



PACIFIC ADAPTATION TO CLIMATE CHANGE

FIJI ISLANDS

REPORT OF IN-COUNTRY CONSULTATIONS

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INTRODUCTION

1.1 The need for adaptation to climate change

1. Small island developing States (SIDS) 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 Fiji Islands (Long 175° East and 178° West and lat. 15° and 22° S) 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 Niño event compared to a La Niña event and vice versa (Brazdil *et al.*, 2002).

6. Past studies of adaptation options for small islands have been largely focused on adjustments to sea-level rise and storm surges associated with tropical cyclones. There was an early emphasis on protecting land through ‘hard’ shore-protection measures rather than on other measures such as accommodating sea-level rise or retreating from it, although the latter has become increasingly important on continental coasts. 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.

7. On small islands adaptation costs are high relative to GDP though experience gained from coping with past climate variability and extremes may be beneficial to adaptation planning. In some small islands, traditional methods of coping with environmental change and hazards are being reintroduced. Climate projections suggest a general increase in surface air temperature for the regions of small islands but the increase is not uniform. Precipitation projections show no consistent trend, with increases and decreases of more than 10 percent projected for three 30-year periods by the end of this century.

8. Sea-level rise will exacerbate inundation, erosion and other coastal hazards, threatening vital infrastructure, settlements and facilities that are predominantly based on the coast, thus compromising the socio-economic well-being of island communities and states. It will also negatively impact coastal ecosystems, such as coral reefs and mangrove forests, and commercial and artisanal fisheries based on those systems. Tourism is a major contributor to GDP and employment in many small islands, and dominates the economies of some. Surveys suggest that deterioration in environmental conditions, for example through erosion of beaches or coral bleaching, will reduce numbers traveling to such destinations.

9. Climate change will be a major impediment to the achievement of sustainable development in small islands, as all economic and social sectors are likely to be adversely affected, and the cost of adaptation will be disproportionately high, relative to GDP. In attempting to mainstream adaptation strategies into their sustainable development agendas, small islands will be confronted by many challenges including insufficient resources, equity considerations, prioritization of adaptation measures and uncertainties over climate change projections and adaptation strategies.

10. 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.

11. 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 the aim of building 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.

12. 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.

13. The Pacific island countries are already experiencing severe impacts of climate events as evidenced by cyclone damage of more than US\$1 billion during the 1990s. Thus an adaptation strategy for the Pacific islands and indeed for Fiji Islands should include a strategy for precautionary adaptation since it is difficult to predict far in advance how climate change will affect a particular site, sector or community. Thus adopting a “no regrets” adaptation measures would be justified even in the absence of climate change, as this would more than likely lead to better management of natural resources and sustainable development.

1.2 Objectives of Pacific Adaptation to Climate Change (PACC)

14. Given the foregoing urgency 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. Fiji Islands, 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.

15. 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

16. 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 Fiji Islands in-country consultations on PACC which were held in Suva, Fiji Islands from July 24 to 28 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 the Fiji islands covering issues relating to assessment of impacts of climate change on the biophysical and human systems and stakeholder analysis; section 3 covers sectoral analysis with regard to a methodology and/or a criteria used to select a priority sector for adaptation intervention, institutional and development baselines within the priority sector as well as the analysis of the impacts of climate change within the priority sector; section 4 provides information of the delivery mechanism for full-sized project implementation of the Fiji 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.

GENERAL OVERVIEW

2.1 Situation analysis

17. The Republic of the Fiji Islands lies in the Southwest Pacific Ocean, between longitudes 175° East and 178° West and latitudes 15° and 22° South. The Fiji Islands is made up of two major islands – Viti Levu and Vanua Levu, with land areas of 10,429 and 5,556 square km² respectively (Fig. 1).



Figure 1. **The Fiji Islands** (Fiji Visitors Bureau, 2000).

18. Other main islands are Taveuni (470 km²), Kadavu (411 km²), Gau (140 km²) and Koro (104 km²). The total land area of the Fiji Islands is 18, 272 km². The Republic includes the island of Rotuma (43 km²), located 650 kilometres north-northwest of Suva. Fiji's Exclusive Economic Zone (EEZ) contains approximately 332 islands, of which one-third are inhabited. The Economic Exclusive Zone covers about 1.3 million km².

19. The Fiji Islands are composed of large mountainous islands, which are largely of volcanic origin, such as Viti Levu and Vanua Levu (which take up 87% of the total land area), and numerous small volcanic islands, low-lying atolls and elevated reefs. The largest islands have a diverse range of

terrestrial ecosystems, including extensive areas of indigenous forest. The high islands have distinct wet and dry sides due to prevailing wind patterns. Coastal ecosystems include mangroves, algae and sea-grass beds in shallow reef and lagoon areas, and various reef types such as barrier, fringing platform and atoll or patch reefs.

20. The climate of Fiji is generally categorized as an oceanic tropical climate. The South Pacific Convergence Zone (SPCZ), associated with high rainfall, fluctuates northeast and southwest of Fiji. Its location relative to the Fiji islands has a strong influence on both seasonal and inter-annual variations in climate, particularly rainfall. The El Niño-Southern Oscillation (ENSO) phenomenon influences the positioning of the SPCZ relative to Fiji. During the dry season (May to October) the SPCZ tends to be positioned more to the northeast of Fiji. In the rainy season (November to April) the SPCZ tends to be located over Fiji. In addition to these seasonal variations, there is also a high degree of inter-annual variability in rainfall, which is strongly influenced by ENSO and SPCZ fluctuations.

21. Another important influence on rainfall is the southeasterly trade wind, which carries moist air onto the islands. On Viti Levu and Vanua Levu, the southeastern regions experience high and intense rainfall. The mountains of these high islands have a strong influence on the distribution of rainfall, with the regions on the leeward (western) side of the mountains being much drier on average. The annual rainfall in the east of Viti Levu, where Suva is located, ranges from 3,000 mm to 5,000 mm, while in the west of Viti Levu, where Ba, Lautoka, Nadi and Sigatoka are located, annual rainfall ranges from 2,000 mm to 3,000 mm.

22. Fiji is also affected, often severely, by tropical cyclones and depressions which tend to track from the north and west. Fiji lies in an area normally traversed by tropical cyclones mostly during the November-April wet/cyclone season. Cyclones bring about flooding and multiple landslips which have major impacts on the economy and infrastructure, and many adverse effects for the people of Fiji. Although the west of Viti Levu is drier on average it can experience very heavy rainfall events and associated flooding during storm events.

23. El Niño events, which lead to a northeast positioning of the SPCZ, are the major cause of drought in Fiji. During an ENSO event, conditions drier and hotter than normal can be expected from December to February and drier and cooler conditions from June to August. While lower than normal rainfall can be expected over most of Fiji, the most severely affected areas tend to be in the west of the main islands.

24. Based on an analysis of observed data for high and low rainfall extremes and potentially damaging winds, Hay (2006) has shown that annual extremes have increased in recent decades in both frequency and magnitude in Fiji. This gives rise to a significant reduction in return periods of extreme daily rainfall events while return periods for hourly rainfall events have increased in recent decades in Fiji. Extremes in annual rainfall are associated with Southern-Oscillation Index with drought conditions occurring when the SOI is strongly negative (El Niño) while annual rainfall is significantly higher when the SOI is strongly positive (La Niña).

25. Droughts in Fiji are strongly associated with negative phase of the SOI or with El Niño conditions. The maximum wind gusts associated with cyclones occurring in Fiji area show large interannual variability although previous 40-year records show a 14% increase in maximum wind gusts. Such an increase is consistent with findings of Webster et al. (2005) that the number and proportion of tropical cyclones in the Southwest Pacific Ocean reaching categories 4 and 5 has increased over the past 35 years so as the observed increase in sea surface temperatures.

26. Projections of systematic changes in the average climate show significant increases in the frequency of extreme high sea levels, temperatures and winds are highly likely in the Fiji area in the coming decades. For instance, sea level is projected to increase by 11cm by 2025; 23 cm by 2050; 36cm by 2075 and 51cm by 2100 while annual rainfall is likely to change by 0.4% by 2025, 0.6% by 2050, 1.3% by 2075 and 1.6% by 2100. Maximum wind gusts are likely to change by 3.4% by 2025, 6.8% by 2050, 10.8% by 2075 and 13.4% by 2100 and temperatures are expected to increase by 0.3°C by 2025, 0.7 °C by 2050, 1.1 °C by 2075 and 1.4 °C by 2100 in Fiji.

Development sectors

27. Small islands have traditionally depended upon subsistence and cash crops for survival and economic development. Whilst subsistence agriculture provides local food security, cash crops (such as sugar cane, banana and forest products) are exported to earn foreign exchange. However, exports have depended upon preferential access to major developed country markets which are slowly eroding. Many island states have also experienced decrease in GDP contributions from agriculture, partly due to the drop in competitiveness for cash crops, cheaper imports from larger countries, increased costs of maintaining soil fertility and competing uses for water resources, especially with tourism (FAO, 2004).

28. Local food production is vital to small islands even those with very limited land areas. In the Pacific islands subsistence agriculture has existed for several hundred years. The ecological dependency of small island economies and societies is well recognized (ADB, 2004). A report by FAO's Commission on Genetic Resources found that Fiji's interdependence with regard to plant genetic resources is estimated at 65 percent in Fiji as compared to 37 percent in Vanuatu (Ximena, 1998).

29. Projected impacts of climate change include extended periods of drought, and on the other hand, loss of soil fertility as a result of increased precipitation, both of which will negatively impact on agriculture and food security. In the study on the economic and social implications of climate change and variability for selected Pacific Islands, World Bank (2000, 2002) found that in the absence of adaptation, a high island such as Viti Levu, Fiji, could experience damages of 23 million to 52 million USD per year by 2050, (equivalent to 2-3 percent of Fiji's GDP in 2002).

30. Agriculture has always been the largest sector in Fiji's economy, accounting for 43% of Fiji's foreign exchange earnings in 1999. It provides 50% of the country's total employment and contributes 19% to Fiji's GDP. The decline in production of sugar (Fiji's largest agricultural export) due to the 1997-98 drought, created an economic crisis sending the economy into negative growth of 4%. With the crop back to normal in 2000, the economy as a whole recovered with a 3-3.5% growth that year. Similar patterns have emerged in previous years when good sugar production has been reflected in healthy economic growth overall. 16% of total land area of Fiji is suitable for farming and is found mainly along coastal plains, river deltas and valleys of the two main islands, Viti Levu and Vanua Levu. Of the arable land, 24% is under sugar cane, 23% coconut and the remaining 53% under other crops.

31. In a study comparing estimated costs of agriculture without cyclone Ami and related flooding and with damage from Cyclone Ami and related flooding in Fiji, it was shown that cyclones and related flooding cause considerable damage to both subsistence and commercial agriculture (McKenzie, E. Biman, P., Kaloumaira, A. 2005). They showed that in 2002, agricultural GDP as a share of total GDP was 16.2% and agriculture trade balance, in terms of the value of agricultural exports less the value of agricultural imports, was USD44.5million. Sugar exports accounted for 64% of the total agricultural exports. The total agricultural labour force included 132,000 workers, 40 per cent of the total labour

force in 2002. Of the total labour force, 21,246 people were sugarcane growers. The forecast for sugar production for 2003 was estimated at 930,600 tonnes of sugar.

32. Tourism is now Fiji's most important industry and the largest foreign exchange earner. The industry provides employment directly and indirectly to an estimated 40,000 people (15% of the labor force) and contributes approximately 17% of total production in the economy. The tourism industry achieved a record number of visitors and foreign exchange for 1998, the eighth year in a row. The country hosted 371 342 visitors with foreign exchange earnings expected to be over the half billion mark, \$527.1 million dollars in 1998.

33. As an island nation with an open economy, Fiji is heavily dependent on transportation services. The transport sector accounts for around 12 per cent of GDP. Government's major role in the transport sector is through the development of infrastructure (roads, jetties and airstrips), and providing the regulatory framework for the operation of all transport modes. Statutory bodies run the major airports and ports. Transport services are mainly provided by the private sector, though government is also involved in inter-island shipping, shipbuilding and ship repair. As a shareholder in the airline industry, government also assumes a planning role in relation to the various transport modes.

34. GCM model outputs and impact assessments indicated that a number of key socio-economic sectors would be adversely affected in a variety of ways. These include coastal resources, water resources, agriculture and human health. Climate change and sea-level rise may lead to increases in coastal erosion and coastal inundation, increased exposure of beaches to wave action (as coral growth lags behind sea-level rise), and in some cases the retreat of mangroves. Other climate change effects on coastal resources would include:

- a) Increased sea surface temperatures leading to an increase in coral bleaching. This, together with the lag in coral growth, may lead to a reduction in sediment production necessary for maintaining shoreline stability. Coral bleaching is also likely to have adverse effects on coastal biological diversity and fisheries.
- b) Changes in the patterns of storminess, such as an increase in the frequency or intensity of tropical cyclones, may cause greater incidence of coastal inundation and erosion events. These processes may be exacerbated by reduced reef protection.
- c) Reduction of coastal system resilience and low adaptive capacity to cope with or adapt

35. Fiji, especially Viti Levu, already suffers from human-generated effects on the coastal zone. High population growth rates, intensive urban development, deforestation of catchments, pollution and increased exploitation of biological and physical coastal resources have exposed large areas of coast to erosion and inundation events. Accordingly:

- a) Coastal systems have reduced resilience to cope with climate variability,
- b) Coastal systems have reduced capacity to adapt to climate change, sea-level rise and human activities, and,
- c) Coastal populations and their assets are exposed to higher vulnerability to extreme events such as storm surges, tsunamis, and high tides, not to mention sea-level rise.

36. Using the period from 1992 to 1999, as an analogue for future conditions under climate change it might be assumed that over the next 50 years sugarcane production would decrease by up to one-quarter of expected production, implying difficulties for a large sector of the population in the agricultural sector dependent on sugar production and associated industries.

37. Process-based model results of the impacts of climate change on dengue-fever epidemics indicated that climate change, through increasing temperature, would lead to increases in the risk of dengue-fever epidemics in Fiji while diarrhoeal disease may become more common if Fiji becomes warmer and wetter and if droughts and tropical cyclones occur more frequently, disrupting water supplies and sanitation systems. Additionally, nutrition-related illnesses are most likely to be affected by increases in frequency and/or magnitude of tropical cyclone and drought events. Further, it is also likely that if climate change leads to economic and social disruption and environmental degradation, disadvantageous effects on health may be serious.

38. Based on vulnerability and adaptation studies undertaken previously in Fiji the numerous sectoral adaptation options have been identified in coastal resources and coastal zone management, agriculture, water resources, human health. Adaptation options range from better understanding of the impacts of climate change on development sectors to implementation of adaptation measures to cope with or improve adaptive capacity and resilience of sectors to adverse impacts of climate change.

39. In agriculture and water resources sectors adaptations include development of flood-control measures (drainage systems) to cope with extreme high-rainfall events include such measures as diversion channels, building of weirs, cut-off channels, retarding basins and dams, and river-improvement activities such as channel widening, dyke construction or river-bed excavation, catchment management including reforestation, land-use controls, protection of wetlands and soil conservation and control of flood-damage potential by regulating development on flood plains and promoting flood-proof building design. Various activities at community level can improve awareness of water conservation and emergency response and institutional development such as the creation of catchment and water authorities would help build capacity to improve the management of water resources particularly in intensive farming areas of Fiji.

Sustainable development policies and programmes

40. Fiji's sustainable development policies are entrenched in its "Strategic Development Plan 2003-2005 (SDP), a rolling development plan, which is updated every three years with emerging needs and priorities of government. The policies embedded in the SDP are consistent with the Millennium Development Goals adopted in September 2000 and emphasizes that sustainable development is achieved through policies that are economically sound, socially balanced and environmentally friendly.

41. In the current SDP plan period a number of policies and programmes are pertinent to sustainable development and economic growth, including Rural and Outer Island Development (ROI); Land Resources Development and Management; Environment; and Disaster Mitigation and Management.

42. The main objective of the ROI is to ensure provision of minimum and affordable basic needs for rural and outer island populations and plans for 100% provision on a participatory basis, of potable piped water to rural areas and to ensure food and income security for all.

43. Division of Land Resources Planning and Development, Ministry of Agriculture, Sugar and Land Resettlement (MASLR), undertakes planning, development and management of land resources. A land-

use plan is expected to be completed for the whole country by 2010. The increase in population over the years has increased demand for agricultural land and consequently has put a significant amount of pressure on arable land. This has resulted in land degradation, reduced productivity, lower yields, reduced food security and an increase in poverty. Thus it will need a land use policy including rural land use policy, watershed management master plan. Policies for the sustainable development and management of land resources are:

- a) Ensuring sustainable utilization and development of land;
- b) Creating a leasing system that is mutually beneficial to both land owners and tenants;
- c) Minimizing degradation of land; and
- d) Consolidating and updating all land databases and information.

44. The proper management of the environment and sustainable use of its natural resources is critical for sustainable development of Fiji's largely natural-resource-based economy. The Ministry of Environment is responsible for better coordination, effective formulation and implementation of national environmental policies. Issues of serious concern include loss of biodiversity, inappropriate waste management, pollution of air and waterways, land degradation and climate change. Policies for the sustainable management of the environment include:

- a) Minimizing degradation of natural resources and protecting Fiji's biodiversity;
- b) Promoting and supporting sustainable waste management;
- c) Mitigating the effects of climate change; and
- d) Enacting the Sustainable Bill after it has been reviewed.

45. Climate change and sea-level rise is considered as one of the main environmental problems as well as the expansion of agricultural lands causing land degradation Fiji. The main policy objective is to minimize degradation of natural resources and protection of biodiversity. Towards this end a Sustainable Development Bill has been developed which includes a requirement for all development projects to have environmental impact assessments.

46. As Fiji is often exposed to extremely damaging natural disasters like cyclones and associated coastal erosion and flooding, reduction of the vulnerability of rural communities to disasters is undertaken through the Disaster Management Office under the National Disaster Management Act of 1998. Its role focuses on the promotion of rapid effective response to emergencies, investment in safe, cost-effective and strategic infrastructure to mitigate the impact of disasters and capacity building for disaster management. The Ministry of Fijian Affairs, Lands and Provincial Development is exploring a Comprehensive Hazard and Risk Management (CHARM) approach to disaster mitigation and management. The priorities for the sector are:

- a) Mainstreaming Disaster Management into the national development decision making process;
- b) Ensuring the formulation of a comprehensive hazard and risk management plan;
- c) Improve community awareness of risk, preparedness and response; and
- d) Investing in infrastructure to mitigate the impact of disasters.

47. Fiji has made good progress since the UNCED. Since 1992 Fiji has signed and ratified 19 International and Regional Conventions that emanated from the Earth Summit; and formulated 17 international and regional plans of actions, 25 national policies and plans and 17 national implementation programmes addressing sustainable development.

Ratification and implementation of the UNFCCC

48. Fiji has ratified the Framework Convention on Climate Change and as part of its obligations under the UNFCCC Fiji has also completed and submitted its initial national communication (INC) to the Conference of the Parties of the UNFCCC. Since the completion and submission of the INC, Fiji 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 WSSD and JPoI, BPoA and IM, NBSAP under the CBD. With the support of the GEF, Fiji 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, and the development of a sustainable land management project.

49. Fiji has drafted a Sustainable Development Bill to provide a framework for the sustainable management of the environment. It is a comprehensive and integrated piece of legislation that focuses on Environmental Impact Assessments, Codes of Environmental Practice, Natural Resource Management and the establishment of a National Council for Sustainable Development to provide effective and coordinated decision making on sustainable development planning, policies and implementation of programmes. An extensive consultative process has been mounted to ensure that the Sustainable Development Bill is acceptable to all.

50. The Government of Fiji is fully committed to the implementation of the UNFCCC. It has also embarked on an economic growth policy which is focused on improving its economic and environmental performance, education, private sector development and creation of employment, agricultural opportunities, social structure, infrastructure and services, tourism and public sector efficiency. The government of Fiji is also fully cognizant of the need to pursue a development strategy that focuses on sustainable development and wise use of its resources and environmental products and services over the long term. In this context, a number of policies and programmes have been developed to shape its development trajectory. These include:

- a) Climate change policy which aims to promote understanding of, and to formulate appropriate responses to climate change by mainstreaming climate change concerns/issues in all environmental, social, and economic processes including enactment and amending of current legislations. The policy also focuses on adaptation to and mitigation of climate change.
- b) National Environment Act 2005 which established the National Environment Council with multi-stakeholder representation and includes provisions for mandatory environmental impacts assessments for development projects.
- c) Sustainable Development Programmes such as European Union-funded Adaptation Strategy for Sugar (ASS) and Asian Development Bank-funded Alternative Livelihood Project (ALP) and Rural and Outer Island Development Project.

51. The main goals of the Adaptation Strategy for Sugar is to achieve an effective transition to a sustainable sugar cane industry over the period 2006 – 2013 and to achieve macro-economic stability through a highly competitive sugar-industry and an integrated, well- balanced rural development program including specifically tailored crop diversification programs profiting from market opportunities for export. Adaptation for Sugar in Fiji is in direct response to the EU sugar reform will have wide-ranging impact on the sugar industry and economy of Fiji. Thus phased reduction in the price of sugar exports to the EU will imply a corresponding loss of foreign exchange export earnings that will

be around 65 Million F\$ from 2009-2010 onwards. The loss of exports earnings will have macro-economic consequences that could reduce government's ability to meet socio-economic targets.

52. The ALP seeks to address the needs of poor rural people in the Western and Northern Divisions of Fiji whose conditions have been further jeopardized by problems of lease renewals and the prospective restructuring of the sugar sector. Thus food production and food security is a high priority. ALP is closely aligned with the SDP 2003-2005. The ROI focuses on infrastructure rehabilitation in rural and outer islands of Fiji.

Arrangements for implementation of climate change activities

53. Climate change programmes, projects and activities are currently coordinated by the Ministry of the Environment (MoE) through the National Climate Change Country Team with representations from various government ministries/agencies and non-government organizations. The Ministry also coordinates and administers the functions of the National Environment Council which was recently established under the national Environmental management Act 2005. The MoE also serves on the National Sustainable Development Committee which provides oversight, among others, to such projects as ALP and ROI.

2.2 Stakeholder analysis

Process and approach used

54. The consultations on Pacific Adaptation to Climate Change (PACC) were conducted by the PDFB team¹ 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.

55. 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.

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

Institutions and individuals involved/consulted

56. A total of eight ministries, agencies and institutions of government and one non-government organization in Fiji involving 25 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.

STAKEHOLDERS AND INSTITUTIONS INVOLVED/CONSULTED

Institution	Stakeholders interests/responsibilities	Relevance to climate change/reasons for inclusion	Role in the consultation process
GOVERNMENTAL INSTITUTIONS			
DEPARTMENT OF ENVIRONMENT	<p>Operational focal point of the UNFCCC and the GEF.</p> <p>Responsibilities:</p> <ul style="list-style-type: none"> - Manages donor-funded programmes and the multilateral environmental agreements. - Implementation of the Climate Change Convention 	<p>Project Management Unit Climate Change Section, established within DOE.</p> <p>Secretariat to National Environment Council.</p> <p>Responsible for preparation of the INC and SNC and its submission to the CoP</p> <p>Responsible for UNFCCC/NCSA preparation in collaboration with other relevant agencies</p> <p>Chair National Climate Change Country Team (NCCCT)</p>	<p>Regular consultations with the UNFCCC focal point for discussion of the proposal of the SNC 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>Priorities include food production and security, coastal zone management and infrastructure, water resources and tourism infrastructure.</p>
LAND RESOURCE PLANNING AND DEVELOPMENT	<p>Responsible for land management and all matters relating to land, natural resources and environment</p>	<p>Undertake land surveys, land capabilities, land resources management and conservation.</p> <p>Currently implementing Sustainable Land Management Programme</p> <p>Implementing “development of sustainable agriculture in the Pacific” including crop management and income-generation.</p> <p>To enable clients to improve productivity, market access and profits, while sustaining the environment and agricultural (food) security; and to account for the use of resources in the delivery of services that are conducive to</p>	<p>Consultations on national priorities, mainstreaming of climate change in sustainable land management, programmes and other documents, as well as on current and planned projects.</p> <p>Priorities include food production and security and sustainable land management</p>

Institution	Stakeholders interests/responsibilities	Relevance to climate change/reasons for inclusion	Role in the consultation process
MINISTRY OF FOREIGN AFFAIRS	.Responsible for global integration for political and economic advancement. Promote and secure strategic economic and diplomatic relations with sovereign States, regional and international institutions Recognize and adhere to international declarations, agreements, conventions, treaties, Improve investment and trade facilitation and negotiation capacity	improved agriculture Member of the National Sustainable Development Committee Advocate of regional and international institutions, advice and follow-up on international declarations and agreements including the UNFCCC	Consultations on Food and food security as an overarching sustainable development issue. Alternative Livelihood Project has close linkages to sustainable development goals, MDGs Co-financing from ALP project
MINISTRY OF FINANCE AND NATIONAL PLANNING	Responsible for economic development planning and policy development	Provides overall guidance on economic and technical policy issues. Integrate climate issues into sectoral planning	Consultations on information and data on sustainable development strategy Priorities for adaptation will depend on the Strategic development Plan 2006-2011 Environment component is not adequately reflected in the SDP Co-financing will depend on line ministries of government Priority focus on coastal zone management and infrastructure
MINISTRY OF PUBLIC WORKS	Responsible for implementing projects on water, wastewater, roads, rural water projects	Implements infrastructure projects and activities in rural areas, coastal zones. Involved in the implementation of the Rural and Outer Island development project	Consultations on the problems of lack of coordination between various agencies on water issues. Climate change issues are not integrated into projects, programmes and activities due to lack of capacity. Need for a unit/cell responsible for water sector Priority to ensure adequate water supply

Institution	Stakeholders interests/responsibilities	Relevance to climate change/reasons for inclusion	Role in the consultation process
			and quantity available for population
MINISTRY OF AGRICULTURE, SUGAR AND LAND RESETTLEMENT	<p>Responsible for a vibrant business-focused agriculture sector providing food and income security for all.</p> <p>Promotes sustainable community livelihoods through competitive exports and efficient food security.</p>	<p>Member of the NCCCT</p> <p>Assist agriculture and forest sectors on agroforestry and reforestations programmes</p> <p>Accelerate agricultural diversification, promote food security and sustainable development in non-sugar agriculture</p>	<p>Consultations on the process of incorporating climate change issues into the agricultural development.</p> <p>Main priority is food production and food security</p> <p>Climate change impacts on drainage design infrastructure in lowland farming areas</p>
MINISTRY OF MULTI-ETHNIC AFFAIRS	<p>Responsible for working towards the sustainable development of communities</p> <p>Provides assistance to the poor and disadvantaged.</p>	<p>Implements projects on rural water supply through provision of catchments.</p> <p>Self-help projects on water, poverty eradication, rural electrification</p>	<p>Consultations on the impacts of climate change on water and sanitation programmes in rural areas.</p> <p>Water and sanitation in communities as priority</p> <p>More coordination needed on climate change issues and activities</p>
MINISTRY OF FIJIAN AFFAIRS, LAND AND PROVINCIAL DEVELOPMENT	Responsible for Disaster management and risk reduction	<p>Provides policy and technical advice on disaster preparedness, management and risk reduction</p> <p>Adopt CHARM and mainstreaming into sectoral programmes, policies and plans</p>	<p>Consultations on the need for efficient and effective early warning system</p> <p>Vulnerable coastal communities</p> <p>Need for more coordination and collaboration with other agencies off government</p> <p>Need for more buffers in the coastal zones, e.g. mangrove planting, sand bank retention.</p>

2.3 Climate change programmes, projects and activities

57. At the national level, the proposed PACC project will have strong linkages to a number of on-going UNDP-GEF enabling activities such as National Sustainable Land Management Project (SLM) and the second national communication. PACC project will also have strong linkages to the Fiji Government's Alternative Livelihood Project, Rural and Outer Island Development Project and Adaptation Strategy for Sugar.

58. The PACC Fiji component will benefit from the experience of project implementation of the following projects which are currently being developed and or implemented in Fiji:

- a) The World Health Organization/United Nations Development Programme Global Project on Piloting Climate Change Adaptation to Protect Human Health focusing on increasing adaptive capacity to respond to climate-sensitive health risks relating to water stress, food production and food security issues and human health,
- b) An Economic Analysis of the Impacts of Climate Change, a study mandated by the Forum Economic Ministers Meeting (FEMM) in 2005 to be completed by 2007.
- c) Integrated Water Resources Management project (IWRM) focusing on water resources management in 10 Pacific Island countries coordinated by SOPAC. Given that one of the focus areas of the PACC project is on water resources management, this project and PACC Fiji component are very likely to have similar activities. Thus, efforts will be made through consultation between the two agencies responsible to ensure there is no duplication and to collaborate and cooperate in the delivery of technical services and policy guidance to Pacific island countries in the implementation of adaptation activities relating to water resources management,
- d) Development of Sustainable Agriculture in the Pacific (DSAP) which is being coordinated by SPC and is being implemented at the national level focusing on water stress, cover crop (nitrogen-fixing cover), drip-irrigation, introduction of new crops (emerging high value crops), quick composting, collection, protection and storage of genetic material (Germplasm Centre), and invasive species. These project activities have strong linkages to PACC activities particularly with regard to food production and food security issues in Pacific islands region. PACC can use the expertise, knowledge, experience and technology gained from DSAP in the identification, prioritization and implementation of adaptation activities relating to food production and food security, biosafety and invasive species, sustainable land management and sustainable forest management.
- e) Climate Change Capacity-building and Training at regional and national levels to enhance the capacity of Pacific island countries to deal with the adverse effects of climate change. These include: Climate change vulnerability and adaptation course; training institute on Climate Extremes; Assessment of Impacts of, and Adaptation to Climate Change in Multiple Regions/Sectors (AIACC); Working with communities through Fiji Locally-Managed Marine Areas; Adaptation to Climate Change project involving six communities in Fiji. Lessons learnt from these activities, programmes and projects will provide useful insights to the identification, prioritization and implementation of adaptation activities in the Pacific island countries. Strong linkages and synergy exists between the proposed PACC activities/focus areas and the activities, programmes and projects relating to capacity-building and training for climate change adaptation.

SECTORAL ANALYSIS

59. The following priorities were identified during consultations with various agencies and ministries (see table above) food production and food security, water and sanitation, coastal zone management and infrastructure, tourism infrastructure and protection of coastal communities and socio-economic infrastructure and activities. These priorities are consistent with those outlined in section 2 of this report which has also been outlined in Fiji's initial national communication under the UNFCCC.

3.1 Methodology/criteria for selection of priority sector

60. 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 Fiji 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.

61. Based on these three criteria, food production and food security was selected as a priority sector for adaptation intervention in Fiji under the PACC project. Under this theme, an adaptation project entitled "*Piloting climate change adaptation in lowland farming systems in Fiji*" was proposed. This project would focus on enhancing, and where necessary, developing new drainage design features for drainage networks and infrastructure in lowland farming areas of Fiji. The premise for this project is that the current design infrastructure of drainage networks is not able to cope with changes in rainfall regimes and sea-level changes leading to damage by prolonged flooding of cropland and damage to crops as well as having adverse effects on livelihood of lowland farmers.

62. At present there is limited integration of climate change adaptation into sectoral development planning and budgeting processes relating food production and food security 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. This project will:

- a) Contribute to effective adaptation response in the area of farming systems
- b) Implement urgent adaptation measures to enable the communities to cope with future climate and sea-level changes,
- c) Strengthen networking and information sharing/exchange amongst all stakeholders to develop appropriate measures to address climate change, climate variability and sea-level rise.
- d) Conserve and protect breeding grounds and habitats and species that are considered vulnerable to impacts of natural disaster and human induced activities.
- e) Improve water management efforts with better supply-side and demand-side management.
- f) Develop a climate change and climate variability database and collect data on sectors and relevant indicators to monitor and evaluate their impacts,
- g) Promote sustainable land management and protection of agricultural lands,
- h) Enhance food production, food security and income-security and sustainable livelihood.

3.2 Assessment of food production and food security for climate change adaptation intervention

63. Food production and food security is at the core of the Government of Fiji's current development programmes such as the Alternative Livelihood Project, Rural and Outer Island Development Programme and Adaptation of Strategy for Sugar. While the focus of these projects is wide-ranging covering economic development and trade, almost invariably they all point to food production and food security for its people over the long term.

64. In 2002, food production and food security of Fiji's agriculture sector contributed 40% of the labour force and 16% of agricultural GDP as a share of total GDP. Most of the activities relating to food production and food security were rural-based involving 132,000 workers, making this sector one of the most important development sectors in the country.

65. In 2003 Cyclone Ami damage to subsistence crops was estimated at FJ921,000 (between 60-80%) while direct damage to commercial crops was estimated at FJ\$39.3million, of which the sugar industry loss was FJ\$13.6million with 150,000 tonnes of sugarcane crop was damaged valued at FJ\$7.6million. Direct damage to Fiji Sugar Corporation's infrastructure and equipment was valued at FJ\$6million. Additionally there were indirect impacts such as the value of lost production in 2003 amounted to FJ\$11.2million and an additional 400 personnel employed for post-disaster clean up costing additional FJ\$884,000 in 2003. Increased transport costs were felt throughout the sugar industry due to damage to sugar-train rail system and sugarcane transport roads.

66. Since 1990 floods associated with cyclonic storms and rainfall have caused considerable damage to agricultural lands particularly in the lowlands. Damage caused by flooding associated with Cyclone Sina was estimated at FJ\$33million while overall flood damage was estimated at FJ\$188million from Cyclone Kina (World Bank 2000). Other damages resulting from flooding associated with cyclonic storms and rainfall include:

- a) Severe flooding in Tailevu with intensive damage to vegetable farms. Over 100ha of crops (valued at FJ250,000) destroyed during flooding (Tropical Cyclone Vania 1994),
- b) Overall flood damage amounted to FJ\$35million associated with Cyclone Gavin in 1997 (World Bank 2000),
- c) Cyclone June flood damage FJ\$1million in 1997,
- d) Severe rainfall caused estimated loss (agriculture, infrastructure and utilities) at FJ\$10million 1999,
- e) Flash flooding in the Central Division, most places under water for prolonged periods of time 1999.

67. In a study by the World Bank on climate change impacts on agriculture in Viti Levu, Fiji islands in 2000, it was estimated that climate change could lead to more intense droughts during El Nino years and could result in a 9 percent average drop in sugarcane production levels from current conditions with losses averaging USD13.7million a year by 2050. In contrast the impacts on traditional crops could result in losses ranging from 11-15 percents shortfall in taro, yams and cassava yields. Under increasing rainfall scenario, future climate variability could cost an average of USD68,000 a year in lost food crops on Viti Levu, Fiji Islands. Over the long term these losses give rise to substantial economic costs with Fiji suffering from economic damage averaging USD23-USD52million a year by 2050 (i.e. 2-4 percent of Fiji's GDP).

68. The current expenditure (2006 estimates) on Activity 5: Drainage and Irrigation will be FJD733,400 of which FJD15,900 (2%) will be on maintenance and operations, while under Programme 5 – Land, Drainage and Flood Protection, the total allocation for rehabilitation work is FJD7, 416,600, FJD5.5 million (74%) of which is for capital construction. These amounts of expenditures on drainage and flood protection will highly likely remain the same for the foreseeable future as the expenditure projections for 2007 and 2008 will remain the same as the current year.

69. Co-financing for the project will be provided by the Government of Fiji through its budgetary allocations and potentially from its flagship projects such Alternative Livelihood Project, Rural and Outer Island Development Programme and Adaptation Strategy for Sugar. As indicated above the projections of expenditure for the next two years are not likely to deviate much from current accounts. Hence co-financing will likely be in the vicinity of FJD15,000,000 for the adaptation activities from government contributions.

70. The total outlay for Piloting adaptation in lowland farming systems in Fiji will cost approximately USD1,000,000 over a five year period (2007-2011). The goal of this project is to “increase the resilience and enhance adaptive capacity of food production and food security sector in Fiji.” There are number of objectives for this project:

- a) Integrate implementation of climate change adaptation into physical planning and policy processes relating to agriculture and food security
- b) Implement urgent adaptation measures to enable the communities to cope with future climate and sea-level changes,
- c) Strengthen networking and information sharing/exchange amongst all stakeholders to develop appropriate measures to address climate change, climate variability and sea-level rise.
- d) Conserve and protect breeding grounds and habitats and species that are considered vulnerable to impacts of natural disaster and human induced activities.
- e) Improve water management efforts with better supply-side and demand-side management.
- f) Develop a climate change and climate variability database and collect data on sectors and relevant indicators to monitor and evaluate their impacts,
- g) Promote sustainable land management and protection of agricultural lands,
- h) Enhance food production, food security, income-security and sustainable livelihood.

Lessons learned

71. The following are a number of lessons learned from the consultations and from previous work relating to the climate change projects, programmes and activities in Fiji will provide further impetus to the implementation of adaptation activities within the food production and food security sector:

- a) Strong institutional arrangement and support is critical in the management of the adaptation projects and their implementation.
- b) Greater clarity over roles and responsibilities of various ministries, agencies and institutions and the need to strengthen institutional arrangements including mechanisms for delivery, and development and use of in-country capacity and in-country training will be critical in the implementation of adaptation activities,
- c) The level of collaboration and cooperation between and among the various agencies, institutions of government and non-government organizations and communities in the

implementation of adaptation projects is quite critical in contributing to the effective implementation of the various components of the PACC in Fiji.

- d) Some of the activities relating to the implementation of adaptation activities will require capacity enhancement and possibly training. This could include skills upgrading and outsourcing experts and institutions to carry out the tasks/activities in a timely manner.
- e) Fiji has made good progress under its public service reform programme particularly in promoting economic growth through sustainable development and environmental management. The rolling Strategic Development Plan provides a blueprint for development sectors with key performance indicators. The Environmental management Act 2005 and the Sustainable Development Bill together with the National climate Change Policy is testimony to the Fiji's commitment to integrate environmental impact assessment and climate change issues and concerns into the sectoral planning and development.

3.3 Current institutional and priority sector baseline (including costs within priority sector)

72. The Ministry of Agriculture, Sugar and Land Resettlement (MASLR) is responsible for agriculture sector in Fiji. The main focus of the ministry is to diversify, be market-driven and improve efficiency in its service delivery. The restructuring of Sugar Industry in 2004 was part of this overall goal. In the current financial year the Ministry is to facilitate private sector involvement in the development of agribusiness, capacity-building of farmers to raise levels of production and to promote food security and ensure sound land management and development.

73. One of the major constraints to sustainable agriculture, especially in sugarcane growing areas, is poor drainage. The problem has attracted the attention of the Minister for Agriculture, Sugar and Land Resettlement, Government of Fiji, who stressed that the problem of poor drainage has and will always be a major concern for sugarcane farmers and further stated that "the sorry state of the drains is a major concern as it leads to major floods in areas with poor drainage" (Gyani Nand, Minister for Agriculture, Government of Fiji, Fiji Daily Post, page 5: September 5, 2006).

74. Land drainage work is one of the activities implemented by the MASLR to support the agricultural activity in the low lying and deltaic areas especially in the Central Division of Fiji Islands. By means of proper land drainage, high ground water table can be lowered, sufficiently to change the swampy and boggy lands into suitable agricultural land. Protective barriers are also constructed to prevent saltwater and tidal intrusion into suitable land areas.

75. The MASLR had already constructed a total of 51 drainage schemes, which are distributed over such areas Matabau, Tailevu, Naitasiri, Rewa Delta and Serua/Namosi Province. These drainage schemes were constructed between 1980 and 1992 under the "Agricultural Development Programme" which cost a total of FJ\$13.87 million dollars.

76. The total drainage scheme serves a total land area of 13,152 ha with 2,685 farm-families at the initial time of construction. The drainage schemes consist of main drains and associated infrastructures with 600 km of main drains, 71 km of seawalls, 30 km of access roads, 62 outfall floodgate structures and over 1, 000 associated structures.

77. Over 50% of these drainage schemes are now over 20 years old and many have reached their design life span. Only yearly maintenance work was being carried out within the drainage schemes, focusing mainly on desilting of the main and outlet drains. Weeding along the drains is now a supplementary activity to control the deposition of silt for those drains, which cannot be removed by

desilting work. Maintenance of outfall floodgate structures and other associated structures are also carried out on a rotational basis, normally once in every 5 years. However, due to financial constraints (decreased from FJ\$450,000 in 1998 to FJ\$200,000 in 2006), some programmes relating to drainage schemes maintenance and operation have not been carried out. Thus, some infrastructures like floodgates, seawalls, and spillways in some schemes are now overdue for the maintenance and rehabilitation.

78. According to an assessment of needs undertaken by MASLR relating to programmes on drainage schemes, it would require at least FJ\$500,000 per year (range FJ\$47,000-FJ\$540,000) to carry out physical maintenance and rehabilitation of the drainage schemes and its associated infrastructure.

79. Major stakeholders of the drainage schemes and drainage programmes include:

- a) Extension Division - To advise and educate the farmers with respect to agronomy, market demand, land preparation for the crops, farm drains, which have to be dug and linked to the main drainage net work.
- b) Central Division Drainage Board - To deal with problems/constraints (operational, physical) in regards to the main drains, collect the drainage rates & levee and educate and enforce the Drainage Act in its jurisdictional areas through the Drainage Board, Tikina and the Provincial Councils
- c) Tikina and Provincial Councils - To educate the farmers to abide the Drainage Acts and to co-operate with the officials of Central Division Drainage Board and Extension Officers to sort out the drainage issues and agricultural programs.

80. Some of the risks or constraints associated with the implementation of adaptation implementation include:

- a) Lack of financial resources – Optimum amount required to carry out drainage work in the lowland agricultural areas is estimated at FJ\$500,000 per year. Anything less than this amount would affect many programmes for rehabilitation and development
- b) Lack of professional and sub-professional staff – Qualified personnel will be required to plan, design, observe, monitor, supervise and inspect before, during and after implementation. Current level of personnel available is insufficient and therefore urgent recruitment of new personnel will be necessary.
- c) Poor mobility due to old aged vehicles – New vehicles for transport and drainage work will be essential.
- d) Poor co-operation of the farmers – Full cooperation and collaboration by farmers and MASLR with regard to planting consistently and commercially as well as proper and timely advice, technical service for agricultural products will be necessary.

3.4 Impacts of climate change on food production and food security

81. A number of studies have focused on the impacts of climate change on agriculture sector in Fiji (World Bank 2000, AusAID, 2005). For instance changes in rainfall and temperature are likely to affect agricultural production. Sugarcane production is expected to drop by 9% from current conditions with losses averaging US\$13.7million a year by 2050. Impacts on traditional crops with 11-15% drop in taro, yam and cassava production with a loss of US\$680,000 a year in lost food crops. In terms of the economic costs of climate change impacts, the island of Viti Levu, Fiji Islands, could suffer economic damage averaging at least US\$23 –US\$52 million a year by 2050 (i.e. equivalent to 2-4% of Fiji's GDP).

82. In a recent study commissioned by AusAID (AusAID 2005), on the *Economic Impact of Natural Disasters on Development in the Pacific*, the impact of Cyclone Ami and related flooding on agriculture sector in Fiji was estimated at FJ\$1,020,671 (2003 dollar equivalent) while 60-80% of subsistence crops were damaged at a cost of FJ\$921,000. However, direct damage to commercial crops such as kava, taro and copra was estimated at FJ\$39.3 million. The sugar industry suffered a direct damage of FJ\$13.6million including damage to 150,000 tonnes of sugarcane valued at FJ\$7.6million. The value of lost production of sugar in 2003 was 30% lower than forecast crop. The total impact of Cyclone Ami on agriculture and food security in Fiji Islands was estimated at FJ\$66,019,600.

3.5 Determination of additional adaptation activities

83. A number of additional adaptation activities have been identified which will be included in ***Piloting adaptation to climate change in lowland farming systems of Central Division of Fiji Islands***. The two pilot sites proposed will be within the areas covered under Tailevu/Rewa and Serua/Namosi Provinces. The population of the two pilot provinces that will be affected by this project is estimated at 149,763 and 21,203 respectively. Total land area is 121,701 ha and 139,201ha of which 10,122 ha and 3,643ha are considered arable land.

84. Tailevu/Rewa Provinces include 10,195 farmers (1996 census) of which 944 are full-time commercial farmers while in Serua/Namosi Provinces total number of farmers is estimated at 3,370 farmers with 459 full-time commercial farmers (1996 census). The rest are either semi-commercial or subsistence farmers for both pilot provinces. In terms of the gross value of crops, it was estimated at FJD 34 million for Tailevu/Rewa and FJD16.4 million for Serua/Namosi Provinces in 2005. The average value of production per farmer was approximately FJD3,345 for Tailevu/Rewa and FJD4,733 for Serua/Namosi.

85. Major crops grown in the two pilot provinces include dalo, cassava, sweet potato, yams, tumeric, ginger, duruka, coconut, banana, pineapple, yaqona, floriculture, dalo ni tana, and assorted vegetables. Adaptation activities will focus on enhancing the resilience of these crops to impacts of climate-related extremes such as flooding, drought, soil erosion, and water-logging. Improving and climate proofing the drainage system within the two pilot sites will facilitate adequate adaptation and resilience of food production and food security over the long term. Some of the additional adaptation activities that have been determined during the consultations with the various stakeholders include:

- a) The maintenance, rehabilitation and where necessary, developing/building new drainage schemes with a pre-determined recurrence interval of a storm event.
- b) The development of climate proof design infrastructure for drainage schemes in the Central Division
- c) Increase in the size of agricultural and, or arable lands
- d) Increase in the areas of various crops production

- e) Increase the viability of land for livestock production (e.g. poultry, piggery farm and grazing land), and
- f) The improvement of food and income security, reduction of poverty and improvement of social security.

PROPOSED MECHANISM FOR DELIVERY OF FULL-SIZED PROJECT

4.1 Institutional arrangements

86. Given that the Ministry of Environment currently coordinates all environmental and climate change programmes, projects and activities in the country, it is proposed that the coordinating agency and focal point for PACC-Fiji remains with the same Ministry. The added value is that Ministry of Environment already has vast experience in project implementation of this kind at the national level and it is prudent that such experience and expertise is used to maximum benefit.

87. The National Focal Point for PACC-Fiji is the Chief Executive Officer, Ministry of Environment and the implementing agency for the PACC-Fiji project will be the Ministry of Agriculture, Sugar and Land Resettlement. The office within the MASLR responsible for implementing adaptation activities will be the Drainage and Irrigation Section of the Land and Water Resources Management Division. The national focal point and the implementing agency will be responsible to their respective Chief Executive Officers and serve as secretariat to the National Climate Change Country Team (NCCCT). The NCCCT will provide overall guidance (technical, scientific and policy) to the implementing agency as it relates to the PACC-Fiji project.

4.2 Assessment of existing and potential barriers to implement adaptation

88. A number of pertinent barriers (existing and potential) were identified during the consultations. These include; lack of absorption capacity, lack of understanding and/or clarity over roles and responsibilities, lack of capabilities, capacity, awareness, competing demands on staff time, inadequate staff resources, equipment, etc. However, Fiji is currently putting in place an institutional framework together with changes to policy and regulatory framework to enhance cross-sectoral collaboration, coordination and complementarity.

89. 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.

EXPECTED GOAL, OUTCOMES, OUTPUTS AND ACTIVITIES

90. The main goal of this project is to “increase the resilience and enhance adaptive capacity of food production and food security sector in Fiji.” This goal will be achieved through a project titled “Piloting climate change adaptation in lowland farming systems in Fiji.” This project will also focus on enhancing, and where necessary, developing new drainage design features for drainage networks and infrastructure in lowland farming areas of Fiji.

91. One of three major targeted outcomes of the Ministry’s work is to ensure sustainable community livelihood through competitive exports and sufficient food security. Among the many outputs of the

ministry relating to the targeted outcome is to repair and maintain irrigation channels, provision of land drainage service and irrigation services.

92. Outcomes and outputs of this project will depend on the objectives as outlined above but will generally focus on outcomes/outputs that will improve the sustainable livelihood of the lowland farming communities in Fiji. For example, one of the outcomes could be a strengthened and sustainable climate resilient infrastructure design for drainage and flood protection in lowland farming areas and an output could be an elaborate network of improved/enhanced drainage (or protective) infrastructure which increases the productivity of lowland farms. Adaptation activities for the project could include redesigning engineered outlet waterways, culvert crossings, gravelling and upgrading of seawalls, gabion baskets/access roads.

Goal:

To enhance the capacity of the Fiji Islands to adapt to climate change, including variability, in selected key development sectors.

Specific Objective:

93. The main objective of this project is to “increase the resilience and enhance adaptive capacity of food production and food security sector in Fiji”. This project will also focus on enhancing, and where necessary, developing new drainage design features for drainage networks and infrastructure in lowland farming areas of Fiji.

Specific Outputs

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

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

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

Description:

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

93. 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.

Specific Outputs:

Output 1.1: Practical guidance to design drains and drainage networks to adapt to current and future rainfall regimes.

Output 1.2: Practical guidance to design drains and drainage networks to adapt to current and future rainfall regimes demonstrated (with co-financing support)

95. This output will assist the Land and Water Resources Division of the Ministry of Agriculture in Fiji, communities and key stakeholders to develop their capacity for the design and implementation of drainage and drainage network designs to adapt to current and future impacts of climate change. Current design of drainage networks is no longer able to cope with current rainfall regimes and sea-level change. The consequence is that low-lying areas are constantly flooded and water outflow limited causing substantial damage on valuable crops that the Fijian economy is dependent on as well as farmers' livelihoods. The Government of Fiji over the years has used considerable amount of funding to try and dredge the water-ways and rejuvenate existing drainage schemes to alleviate the flooding problems the country is facing. In most cases, this is an exercise in futility, as the drainage networks are not designed for two-to-threelfold increases in precipitation. As recent as February 07, 2007, the Fiji government had been asked to relocate a whole village due to extreme rainfall and its consequent flooding. The Government in its existing budget of about USD 8.6 million for the next 5 years will continue to work on improving drainage schemes throughout the country. This project activities would significantly contribute to Government's effort to address this

issue. Two pilot sites in Tailevu/Rewa and Serua/Namosi provinces have been identified for pilot interventions through this project. The population of the two pilot provinces are 149,763 and 21,203 respectively with a total land area of 121,701 ha and 139,201 ha respectively of which 10,122 ha and 3,643ha are considered arable land. Activities to be undertaken would include:

- Training in use of models and rainfall forecasts/historical data to assess future impacts of climate change on rural agricultural productivity and vulnerability of community to climate change risks;
- Use assessment findings to review existing drainage design which was designed in the late 70s for the whole of Fiji;
- Develop and evaluate appropriate design criteria in view of current and future changes in climate;
- Incorporate design changes into drainage scheme designs so that current schemes can cope with extreme rainfall regimes (i.e. flooding);
- As part of the evaluation of design, also evaluate coastal protective structures and how it can be enhanced as part of the whole drainage network;
- Demonstrate application of new design in a pilot setting and monitor overtime;
- Strengthening networking and information sharing/exchange amongst farmers/stakeholders; and
- Document process and result.

PROJECT LOG FRAMES AND INDICATORS

96. Project Log Frame and indicators for Fiji 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			140,000	38,000	28,100	34,600	28,200	11,100	140,000
Outcome 2									
	71200	International Consultation	10,000	10,000	0	0	0	0	10,000
	71300	Local Consultants	80,000	10,000	30,000	20,000	10,000	10,000	80,000
	71400	Service Contracts - Ind	200,000	30,000	70,000	70,000	20,000	10,000	200,000
	71600	Travel	20,000	2,000	5,000	5,000	5,000	3,000	20,000
	72100	Contractual services - Co	420,000	55,000	205,000	55,000	55,000	50,000	420,000
	72200	Equipment & Furniture	10,000	0	5,000	5,000	0	0	10,000
	72500	Supplies	80,000	10,000	25,000	25,000	10,000	10,000	80,000
	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			870,000	132,000	353,000	191,000	106,500	87,500	870,000
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			20,000	4000	4000	4000	4000	4000	20,000
Outcome 4	71300	Local Consultants	88,758	17752	17752	17752	17752	17750	88,758
Subtotal			88,758	17752	17752	17752	17752	17750	88,758

Total		1,118,758	191,752	402,852	247,352	156,452	120,350	1,118,758
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ANNEXES

LIST OF ORGANISATIONS AND EXPERTS CONSULTED

Ministry of Agriculture, Sugar and Land Resettlement

1. Ms. Tokas Buiniwasi Deputy Secretary
2. Ms. Bulen Rakuita
3. Mr. Asaeli Tubalibau Land Resources Development and Planning
4. Mr. Shim Chand Acting Director (AHWP)
5. Mr. Mesake Nacola Koronivia Research Station
6. Mr. Kyaw Win Principal Engineer, Land and Water Resources Management
7. Mr. Taitusi Naidula Quarantine Officer
8. Mr. Jale Fotofili Director, Human Resources and Finance
9. Mr. Sakiusa Tubuna Acting Principal Economist
10. Ms. Maria Elder Agricultural Officer
11. Mr. Osea Bolawaqatabu Principal Research Officer
12. Mr. Atish Prasad Acting Senior Research Officer

Ministry of Fijian Affairs, Lands and Provincial Development

1. Mr. Shiri Chand Deputy Secretary
2. Mr. Joeli Rokovada Director, Disaster Management

Ministry of Finance and National Planning

1. Mr. Josefa Sania Chief Economic Planning Officer
2. Mr. Luke Koroisave Acting Principal Planning Officer

Ministry of Foreign Affairs

1. Mr. Amena Yauvoli Deputy Chief Executive Officer

Ministry of Environment

1. Mr. Napolioni Maserewa Chief Executive Officer
2. Mr. Epeli Nasome Director

Ministry of Multi-Ethnic Affairs

1. Mr. Director
2. Mr. Chand Principal Administrative Officer
3. Mr. Chand Administrative Officer
4. Mr. Rural Adviser – Eastern Division

Ministry of Works

1. Mr. R.S.Shandil Acting Deputy Secretary
2. Mr. Ajay Gautum Principal Engineer, Wastewater
3. Mr. Virend Chand Prasad Acting Hydrologist

World Wildlife Fund – South Pacific

1. Ms. Diane McFadzien Coordinator, Climate Change and Energy