Transport of kava, root crops & peanuts	Erosion Cyclone Flooding	Relocate 422 meters of road	3,544,800
Moriu -578 meters, Hslds – 24 Use - Transport of kava, root crops & peanuts	Erosion Cyclone Flooding	Relocate 578 meters of road	4,855,200
Rovo Bay sea wall – 51 meters Use - Transport of kava, root crops & peanuts	Erosion Cyclone	Rehabilitate -51 meter sea wall. Stabilize and protect foundation of the existing concrete retaining wall.	2,500,000
Malvasi	Cyclone Flooding	Coastline protection - Re-vegetation (800m)	3,000,000

Yapuna (Loter point) Dist – 98 meters Hslds – 15 Use - Transport of Ag produce (kava, root crops & peanuts)	Erosion Cyclone	Coastline protection -Construct 98 meters road embankment protection barrier	3,000,000
Yavali	Cyclone Flooding	Coastline protection - Re-vegetation (800m)	3,000,000
Ponkovio	Cyclone Flooding	Coastline protection - Re-vegetation (800m)	3,000,000
Wambe/Metano Point Dist – 490 meters Hslds – 20 Use - Transport of Ag produce (kava, root crops & peanuts)	Erosion Cyclone Flooding	Relocation of 490 meter road	4,116,000
Lamen Bay Airstrip	Erosion Cyclone Flooding	Rehabilitate - Coastline protection works (piling works)	20,000,000
<b>Total</b>		<b>Total (vatu) (USD)</b>	<b>77,121,600 712,637</b>

### 3.7 Options to mainstream adaptation within priority sector

127. Given that GOV considers climate change as a critical development issue as reflected in its draft climate change policy, opportunities for mainstreaming climate change adaptation within priority sector will be important over the long term. This pilot adaptation will more than likely produce some lessons and recommendations which can be used to inform other sectors of the economy. The design of follow-up projects will complement the pilot and will produce recommendations and follow-up schemes for Vanuatu for potential replication on a wider scale and integration of climate change risk management in coastal road design and planning.

128. Opportunities also exist for mainstreaming adaptation within other sectors of the economy. This pilot project will produce lessons that will be critical for sectors such as food production and food security and water resources management.

129. The policy/regulatory, institutional framework, information and knowledge and stakeholder involvement in project implementation and GOV commitment to co-financing of the pilot project will necessarily encourage mainstreaming of adaptation into various sectors of the economy. The national advisory committee on climate change (NACCC) provides scientific, policy, technical oversight to climate change activities in Vanuatu and therefore will facilitate the integration of climate change adaptation into national planning and budgeting processes.

## IV. MECHANISM FOR DELIVERY OF FSP

### 4.1 Institutional arrangements

130. All climate change programmes, projects and activities are being coordinated by the Climate Change Section of the Department of Meteorology, Ministry of Infrastructure and Public Utilities. Climate Change Section currently has one full-time staff that carries out tasks/activities relating to climate change in the country such as the preparation of climate change enabling activities (e.g. second national communication and national adaptation programme of action). The Climate Change section also serves as a secretariat for the National Advisory Committee on Climate Change (NACCC).

131. Under the PACC-VANUATU project, the Climate Change Section will continue to coordinate climate change activities relating to PACC. However, given that PACC is focused on implementation of adaptation activities, the implementing agency for PACC-VANUATU will be the Public Works Department (PWD), Ministry of Infrastructure and Public Utilities. Department of Meteorology will serve as secretariat to the NACCC on issues relating to the implementation of PACC-VANUATU.

132. In addition to the implementation of PACC-VANUATU, PWD will host at least three full-time staff that will provide the day-to-day operation of the PACC-VANUATU. These two full-time staff will be part of the PACC Project Management Unit (PMU). The PMU will be directly responsible to the Director of Public Works Department.

133. At the national level, PACC-VANUATU will be implemented by various stakeholders within their respective mandates while scientific, technical and policy oversight will be provided by the NACCC. The NACCC comprises representatives from various government ministries, agencies and institutions and the private sector and was established in 1989 by the Council of Minister to provide scientific, technical and policy advice on climate change issues affecting Vanuatu.

## **4.2 Assessment of existing and potential barriers to implement adaptation**

134. PACC-VANUATU is underpinned by GOV policy and regulatory framework and its Priority Action Agenda 2005-2007 wherein it identifies “Improving the lives of the people in rural areas by improving service delivery, expanding market access to rural produce, lowering of credit and transportation, and ensuring sustainable use of natural resources” as a critical component of its current development strategy. The GOV is currently implementing the MCC and ShefaREDI with the aim of enhancing the economic, environmental and social livelihood of rural communities. These programmes are jointly managed and implemented by various government departments and ministries, provincial and municipal governments and the rural communities.

135. A number of climate change enabling activities (e.g. national communication and national adaptation programme of action) have also involved numerous organizations, institutions and individuals in carrying out various tasks and activities. These activities have been supported by the NACCC 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-VANUATU. Some of these barriers include, competing demands on staff time, inadequate staff resources, equipment, and lack of incentives.

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

## V. EXPECTED GOAL, OUTCOMES, OUTPUTS AND ACTIVITIES

### Goal:

137. 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.

### Specific Objective:

138. The main goal of this project is to “increase the resilience and enhance adaptive capacity of coastal communities, socio-economic activities and infrastructure. This goal will be achieved through a project “Piloting climate change adaptation in coastal communities of Epi Island focusing on integrated coastal zone management and its associated infrastructure. This project will also focus on enhancing, and where necessary, constructing the relocation of approximately 7 kilometers of road sections which have been significantly affected by erosion, storm surge and tropical cyclones.

139. The implementation of integrated coastal zone management (ICZM) will entail the implementation of sustainable projects that will create coastal sanctuaries and parks that will act as buffers to extreme climate-related events, protect the environment and promote sustainable coastal development. Adaptation interventions will include (soft) non-structural and structural (hard) options that compliment each other. The listed activities below indicate community efforts to improve communities’ resilience to natural hazards and for conservation and protection from further degradation.

### Specific Outputs

**Output 1.1:** Relevant plans and programmes incorporate climate risks in the coastal sector in the Republic of Vanuatu.

**Output 2.1** A multi-stakeholder decision making system for relocation of road infrastructures in isolated coastal communities (with co-financing support).

**Output 2.2** Practical guidance to design a multi-stakeholder decision making system for relocation of road infrastructures in isolated coastal communities.

### Description:

**Output 1.1:** Relevant plans and programmes incorporate climate risks in the coastal sector in the Republic of Vanuatu.

140. 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** A multi-stakeholder decision making system for relocation of road infrastructures in isolated coastal communities (with co-financing support).

**Output 2.2** Practical guidance to design a multi-stakeholder decision making system for relocation of road infrastructures in isolated coastal communities.

141. This output will assist the Government of Vanuatu and key stakeholders in the island of Epi to develop their capacity to design and demonstrate multi-stakeholder decision-making systems to design and implement relocation of road infrastructures so as to increase resilience to climate change related risks. Multi-stakeholder decision making systems to design and implement relocation of road infrastructures taking into consideration current and future changes in climate and sea level change would be an important adaptation measure to be piloted by Vanuatu. Epi experiences on average 2.6 cyclones per year. A total of nine tropical cyclones have either directly or indirectly affected the infrastructure on Epi Island since 1941. In the event of extreme events (tropical cyclones, ENSO-related events) it can set the whole economy of Epi and Vanuatu back by 5 years, therefore diverting development funding to recovery. In the case of Cyclone Ivy in 2004, damage was estimated at a total cost of USD 4.276 million (VT427.6 million). Government has committed US\$2.9 million to the rebuilding of the main Lamén Bay wharf in Epi and storage houses that would be able to hold produce from the communities to await shipment to Port Vila or other overseas markets. Other in-kind support would be available with relation to equipments and machinery if so needed.



142. The proposed pilot should provide the opportunity to test out different decision systems that takes the socio-economic, natural resource and cultural/human settlement issues of affected communities into consideration. Activities to be undertaken would include:

- Multi-stakeholder assessment exercise to assess vulnerability of coastal roads and design specifications to the impacts of climate change;
- A multi-stakeholder decision making system for relocation of road infrastructures in isolated coastal is developed.
- Training in development and use of a multi-stakeholder decision making model based on environmental and socioeconomic considerations for climate proofing coastal infrastructures;
- Participatory design and costing of road relocation taking into account measures to adapt to the effects of climate change and appropriate roadside vegetation cover to enhance stability and resilience;
- Demonstrate the decision system model developed in an actual climate proofing scenario for Epi;
- Document all the process and lessons learnt and share with all PICs

## **PROJECT LOG FRAMES AND INDICATORS**

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

**BUDGET**

Responsible	ERP/Atlas	Budget Description							
	Budget Code								Total
				Year 1/08	Year 2/09	Year 3/10	Year 4/11	Year 5/12	Budget
Outcome 1	71200	International Consultants ( including national regional staffing)	10,000	10,000	0	0	0	0	10,000
	71300	Local Consultants (including national staffing)	30,000	5,000	5000	10,000	5,000	5,000	30,000
	71400	Contractual Services - Ind	20,000	5,000	5,000	5,000	5,000	0	20,000
	71600	Travel	20,000	0	5,000	5,000	5,000	5,000	20,000
	72100	Contractual Services - Co	40,000	10,000	10,000	10,000	10,000	0	40,000
	72200	Equipment & Furniture	10,000	5,000	1,000	3,000	1,000	0	10,000
	72400	Communication & Audio Visual equipment	4,000	2,000	500	500	500	500	4,000
	72500	Supplies	1,000	500	100	100	200	100	1,000
	72800	Information technology and Outreach	3,000	500	1,000	500	1,000	0	3,000
	74200	Printing, Publishing & Production	2,000	0	500	500	500	500	2,000
Subtotal			<b>140,000</b>	<b>38,000</b>	<b>28,100</b>	<b>34,600</b>	<b>28,200</b>	<b>11,100</b>	<b>140,000</b>
Outcome 2									
	71200	International Consultation	10,000	10,000	0	0	0	0	10,000
	71300	Local Consultants	60,000	10,000	20,000	20,000	5,000	5,000	60,000
	71400	Service Contracts - Ind	100,000	10,000	40,000	30,000	10,000	10,000	100,000
	71600	Travel	20,000	2,000	5,000	5,000	5,000	3,000	20,000
	72100	Contractual services - Co	320,000	55,000	105,000	55,000	55,000	50,000	320,000
	72200	Equipment & Furniture	10,000	0	5,000	5,000	0	0	10,000
	72500	Supplies	50,000	10,000	10,000	10,000	10,000	10,000	50,000
	72400	Audio Visual Equipment and Communication	20,000	5,000	5,000	5,000	2,500	2,500	20,000
	72800	Information Technology Equipment and Outreach	15,000	5,000	4,000	3,000	2,000	1,000	15,000
	74200	Printing and Publications	15000	5,000	4,000	3,000	2,000	1,000	15,000
Subtotal			<b>620,000</b>	<b>112,000</b>	<b>198,000</b>	<b>136,000</b>	<b>91,500</b>	<b>82,500</b>	<b>620,000</b>
Outcome 3									
	71200	International Consultants							
	71300	Local Consultants							0
	71600	Travel	20,000	4000	4000	4000	4000	4000	20,000
	72100	Contractual Services - Co							0
Subtotal			<b>20,000</b>	<b>4000</b>	<b>4000</b>	<b>4000</b>	<b>4000</b>	<b>4000</b>	<b>20,000</b>
Outcome 4	71300	Local Consultants	<b>88,758</b>	17752	17752	17752	17752	17750	<b>88,758</b>

Subtotal		<b>88,758</b>	17752	17752	17752	17752	17750	<b>88,758</b>
<b>Total</b>		<b>868,758</b>	<b>171,752</b>	<b>247,852</b>	<b>192,352</b>	<b>141,452</b>	<b>115,350</b>	<b>868,758</b>

## SELECTED REFERENCES

- Adger, N., Mace, M.J., Paavola, J., and Razzaque, J., 2003: Justice and equity in adaptation. *Tiempo* 52, 19-22.
- Adger, W. N., S. Huq, K. Brown, D. Conway, M. Hulme, 2003: Adaptation to climate change in the developing world. *Progress in Development Studies*, 3 (3), 179-195.
- ADB (Asian Development Bank) 2004: *Environmental Pacific Regional Strategy, 2005-2009*, ADB Manila, Philippines, 105 pp
- ADB, 2003. Vanuatu Country Strategy and Program Update 2004-2006.
- Barnett, J., 2001: Adapting to climate change in Pacific Island Countries: The problem of uncertainty. *World Development*, 29, 977-993
- Brazdil, R., T. Carter, B. Garaganga, A. Henderson-Sellers, P. Jones, T. Carl, T. Knustson, R.K. Kolli, M. Manton, L.J. Mata, L. Mearns, G. Meehl, N. Nicholls, L. Pericchi, T. Peterson, C. Price, C. Senior, Q.C. Zeng, and F. Zwiers, 2002: *IPCC Workshop on changes in extreme weather and climate events*, Workshop Report, Beijing, China, 11-13 July, 2002, 41- 42. Accessed 15.11.2004 at <http://www.ipcc.ch/pub/extremes.pdf>
- Folland, C.K., J.A. Renwick, M.J. Salinger, N. Jiang, and N.A. Rayner, 2003: Trends and variations in South Pacific Islands and ocean surface temperatures. *Journal of Climate.*, 16, 2859-2874
- Folland, C.K., J.A. Renwick, M.J. Salinger, and A.B. Mullan, 2002: Relative influences of the Interdecadal Pacific Oscillation and ENSO on the South Pacific Convergence Zone. *Geophysical Research Letters*, 29, 21-1-21-4
- Griffiths, G.M., M.J. Salinger, and I. Leleu, 2003: Trends in extreme daily rainfall across the south Pacific and relationship to the South Pacific convergence zone. *J. Climatol.*, 23, 847-869.
- Government of Vanuatu, Initial National Communication Under the UNFCCC, Port Vila, Vanuatu.
- Government of Vanuatu, Vanuatu Infrastructure Masterplan, Asian Development Bank Development Framework. Philippines.
- Government of Vanuatu, n.d. Priorities and Action Agenda Supporting and Sustaining Development, Port Vila, Vanuatu.
- Government of Vanuatu, Shefa Rural Economic Development Initiative (ShefaREDI), 2003-2007. Port Vila, Vanuatu.
- Government of Vanuatu, 2005, Capacity building for development of adaptation measures in Vanuatu, South Pacific Regional Environment Programme, Apia, Samoa.
- IPCC, 2001: *Climate Change 2001: The Scientific Basis*. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change, J.T. Houghton, Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, X. Dai, K. Maskell, and C.A. Johnson (eds.), Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 881 pp.
- Lal, M., 2004: Climate change and small island developing countries of the South Pacific, *Fijian Studies, Special Issue on Sustainable Development*, V2(1), 15-31.
- Manton, M.J., P.M. Dellaa-Marta, M.R. Haylock, K.J. Hennessy, N. Nicholls, L.E. Chambers, D.A. Collins, G. Daw, A. Finet, D. Gunawan, K. Inape, H. Isobe, T.S. Kestin, P. Lefale, C.H. Leyu, T. Lwin, L. Maitrepierre, N. Oprasitwong, C.M. Page, J. Pahalad, N. Plummer, M.J. Salinger, R. Suppiah, V.L. Tran, B. Trewin, I. Tibig, and D. Yee, 2001: Trends in extreme daily rainfall and temperature in southeast Asia and the south Pacific: 1961-1998. *J. Climatol.*, 21, 269-284.
- Millenium Challenge Corporation, 2006. Compact Executive Summary. Port Vila, Vanuatu.
- Nurse, L., G. Sem, J.E. Hay, A.G. Suarez, P.P. Wong, L. Briguglio and S. Ragoonaden, 2001: Small island states. . In: *Climate Change 2001: Impacts, Adaptation, and Vulnerability*. J.J. McCarthy,

- O.F. Canziani, N.A. Leary, D.J. Dokken, and K.S. White (eds.). Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 842-975.
- Nurse, L., and R. Moore, 2005: Adaptation to global climate change: an urgent requirement for Small Island Developing States. *Review of European Community and International Law (RECIEL)*, 14 (2), 100-107.
- World Bank, 2000: *Cities, Seas and Storms: Managing Change in Pacific Island Economies. Vol. IV, Adapting to Climate Change*. World Bank, Washington, D.C. 72 pp.
- World Bank, 2002: *Cities, Seas and Storms: Managing Change in Pacific Island Economies*. World Bank, Washington, D.C.
- World Bank, 2006: *Not If, But When: Adapting to Natural Hazards in the Pacific islands Region: A Policy Note*. World Bank, Washington, D.C., USA, 60 pp.

## **ANNEXES**

**Letter of Co-Financing (to be attached)**