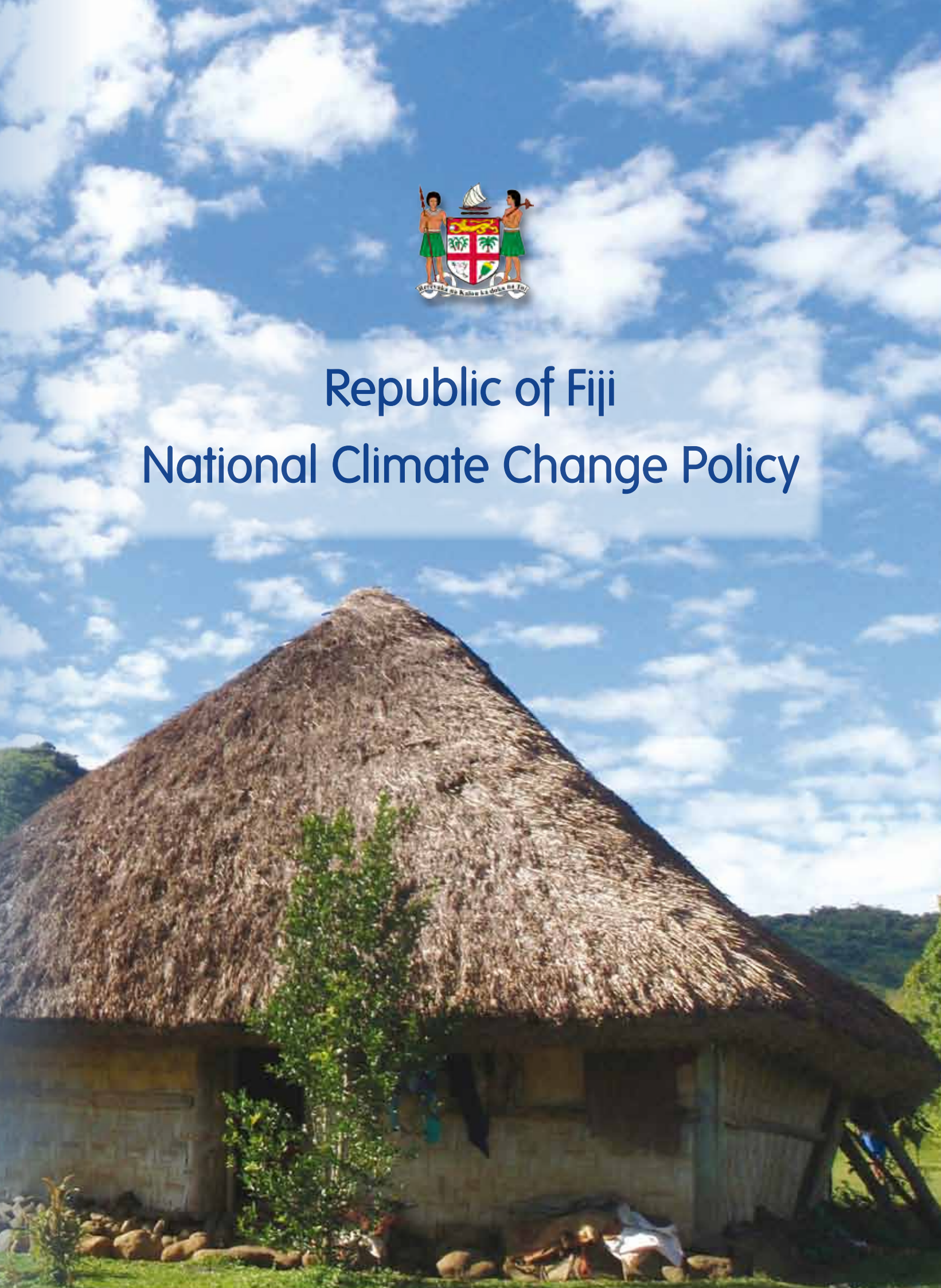
Republic of Fiji
National Climate Change Policy



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Prepared by the Government of the Republic of Fiji, in consultation with
the National Climate Change Country Team and national and divisional stakeholders

Published by the Secretariat of the Pacific Community
Suva, Fiji, 2012

Original text: English

Secretariat of the Pacific Community Cataloguing-in-publication data

Republic of Fiji national climate change policy /
prepared by the Government of the Republic of Fiji, in consultation with
the National Climate Change Country Team and national and divisional stakeholders.

1. Climatic changes — Government policy — Fiji.
2. Climate change mitigation.

I. Title II. Government of the Republic of Fiji III. IV. Secretariat of the Pacific Community

363.7099611 AACR2

ISBN: 978-982-00-0517-4

Cover photo: Matt Capper
Design and layout: Muriel Borderie – SPC Publications Section, 2012

Jointly funded by the Climate Change Unit of the Environment Department, the Secretariat of the Pacific Community and the German Agency for International Cooperation *Coping with Climate Change in the Pacific Island Region* programme, and the United Nations Development Programme and Global Environment Fund *Pacific Adaptation to Climate Change (PACC)* project

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CP(2012): 1st Meeting
Date: 19/1/12

CABINET DECISION

Extract from Minutes of Meeting Held on Thursday 19th January, 2012 at 9.00am

14. The National Climate Change Policy for Fiji **CP(12)18**
– EP 12/2/22

Cabinet:

(i) approved the National Climate Change Policy for Fiji, attached as **Annex I** to the Memorandum.

(ii) approved the development of a National Climate Change Law to be undertaken in consultation with the Solicitor-General's Office; and

(iii) agreed that the draft law be brought back to Cabinet for its approval.

[V. Namosimalua (Mrs)]
Secretary to the Cabinet

Foreword

Fiji is currently undergoing policy and institutional reform that involves the updating of existing legislation and policies, and the development of new legislation and policies. The focus of the reform is to ensure sustainable economic and social development and thereby improve the livelihoods of all communities in Fiji.

Policies have been developed in the areas of agriculture, land use, forestry, fisheries and water. They focus on the sustainable management of Fiji's natural resources and the establishment of appropriate institutional arrangements for effective implementation and monitoring. A major component is the incorporation of environmental management in order to address issues that emanate from natural hazards and unsustainable resource management and utilisation. These policies play an important role in supporting efforts to reduce adverse impacts of climate change on Fiji's economic and social development.

Climate change constitutes one of the greatest barriers to sustainable development. It puts Fiji's biodiversity and ecosystems, particularly marine and coastal, at risk. This has severe implications for Fiji's economic growth, as the country relies heavily on its natural resources for economic development; fisheries, forestry and agriculture are its primary industries. The effects of climate change are widespread and cross-sectoral. Effective co-ordination of a multi-disciplinary approach and a well-established government position on issues and policies are required to address the impacts of climate change.

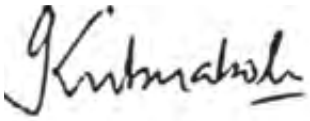
In 2007, Cabinet endorsed Fiji's National Climate Change Policy Framework, which defined the position of government and other stakeholders on issues of climate change, climate variability and sea level rise. It also defined the various responsibilities of each stakeholder in the short and long term. The framework underwent review in 2011 to reflect current and emerging climate change issues at the local, national and international level. The reviewing and updating of the framework led to the development of this National Climate Change Policy, in accordance with the 2011 Corporate Plan of the Department of Environment under its Climate Change Programme. The policy provides a platform for coordination among sectors, and direction on national positions and priorities regarding climate change mitigation and adaptation.

The policy recognises the need for constructive co-operation among all relevant sectors. This interdisciplinary and multi-sectoral approach is emphasised in Agenda 21 of the 1992 United Nations Conference on Environment and Development held in Rio de Janeiro. In the Pacific region, inter-governmental organisations such as the South Pacific Regional Environment Programme (SPREP), the Secretariat of the Pacific Community (SPC) and the University of the South Pacific (USP) are implementing regional climate change programmes that support the development of national programmes and policies.

I express my sincere gratitude to the many stakeholders, which include non-governmental organisations, development partners, community-based organisations and of course the various government sectors, for their commitment and assistance during the development of this policy. The contribution of these stakeholders ensured that the policy is coherent, comprehensive, feasible and appropriate.

The development of the policy was made possible through the financial support provided by the SPC/GIZ Coping with Climate Change in the Pacific Island Region programme and the UNDP/GEF Pacific Adaptation to Climate Change project. We gratefully acknowledge the assistance provided by the two programmes.

As climate change will affect all sectors, this policy will serve to provide over-arching guidance to all sectors on climate change issues. I urge all stakeholders to foster partnerships and collaboration for the successful implementation of the National Climate Change Policy.



Ratu Inoke Kubuabola
Minister for Foreign Affairs and International Cooperation
Republic of Fiji
January, 2012

Preface

Climate change is expected to bring about an increase in the frequency and intensity of extreme events such as flooding, droughts and cyclones. Threats to marine ecosystems (such as coral bleaching, beach erosion, ocean acidification) and terrestrial ecosystems (such as soil erosion, salt water intrusions in low lying coastal areas, reduced soil fertility, and increased pests and diseases) are also anticipated. Whilst Fiji, as a very low emitter of greenhouse gases, is an insignificant contributor to climate change, the country is very vulnerable to its impacts.

This National Climate Change Policy provides guidelines for sectors to ensure that current and expected impacts of climate change are considered in their planning and implementation programmes. In addition, relevant sectors are encouraged to take up climate change mitigation initiatives as part of Fiji's contribution to global efforts to reduce greenhouse gas emissions.

Current administrative and institutional frameworks relating to climate change activities are operating separately and need to be more effectively coordinated. The absence of a climate change policy has made attempts at coordination slow to establish, which constrained Fiji's efforts to address climate change systematically at the national level. This policy sets a platform for dialogue and collaboration among government agencies and stakeholders through organised planning and implementation of national and local climate change programmes. The policy will also support Fiji meeting its international commitments to the United Nations Framework Convention on Climate Change (UNFCCC) and other conventions such as the Convention on Biological Diversity (CBD) and the United Nations Convention to Combat Desertification (UNCCD).

The policy defines objectives and accompanying strategies to facilitate the mainstreaming of climate change issues into relevant sectors and to support the provision of necessary technical and financial resources to this end.

This policy was developed after widespread consultation with all stakeholders. The process was driven by the National Climate Change Policy Taskforce, a sub-group of the National Climate Change Country Team. I take this opportunity to thank all the stakeholders and the members of the taskforce for their hard work and support to the Ministry of Foreign Affairs and International Cooperation.

The policy implementation framework is included with the policy. I now look forward to working closely with my colleagues to develop an action plan for the successful implementation of the National Climate Change Policy for Fiji.

Saipora Mataikabara (Mrs)
Permanent Secretary
Ministry of Foreign Affairs and International Cooperation

Acronyms and Abbreviations

AOSIS	Alliance of Small Island States
CBD	United Nations Convention on Biological Diversity
CBO	Community-based organisation
CCA	Climate change adaptation
CCPT	Climate Change Policy Taskforce
CCU	Climate Change Unit
CDM	Clean development mechanism
CO_2	Carbon dioxide
CTTT	Carbon Trading Technical Team
DoE	Department of Environment
DPCC	Development Partners of Climate Change
DRM	Disaster risk management
DTCP	Department of Town and Country Planning
EMU	Environment Management Unit
ENSO	El Nino Southern Oscillation
FNU	Fiji National University
GEF	Global Environment Fund
GGE	Greenhouse gas emissions
GHG	Greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Agency for International Cooperation)
IPCC	Intergovernmental Panel on Climate Change
INC	Initial National Communication
IUCN	International Union for the Conservation of Nature
JNAP	Joint National Action Plan
KPI	Key performance indicator
MoU	Memorandum of understanding
MDG	Millennium Development Goals
MPI	Ministry of Primary Industries
NCCAS	National Climate Change Adaptation Strategy
NDMO	National Disaster Management Office
NCCCT	National Climate Change Country Team
NCCP	National Climate Change Policy
NGO	Non-governmental organisation
PACC	UNDP/GEF Pacific Adaptation to Climate Change Programme
PIFACC	Pacific Island Framework on Action for Climate Change
REDD+	Reducing emissions from deforestation and forest degradation + forest conservation, sustainable management of forests and enhancement of forest carbon stocks
SIDS	Small island developing states
SOPAC	Applied Geoscience and Technology Division (a division of SPC)
SPC	Secretariat of the Pacific Community
SPCZ	South Pacific Convergence Zone
SPREP	South Pacific Regional Environment Programme
SST	Sea surface temperature
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USP	University of the South Pacific

1. Introduction

International and regional context

Elevated greenhouse gas concentrations in the atmosphere, stratospheric ozone depletion and atmospheric aerosols are having a profound impact on global, regional and local climate systems (IPCC 2007c). Pacific Island countries and territories already experience a high level of risk from the effects of extreme weather and climate variability, and these risks could alter and increase as a result of climate change. Climate models suggest that the Pacific region will continue to warm, which could result in changes in the frequency and/or intensity of extreme weather and climate variability phenomena, and in accelerated sea-level rise. These events will also affect the already stressed marine, freshwater and terrestrial environments.

1.1.1 International and regional frameworks

Climate change has been the subject of international discussion and negotiation for many years. During the first United Nations Conference on Environment and Development (Rio de Janeiro, 1992), the United Nations Framework Convention on Climate Change (UNFCCC) was established, defining the need for global action to achieve 'stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system' (UN 1992). In 1998, Fiji became a signatory of the Kyoto Protocol to the UNFCCC as a Non-Annex I party. Fiji's commitments under the agreement involve the submission of national communication reports, which include greenhouse gas inventories, identification of vulnerable sectors and actions to be taken for sustainable future socio-economic development without increasing the emission of greenhouse gases.

In September 2000, the United Nations Millennium Declaration was adopted. It set out the eight Millennium Development Goals (MDGs), to be achieved by 2015. They form a blueprint agreed on by all countries and leading development institutions.

The Millenium Development Goals

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development

The impacts of climate change will affect the achievement of the MDGs.

Since the establishment of the UNFCCC and the Kyoto Protocol, there has been significant progress towards understanding the impacts of climate change in the Pacific region, and developing programmes to both mitigate and adapt to it. The establishment of the Alliance of Small Island States (AOSIS) has provided a forum allowing Fiji to collaborate with other small island states and negotiate agreements at the UNFCCC Conference of Parties.

The Mauritius strategy 2005–2015 and the Barbados Plan of Action address the problems of small island developing states (SIDS), with climate change as a significant issue. Fiji will contribute to the implementation of the Mauritius Strategy 2005–2015 and the Barbados Plan of Action through this policy.

The Pacific Island Framework for Action on Climate Change 2006–2015 (PIFACC) was developed with the stated goal: 'Ensure Pacific island people build their capacity to be resilient to the risks and impacts of climate change'. The framework is seen as the overarching guide on climate change at the regional level.

The Fiji context

1.1.2 National framework

The *People's charter for change, peace and progress* (December 2008) serves as the umbrella framework for national development. The *Roadmap for democracy and sustainable socio-economic development 2009–2014* defines the implementation framework for the charter. The National Climate Change Policy will serve as an implementing tool for many of the strategies outlined in the charter, such as:

- environmental protection, sustainable management and utilisation of natural resources;
- strengthening institutional capacity for environmental management; and
- strengthening food security.

1.1.3 Fiji's climate

The Republic of Fiji is an island nation with an estimated population of 837,271 people (2007) and an annual population growth of 0.8%. There are an estimated 330 islands, of which approximately one third are inhabited. Fiji has a total land mass of 18,333 sq km, with Viti Levu (10,429 sq km) and Vanua Levu (5,556 sq km) constituting 87% of the total. Fiji has an exclusive economic zone of 1.26 million square kilometres.

The climate of Fiji is generally categorised as an oceanic tropical marine climate.

a. Climate variability
The climate of Fiji varies over different timescales; major features that drive our climate are:

- the El Niño Southern Oscillation (ENSO) phenomenon (occurs every two to seven years, four years on average);
- the South Pacific Convergence Zone; and
- the trade winds.

The ENSO phenomenon

The El Niño-Southern Oscillation (ENSO) cycle is one of the most important drivers of inter-annual climate variations in the Pacific. El Niño (warm phase) and La Niña (cold phase) are opposite phases of ENSO. Since Fiji lies within the transition zone of the southern oscillation, the effects of ENSO events are not always distinct.

An El Niño event usually results in drier and hotter conditions in Fiji during the wet and hot season, particularly from December to February, and drier and cooler conditions in the cool and dry season, particularly between June and August. The most serious effect of strong El Niño events in Fiji is the

reduction in rainfall and increased likelihood of drought. There is a significant (4–6 month) delay between El Niño indicators and the onset of damaging drought (e.g. in 1982 and 1997). However, El Niño events beginning in the dry season may show up earlier in reduced rainfall (Kaloumaira 2002).

The opposite event – La Niña – can bring heavier rainfall in the wet season and occasionally above normal precipitation in the dry season. These events usually result in river flooding. The relationship between La Niña and rainfall is strongest in the dry zones of the island.

Historical data show that the risk of Fiji being affected by tropical cyclones during an El Niño event remains more or less the same as during a normal year, though the chances of high intensity tropical cyclones tend to increase. The data show more off-season tropical cyclones have occurred during El Niño years. The chance of a tropical cyclone affecting Fiji during a La Niña event has been shown to be low (Pahalad and McGree 2003).

South Pacific Convergence Zone and Inter-Tropical Convergence Zone
The South Pacific Convergence Zone (SPCZ), a zone associated with high rainfall, fluctuates northeast and southwest of Fiji. During the southern hemisphere wet season, the heaviest rainfall occurs in the South Pacific Convergence Zone, which includes Fiji. During the southern hemisphere dry season, the heaviest rainfall occurs in the monsoon region and the Inter-Tropical Convergence Zone.

With Fiji in the SPCZ transition zone, there may be a delay between the onset of an ENSO event and the impact on the climate of Fiji, depending on when the SPCZ begins to shift eastward.

Seasonal cycles
Fiji experiences a distinct wet season from November to April and a dry season from May to October. The seasonal cycle is strongly affected by the relative position of the SPCZ, which is most intense during the wet season and close to the country. The trade winds bring orographic rainfall to the eastern parts of the country. Approximately 70% of the national annual average rainfall, over the period 1961 to 2010, occurred during the wet season.

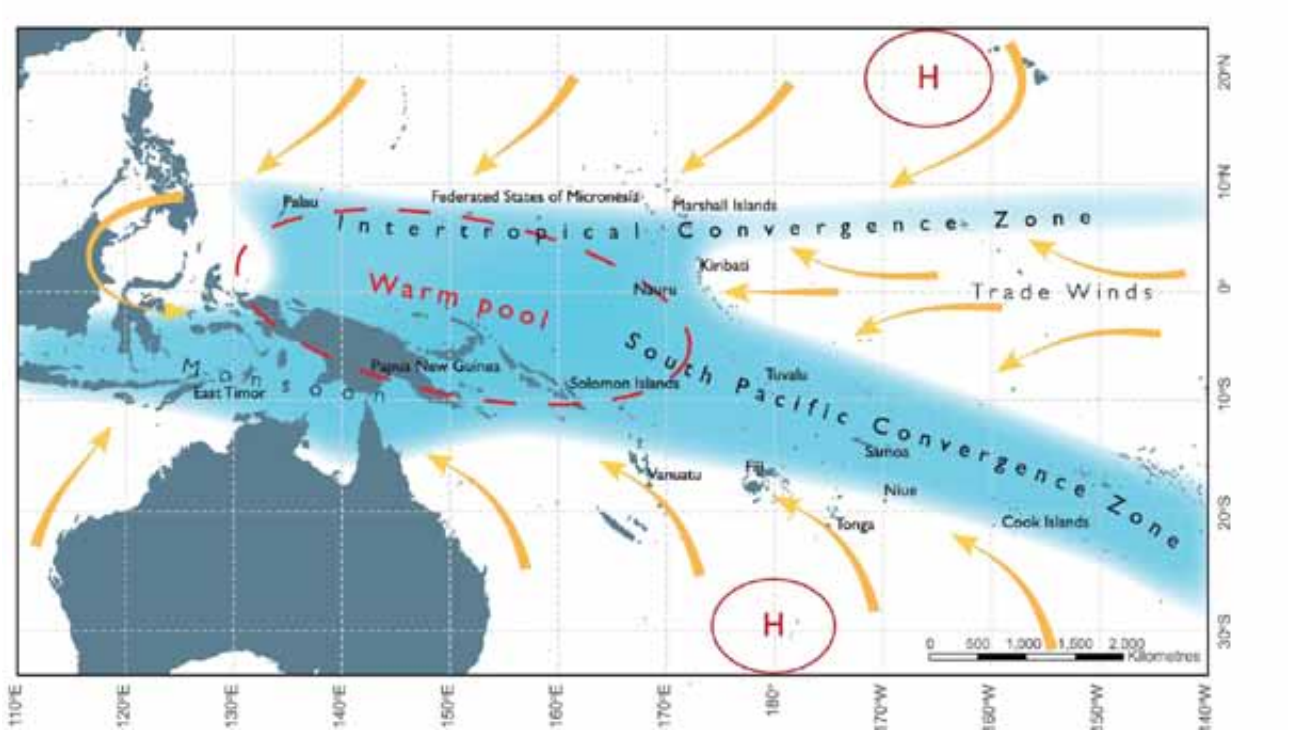


Figure 1. South Pacific Convergence Zone and Inter-Tropical Convergence Zone (Source: Figure ES.2 in Australian Bureau of Meteorology and CSIRO 2011, Climate Change in the Pacific: Scientific Assessment and New Research. Volume 1 Regional. Volume 2 Country Reports)

1.1.4 Fiji climate trends

a. **Current observed trends over Fiji (1961–2010 and 1993–2010)**

Table 1. Climate trends in Fiji from 1961 to 2010 and 1993 to 2010

Climatic variable	Observed trends 1961–2010
Rainfall	Very weak positive linear trend in annual rainfall over Fiji. An annual increase of approximately 0.65 mm/year (approximately 0.03%/year) A weak decreasing linear trend in the wet season rainfall with a seasonal decrease of 1.30 mm/season (approximately 0.08%/year) A weak increasing linear trend in dry season rainfall with a seasonal increase of about 0.76 mm/season (approximately 0.11%/year)
Maximum air temperature	The average annual maximum air temperature increased by 1.1˚C The average warm season maximum temperature increased by 1.2˚C The average cool season maximum temperature increased by 1.0˚C
Minimum air temperature	The annual minimum temperature increased by 0.6˚C Increasing trend in average warm season minimum air temperature and increased by 0.7˚C The cool season minimum air temperature increased by 0.6˚C
	Observed trends 1993–2010
Sea surface temperature	The sea surface temperature from the Lautoka tide gauge indicates a warming trend of 0.05˚C/year (the tide gauge data are insufficient to deduce any long term trend).
Mean sea level	The mean sea level at the Lautoka tide gauge is changing at a rate of 4.6 mm/year (the tide gauge data are insufficient to deduce any long term trend).

(Source: Fiji Meteorological Services 2011)

b. Return periods for extreme climatic variables at selected locations in Fiji

The maximum daily rainfall of 200 mm is likely to be less frequent in future at various locations in Fiji than currently observed (Table 2).

Table 2. Return periods of exceeding daily extreme rainfall of 200mm for selected sites

Locations	Extreme rainfall	Observed	Return periods in years			
			2025	2050	2075	2100
Nadi Airport	200 mm	5.4	6.1	6.9	8.0	8.9
Laucala Bay	200 mm	2.9	3.1	3.5	4.0	4.4
Nabouwalu	200 mm	7.2	8.3	9.7	11.7	13.4
Vunisea	200 mm	9.6	11.5	13.9	17.7	21.0
Lakeba	200 mm	6.1	6.9	8.1	9.7	11.0
Rotuma	200 mm	4.4	4.9	5.6	6.5	7.3

(Source: Fiji Meteorological Services 2011)

The recurrence of the maximum temperature exceeding 35˚C is expected to be shorter in future than currently observed (Table 3).

Table 3. Return periods of exceeding daily extreme maximum temperatures of 350 C for selected sites

Locations	Extreme maximum temperature	Observed	Return periods in years			
			2025	2050	2075	2100
Nadi Airport	35˚C	2.9	1.9	1.4	1.1	1.0
Laucala Bay	35˚C	23.1	13.4	7.7	4.2	3.0
Nabouwalu	35˚C	25.3	14.9	8.7	4.8	3.3
Vunisea	35˚C	40.9	24.4	14.4	7.9	5.5
Lakeba	35˚C	77.7	43.3	23.9	12.2	7.9
Rotuma	35˚C	74.3	39.4	20.5	9.9	6.2

(Source: Fiji Meteorological Services 2011)

The return period of daily minimum temperatures of 16˚C, 18˚C and 21˚C at selected locations in Fiji is likely become more frequent than currently observed (Table 4).

Table 4. Return periods of exceeding daily extreme minimum temperature of 160C for selected sites

Locations	Extreme minimum temperature	Observed	Return periods in years			
			2025	2050	2075	2100
Nadi Airport	16˚C	21.7	15.2	10.5	6.9	5.4
Laucala Bay	16˚C	1.9	1.6	1.3	1.1	1.0
Nabouwalu	18˚C	2.1	1.8	1.5	1.3	1.2
Vunisea	16˚C	3.3	2.7	2.2	1.8	1.6
Lakeba	16˚C	2.1	1.9	1.7	1.5	1.4
Rotuma	21˚C	2.3	1.7	1.4	1.2	1.1

(Source: Fiji Meteorological Services 2011)

The daily maximum winds exceeding 80 knots at selected locations in Fiji are expected to become more frequent in future than currently observed (Table 5).

Table 5. Return periods of exceeding daily extreme wind of 80 knots for selected sites

Locations	Extreme wind	Observed	Return periods in years			
			2025	2050	2075	2100
Nadi Airport	80 knots	7.5	6.6	5.8	5.1	4.7
Laucala Bay	80 knots	21.3	18.3	15.8	13.5	12.3
Nabouwalu	80 knots	205.0	159.0	124.2	95.3	81.1
Vunisea	80 knots	10.8	9.6	8.6	7.6	7.1
Lakeba	80 knots	282.2	215.2	165.3	124.6	104.9
Rotuma	80 knots	83.6	68.4	56.4	45.9	40.4

(Source: Fiji Meteorological Services 2011)

The maximum sea levels are expected to continue to increase throughout this century (Table 6).

Table 6. Return periods of exceeding extreme sea levels of 2.4 and 2.8m for Lautoka and Suva

Locations	Extreme Sea level	Observed	Return periods in years			
			2025	2050	2075	2100
Lautoka gauge	2.8 metres	80.2	26.9	9.1	2.7	1.0
Suva gauge	2.4 metres	98.9	18.7	3.8	1.1	1.0

(Source: Fiji Meteorological Services 2011)

c. Tropical cyclones

Tropical cyclones are one of the most severe extreme events to affect Fiji, and the country has experienced them on numerous occasions in the past four decades. They usually affect Fiji from November to April but have occurred in October and May. On average, one or two cyclones affect some part of Fiji every season, with the greatest risk during the El Niño season. There have been seasons when Fiji has had no cyclones and seasons with four cyclones (1984/85) and five cyclones (1992/93). A decreasing trend in both the number of tropical cyclones and cyclones with hurricane intensity affecting Fiji has been observed in the last four decades (refer to
Figure A1-6, Annex 1).

d. Drought

Major droughts (meteorological) in Fiji have been associated with El Niño events. During moderate to strong El Nino events, the annual rainfall is reduced by as much as 20–50% over most parts of Fiji as experienced during the 1982/83, 1986/87, 1992/93 and 1997/98 events.

e. Floods

Large-scale flooding in Fiji is mostly associated with prolonged heavy rainfall during the passage of a tropical cyclone, tropical depression and/or enhanced, slow moving convergence zone. Localised flash flooding during the wet season (November to April) is quite common.

f. Sea flooding

Sea flooding is usually associated with the passage of tropical cyclones close to the coast. However, heavy swells, generated by deep depressions and/or intense high pressure systems some distance away from Fiji have also caused flooding to low-lying coastal areas. At times, heavy swells coincide with king tides and cause flooding and damage to coastal areas.

1.1.5 Climate projections (global climate models)

By 2030:

The most likely projected change for Fiji is for ***warmer temperatures and little change*** in rainfall, with annual mean temperature increases of 0.7˚C and negligible (–1%) change in mean annual rainfall, which is predicted by 69% of the models. ***Warmer and drier*** change in projected climate is predicted by 6% of the models, with annual mean air temperature increases of 0.6°C and annual mean rainfall decreases of 6%. ***Warmer and wetter*** conditions are represented by 13% of the models, with annual mean air temperature increases of 0.8°C and annual mean rainfall increases of 7%.

By 2055:
The majority of the models (69%) continue to project ***warmer temperatures and little change*** in rainfall, with annual mean air temperature increases of 1.0°C and annual mean rainfall decreases of 1%. Moreover, ***warmer and wetter*** conditions are predicted by 19% of the models, with annual mean air temperature increases of 1.2°C and annual mean rainfall increases of 10%.

By 2090:
The majority of the models (569.) project ***hotter temperaturesand little change*** in rainfall, with annual mean air temperature increases of 1.9°C and annual mean rainfall decreases of 1%. The other likely high impact projected climate is for ***hotter and much drier*** conditions, which is predicted by 6% of the models, with annual mean air temperature increases of 1.8°C and annual mean rainfall decreases of 16%. ***Hotter and much wetter*** conditions are predicted by 13% of the models, with annual mean air temperature increases of 2.3°C and annual mean rainfall increases of 21%.

By 2100:
The sea level projections are based on the fourth IPCC assessment report that global sea level changes are expected to range from 0.21 to 0.48 metres by the end of the century (IPCC 2007a). However, there is significant uncertainty surrounding ice-sheet contributions to sea level rise and a larger rise than that projected cannot be excluded.

Climatic variables
The projected change in climatic variables for Fiji under the A1B emission scenario (a balanced emphasis on all energy sources) relative to 1981–2000 average for the 21st century is shown in Table 7. An ensemble of 16 models has been used for these projections.

Table 7. Projections at intervals of 19 years from 2020 till 2099 under the A1B emission scenario

Variable	2020–2039		2045–2064		2080–2099		Confidence
	Best guess	Likely range	Best guess	Likely range	Best guess	Likely range	
Mean air temperature (°C)	0.7	0.4–0.9	1.0	0.7–1.5	1.9	1.3–2.6	Moderate
Maximum air temperature (°C)	0.7	0.4–0.7	1.0	0.7–1.3	2.0	1.2–2.2	Low
Minimum air temperature (°C)	0.7	0.4–0.7	1.0	0.7–1.3	2.0	1.2–2.2	Low
Mean rainfall (%)	–0.5	–5.5–8.1	–1.0	–9.4–13.7	–1.2	–16.4–24.1	Moderate

(Source: Fiji Meteorological Services 2011)


Photo: Wolf Forstreuter

1.1.6 Sectoral implications for Fiji

Table 8 provides a summary of the projected or potential climate change impacts as they affect particular sectors. In addition to the impacts, the key areas through which the sectors can contribute to climate change mitigation and adaptation are outlined.

Climate change mitigation and adaptation measures have the potential to deliver cross-sectoral benefits. For example:

- mitigation measures focused on reducing energy consumption will also reduce Fiji's reliance on fuel imports and, in turn, reduce household energy bills;
- mitigation measures focused on reducing petrol and diesel consumption may also improve traffic conditions, reduce reliance on vehicular transport and reduce pollution in urban areas;
- reduction in the use of fuel-based transport and emissions of green-house gases will encourage healthier lifestyles (e.g. walking and cycling) and improved living conditions (e.g. reduction in air pollution), which can contribute to a reduction of some non-communicable diseases;
- mitigation measures focused on maintaining forest carbon stocks and increasing sequestration of carbon through forest conservation, reforestation, afforestation and enrichment planting will also contribute to biodiversity conservation, improved watershed management, improved food security and improved waterway conditions;
- conservation and sustainable management of mangroves will protect a large carbon sink and reservoir, while providing physical foreshore protection, marine breeding grounds, and healthy coral reef systems.

Many adaptation and mitigation measures would be worthwhile, regardless of climate change related impacts. These options are often referred to as no 'regrets' options.

Further information on the impacts of climate change on each of the sectors is provided in Annex 3: Sectoral implications of climate change

Photo: Matt Capper

Table 8: Sector specific climate change impacts, and key areas for mitigation and adaptation

Sector	Potential climate change impacts	Key mitigation opportunities	Key properties contributing to climate change resilience
Agriculture	• Extreme events such as high rainfall, floods and droughts can affect livestock production and management; • Land arability could be reduced due to salt water intrusion, coastal and river-bank erosion, exposure to salt water spray, and heat stress on soils; • Floods, droughts and cyclones may physically damage crops, farm equipment and infrastructure; • Reduced food security in terms of food production, food quality, nutritional availability, affordability and access; • Impact on the national economy as Fiji is an agro-economy country; • Increase in pests and diseases.	*Agriculture contributes 13.5% of global greenhouse gas emission. Soil represents 6%; livestock and manure 5.1% (IPCC 2007b)* Increased sequestration and reduced emissions can be achieved through: • the use of fuel-efficient farming equipment • farming practices that maintain or increase forest cover (agroforestry) • ensuring minimal soil tillage and soil cover to prevent the release of carbon in soil • reducing the use of fertilisers that can be converted and released as greenhouse gases • intensification of small scale commercial and subsistence agricultural activities to optimise production can minimise forest clearance • capturing methane gas from manure	• Diverse traditional crop species that are resilient to flood, drought and saltwater • Diverse traditional crop species that are resistant to disease spread • Traditional agroforestry and integrated farming practices
Human health/ welfare	The direct and indirect impacts of climate change on human health are summarised below: Direct impacts • increasing temperature • rainfall variability • storm activity Indirect impacts • increased spread of disease • compromised food and water sources • psychosocial impacts due to population displacement and income loss The direct and indirect impacts listed above can lead to: • increased incidence and severity of vector-borne, zoonotic and infectious diseases, e.g. dengue fever • increased food and water-borne diseases, e,g, diarrhoeal illnesses • increased injuries and longer-term consequences of extreme weather events • impacts on mental health, food and water security and malnutrition • increased cardiovascular respiratory and renal diseases		• Traditional knowledge of various medicines and cures, from locally available sources • Strong social safety nets within communities that increase resilience to extreme weather events

Sector	Potential climate change impacts	Key mitigation opportunities	Key properties contributing to climate change resilience
Marine and fisheries	• Climate and related oceanic variations already have impacts on fish catches, both subsistence and commercial (SPREP nd); • The combination of the high rainfall experienced during cyclonic activity and storm events with steep bare slopes, causes rapid runoff with river floods and sediment discharges into the near-shore seagrass and coral reef habitats, which has adverse impacts on the fisheries sector (World Bank nd); • Prolonged periods of elevated sea surface temperatures coupled with other climate factors has led to increased frequency of coral bleaching; • Ocean acidification caused by increased CO_2 concentration may reduce the ability of many marine species to form calcareous skeletons, thus disrupting food webs and habitat structure; • Changes in climate are causing migratory shifts in tuna aggregations to other locations (FAO 2008). Skipjack and yellow-fin tuna are displaced eastwards during ENSO events and westward in La Niña (Kirby 2007 in FAO 2008). This may become more pronounced with projections for a more ENSO-like climate (FAO 2008); • Increase in sea level, sea surface temperature changes and alteration of the mixing layer thickness will ultimately affect plankton productivity; • More stormy weather and intense cyclones may render fishing trips unsafe and less productive.		• Mangrove areas and coral reefs and other coastal zones provide physical buffers to extreme weather events • Healthy reef ecosystems are more resilient to the impacts of climate change, such as ocean acidification and increasing sea water temperature

Sector	Potential climate change impacts	Key mitigation opportunities	Key properties contributing to climate change resilience
Forestry	• Higher temperatures will make forests more vulnerable to fires; • Higher temperatures and changes in rainfall patterns may lead to increased occurrence of invasive species and pests; • Forest health could be reduced due to salt water intrusion, coastal and river-bank erosion and exposure to salt water sprays and heat stress on soils; • Floods, droughts and cyclones may physically damage forest plantations, natural forest and associated infrastructure; • Changing temperature and rainfall patterns may cause shifts in habitats and boundaries of certain tree species, pollinators and seed dispersers; • Changing temperature and rainfall patterns can affect the flowering behaviour of certain tree species; • Loss of arable land due to climate change would place added pressure on forest areas.	*Land use and land use change contributes 17% of global emissions (IPCC 2007b). Fiji's total forest carbon stock in 2010 was estimated at 192,270,000t CO2e (Carbon partnership Ltd. 2011)* Increased sequestration and reduced emissions can be achieved through: • sustainable management of forests (a huge carbon reservoir) • promoting reforestation, afforestation, and enrichment planting, as only growing forests are continually sequestering carbon dioxide from the atmosphere • sustainable management of mangrove areas and swamp land, which store huge amounts of carbon	• Healthy forest ecosystems increase the resilience of forest communities through the provision of various ecosystem services and food security (IPCC 2007a) • Healthy forest ecosystems increase the climate change resilience of many flora and fauna • Forests maintain land stability and waterway conditions
Communica-tions	• Cyclones, storm surges and other extreme weather events could damage infrastructure, leading to disruption of communication.		• Wide telecommunication and internet networks with good national coverage provide channels for education, emergency calls and warnings • Mobile phone services facilitate instant and easily accessible funds, transferred from overseas, which can assist in responding to disasters and damage
Transport	• Cyclones, storm surges or other extreme weather events could disrupt land, sea and air transportation; • Failure of transport infrastructure could increase the impacts of extreme weather events by isolating victims from food, water and medical treatment.	*Transport contributes 13.5% of global greenhouse gas emissions (IPCC 2007b)* • Utilisation of fuel-efficient equipment and vehicles to reduce greenhouse gas emissions	

Sector	Potential climate change impacts	Key mitigation opportunities	Key properties contributing to climate change resilience
Water resources and water infrastructure	• Potential impacts to water supply ➢ Potable and non-potable water supply will be affected as a result of decreased rainfall, sea level rise, and saltwater inundation/ intrusion; ➢ Extreme rainfall events could result in water contamination, overflow of dams; ➢ Cyclones, storm surges or other extreme weather events could damage water supply infrastructure and disrupt water treatment and distribution; • Potential impact on wastewater treatment ➢ Overflow of wastewater treatment ponds could result in contamination of water supply and waterways; ➢ Cyclones, storm surges, droughts or other extreme weather events could damage infrastructure, disrupt wastewater collection and treatment, and contaminate water supply and waterways. • Potential impact to storm-water drainage ➢ Extreme rainfall events could exceed the capacity of storm-water drainage networks; ➢ Cyclones, droughts, storm surges and other extreme weather events could damage storm-water infrastructure and disrupt drainage through blockage or excessive water flow.	*Wastewater treatment contributes 1.6% of global greenhouse gas emissions (IPCC 2007b)* • Reduction of methane emissions through changes to sludge management and storage	• Diverse water supply sources (surface water, aquifers and freshwater lenses)
Waste and Waste Infrastructure	• Changing climatic conditions will impact on landfill management practices.	• Reduction of household waste burning • Promotion of household composting, including use of compost toilets • Improvements to landfill management • Increased recycling facilities and collections	

Sector	Potential climate change impacts	Key mitigation opportunities	Key properties contributing to climate change resilience
Energy and Energy Infra-structure	• Cyclones, storm surges and other extreme weather events could damage infrastructure and disrupt generation, storage and distribution of electricity; • Decreased rainfall could reduce the environmental flow and impact hydro-electricity generation capacity. In 2010, hydro-electricity represented 48% of the average electricity generation mix (FEA 2010).	*Energy contributes 24.6% of global greenhouse gas emissions (IPCC 2007b)* • Efficient electricity generation and distribution losses to reduce fossil fuel consumption • Promotion of renewable energy • Minimisation of deforestation related to hydro-electricity dam construction	
Tourism	• Damage to buildings and infrastructure from sea level rise, storm surge, cyclones, floods, salt-spray, coastal erosion and landslides; • Disruption of land, sea and air transport to facilities • Decrease in tourist arrivals due to changing weather conditions and patterns, degradation of pristine natural attractions and damage to infrastructure; • Increasing costs to implement adaptation measures that would be subsequently absorbed by tourists and related service providers; • Growth in the tourism sector may be hindered by the need for increased capital investment and increased climate related challenges.	• Increased energy efficiency • Fossil fuel substitution with renewable energy in tourist facilities (green tourism) • Utilisation of fuel efficient equipment	• Diversity of tourism destinations and services to minimise disruption caused by extreme weather events
Urban devel-opment and housing	• Extreme events such flooding and cyclones incur an economic cost to townships; • Extreme events or natural disasters will affect lives of people in poorly built or poorly located houses — marginal communities are likely to be more severely affected; • Added pressure on services and utilities to cope with demands brought about by extreme events such as heat-waves, water shortages and disease outbreaks; • Land loss and reduction in arable land could lead to migration in urban centres, resulting in over-crowding; • Floods, storm surges, cyclones and other extreme weather events can damage houses and residential buildings, and have the potential to put their occupants in danger during or after an extreme weather event.	• Increased energy efficiency and use of renewable energy in residential, commercial and industrial sectors • Reduction of household waste burning	• Some traditional building practices provide resilience to extreme weather events

2. Climate Change Policy Context

National institutional framework

The Climate Change Unit is responsible for delivering the National Climate Change Policy and coordinating climate change programmes and projects in Fiji. The Unit was established in the Department of Environment in 2009. It currently has one established staff member and five project staff.

On 11 November 2011, the Climate Change Unit was moved from the Ministry of Local Government, Urban Development, Housing and Environment to the Division of Political and Treaties in the Ministry of Foreign Affairs and International Cooperation. The designated national focal point for the UNFCCC made the same move, from the Permanent Secretary of the one ministry to the other. The relocation of the Climate Change Unit was a strategic move to strengthen political and national support for climate change activities in Fiji. The Director of the Political and Treaties Division has overall responsibility for the unit.

In 1997, the National Climate Change Country Team (NCCCT) was established with representatives from a range of government agencies, non-governmental organisations and academic institutions. The team was established primarily to facilitate the development of the 2005 *Fiji Initial National Communication* (INC) to the UNFCCC Secretariat. The NCCCT was revived in 2010, and now serves as the main platform for information sharing and climate change project progress reporting. The NCCCT also provides direction and guidance to the Climate Change Unit on climate change-related matters.

In 2008, and in response to growing opportunities in the area of international carbon trading, Cabinet approved the formation of the Carbon Trading Technical Team to advise and work closely with the Director of the Department of Environment (DoE) in establishing carbon trading projects as part of voluntary and compulsory carbon trading markets. The DoE has formulated the clean development mechanism (CDM) policy guideline, which is a framework for the development of CDM projects in Fiji.

Similarly, with the increasing opportunities created through the current development of the *Reducing Emissions from Deforestation and Forest Degradation + forest conservation, sustainable management of forests and enhancement of forest carbon stocks* (REDD+) mechanism, the Department of Forestry has developed a national REDD+ policy. This sets out the framework for the development and implementation of REDD+ activities in Fiji, with the ultimate purpose of getting Fiji to a state of REDD-readiness by the end of 2012.

The National Climate Change Adaptation Strategy (NCCAS) for the land-based sector is in preparation and is expected to be finalised in February 2012. The strategy is focused on the forestry, water, and agriculture and livestock sectors, as well as terrestrial ecosystems. It will lay out an approach to identify and implement efficient and effective activities to manage the existing and anticipated consequences of climate change.

Fiji is in the process of developing a 'joint national action plan (JNAP) for climate change adaptation (CCA) and disaster risk management (DRM)'. The JNAP for CCA and DRM and the NCCAS will support the implementation of the National Climate Change Policy.

Constraints to implementation

Strategic approaches to mitigating and adapting to climate change are necessary for sustainable economic growth and social development. It is imperative that Fiji addresses climate change constraints and issues that would hinder such growth. The following are major constraints towards addressing climate change issues in Fiji.

1. Institutional framework

i. Uncoordinated and highly sectoral development and implementation of climate change projects, and weak collaboration amongst government bodies, NGOs, and the private sector.
ii. Lack of support and funding for the climate change unit to effectively fulfil its role.
iii. Lack of integration of climate change issues into sectoral planning and budgeting processes.
iv. Lack of a national repository for climate change information.
v. Inconsistency in methodologies and standards used by various agencies when collecting and analysing climate change-related data and information.
vi. Lack of coordination in sectoral response mechanisms to communities affected by climate change and disaster-related events.
vii. Lack of an early warning system to inform the public about extreme events.

2. Supporting legislation

i. Existing legislation and sectoral policies do not adequately consider climate change issues.
ii. Lack of effective enforcement of environment and resource management legislation that is contributing to climate change mitigation and adaptation measures.

3. National planning

i. Inadequate consideration of climate change issues into land-use planning, urban and rural planning, coastal zone planning and infrastructure development plans.
ii. Uncontrolled and unregulated clearing of marginal and vulnerable terrestrial areas has reduced the provision of ecosystem services.
iii. Ageing and poorly maintained service utilities and infrastructure that cannot cope with existing demands will be put under further pressure due to climate change.

4. Human resources

i. Lack of personnel with relevant expertise on sectoral climate change issues in government.
ii. Lack of recognition of the relevance of climate change expertise in established positions of government sectors.
iii. Inability of sectors to retain, support and develop skilled personnel.
iv. Lack of core funding to support and sustain established climate change personnel in government sectors.

5. Awareness and training

i. Lack of awareness and understanding of climate change and its impacts, which hinders the development and effective implementation of appropriate responses.

6. Education

i. Inadequate reviewing and updating of climate change-related content in school curricula and technical, vocational and teacher training courses.

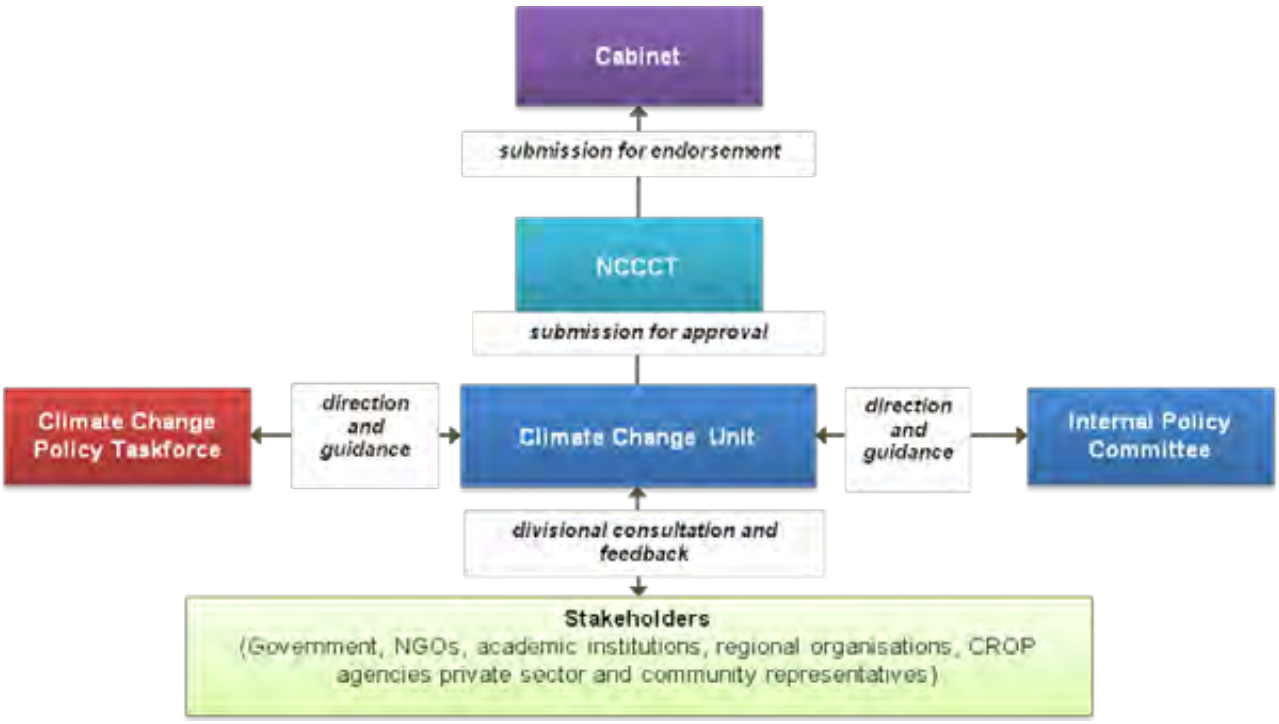
Policy development framework

The National Climate Change Policy is based on the *Climate Change Policy Framework*, endorsed by Cabinet on Tuesday 4 December, 2007. The Policy is aligned to the *Roadmap for democracy and sustainable socio-economic development 2009–2014*, which identifies the need to give priority to protection of the environment, sustainable management and utilisation of natural resources.

The policy presents objectives, principles and overarching strategies to effectively address the constraints mentioned in section 2.2. It is intended to guide the development of detailed strategies and assist in the formulation and delivery of projects and initiatives.

The policy was developed through a consultative process, including extensive consultation with government, non-government, private sector and academic institution representatives from June to October, 2011. The NCCCT and Climate Change Policy Taskforce played key roles in the development and review of the policy prior to its submission to the National Environment Council and Cabinet for approval.

Figure 2. Policy development organisational chart



3. Policy vision

A responsible and exemplary Fiji, leading the Pacific in combating climate change and achieving resilience, while attaining sustainable development.

Photo: Matt Capper

4. Mission statements

- To increase Fiji's capacity to cope with the impacts of climate change by strengthening institutional and legal frameworks, providing sound scientific information, and implementing effective awareness and education initiatives
- To maximise access to and secure globally available financing for climate change mitigation and adaptation efforts
- To strengthen Fiji's support towards neighbouring Pacific Island countries that are highly vulnerable to the impacts of climate change
- To strengthen engagement in international climate change policy processes and fulfil obligations on climate change mitigation and adaptation

Photo: Matt Capper

5. Policy goals

The National Climate Change Policy will guide efforts in following an effective and integrated approach to addressing climate change issues in Fiji, and will support the achievement of relevant key performance indicators identified in Fiji's *Roadmap for democracy and sustainable socio-economic development 2009–2014.*

As a signatory to various international agreements and conventions such as UNFCCC, UNCCD, CBD, and the Kyoto Protocol, Fiji is obligated to develop appropriate national responses. It is also fitting that Fiji establishes national mechanisms that contribute to addressing issues identified in regional policies.

The goals of this climate change policy are:

1. to support the implementation of Fiji's *Roadmap for democracy and sustainable socio-economic development 2009–2014* under the *People's charter for change, peace and progress;*
2. to promote integration of climate change issues in national planning, budgeting and implementation processes;
3. to provide guidance on government's responses to climate change issues;
4. to guide sectors to develop appropriate climate change adaptation and mitigation strategies;
5. to support requests to regional and international agencies to provide resources and assistance in addressing national climate change issues;
6. to contribute to Pacific regional actions and to meeting international commitments.

Photo: Christine Fung

6. Policy principles

The following principles will guide the implementation of the National Climate Change Policy:

1. Long-term sustainability
Initiatives and programmes should deliver long-term, positive, ecological, economic and social impacts.

2. An integrated approach
Ensure multi-sectoral, multi-level and inter-disciplinary approaches to achieve national development goals.

3. Community ownership
Ensure local community involvement and put in place effective feed-back mechanisms.

4. Strategic partnerships
Ensure government coordination with relevant and potential development partners, CROP agencies, NGOs, community-based organisations (CBOs), faith-based organisations, academic institutions and the private sector for effective delivery of initiatives.

5. Scientifically sound and appropriate information
Planning, policy formulation and decision making are to be based on scientifically and technically sound data and information, while recognising the value of traditional knowledge.

6. Reporting and feedback mechanisms
Ensure systematic reporting and feedback of climate change initiatives, programmes and projects through the National Climate Change Focal Point and the National Climate Change Country Team.

7. Monitoring and evaluation
All climate change initiatives, programmes and projects to feed into the national climate change monitoring and evaluation mechanism coordinated by the Climate Change Unit.

8. Equity and fairness
Initiatives, programmes and projects should ensure the equitable accessibility and distribution of all benefits, information and support to marginal and disadvantaged groups, recognising their differing vulnerabilities to climate change.

9. Practical, affordable and appropriate solutions
Adaptation options and technologies are locally appropriate and affordable.

10. Gender considerations
In recognising that men and women face different social, economic, and environment situations, gender issues are to be considered in all planning and implementation processes. A better understanding of the vulnerabilities and capacities of different gender groups to deal with climate change is to be promoted.

11. Incorporating lessons learned
National planning and policy processes should consider findings and lessons learned from climate change-related programmes and projects.

12. International collaboration
Continue to foster international partnerships to address climate change on a regional and global level while acknowledging national responsibilities.

7. Policy objectives and strategies

This section includes the eight objectives and the strategies to achieve each of the objectives. The objectives cover the following areas:

1. mainstreaming
2. data collection, storage and sharing
3. awareness raising
4. education and training
5. adaptation
6. mitigation
7. financing
8. international and Pacific region participation.

Many of the strategies outlined in this policy cut across sectors and will require the contribution of a number of agencies and organisations for effective implementation.

A lead agency and implementing agencies have been identified for each strategy.

It is envisaged that the lead agency will be responsible for initiating and coordinating programmes and initiatives in line with the strategy.

The implementing agencies, in collaboration with the lead agency, will implement projects and initiatives to support the achievement of the strategy.

The lead agency and implementing agencies for each strategy are shown in Table 9.

Objective 1: Mainstreaming

Integrate climate change issues in all national and sector policy and planning processes.

Strategies

1. Incorporate climate change into national plans and budgets in line with the Climate Change Policy Framework.
2. Ensure that reviews of national and sectoral policies align with the National Climate Change Policy.
3. Consider the National Climate Change Policy in legislative review processes and develop cooperative and coordinated agreements between sectors to ensure enforcement.
4. Consider lessons learnt and recommendations of national and local-level reports, projects and studies relating to climate change in the national, divisional and local planning processes.
5. Consider climate change implications in all strategic national development planning, including land use planning, development assessment, infrastructure and settlement planning.
6. Ensure all sectors coordinate climate change adaptation and disaster risk reduction efforts to enhance aid effectiveness and streamline implementation.
7. Task the Climate Change Unit with facilitating the design and implementation of a national monitoring and evaluation tool to assess and improve on climate change integration in sectors, including enforcement of climate change-related legislation.
8. Include climate change programmes in the responsibilities of all government departments.

9. Review public health and social policies to ensure consideration of climate change impact projections and appropriate mitigation and adaptation measures.
10. Review the national building code to ensure consideration of climate change impact projections and appropriate climate change resilience measures.
11. Review the terms of reference of the NCCCT to ensure effective and efficient guidance and review of climate change projects.
12. Strengthen partnerships and establish an effective communication mechanism between government agencies, CBOs, faith-based organisations, NGOs, municipal councils, the private sector, professional and academic institutions, and communities to allow effective and sustainable integration of climate change into their programmes and activities.

Objective 2: Data collection, storage and sharing

Collect, manage and use accurate and scientifically sound climate change-related data and information.

Strategies

1. Establish, within the Climate Change Unit, a clearing house mechanism for climate change data and information (research and projections on climate variability, climate trends, etc.) to foster data accuracy and efficient information sharing.
2. Establish collaboration with all relevant sectors and regional and international agencies on the collection and sharing of climate change-related data.
3. Ensure data management is aligned with international best practice standards such as the IPCC good practice guidance.
4. Collaborate with relevant regional and international research and academic institutions to update climate change-related data and information.
5. Strengthen the national weather and climate monitoring network.
6. Adopt innovative and sustainable approaches to data management.
7. Encourage and promote robust research to provide sound climate change-related data.

Objective 3: Awareness raising

Increase awareness and understanding of climate change-related issues across all sectors and at all levels in Fiji.

Strategies

1. Conduct awareness-raising workshops and sessions for policy makers, decision makers and local and national planners on climate change issues.
2. Use a range of available communication technologies to conduct outreach activities related to climate change adaptation and mitigation.
3. Support CBOs and faith-based organisations to raise climate change awareness in local communities.
4. Establish an effective communication and networking mechanism on climate change issues among government departments, NGOs, CBOs, faith-based organisations, municipal councils, the private sector, and professional and academic institutions.
5. Produce regular information briefs, such as quarterly newsletters, on climate change-related information in Fiji, and utilise effective distribution channels.
6. Produce a suite of awareness-raising materials to allow communication to people with special needs.
7. Develop locally appropriate awareness materials in all common vernaculars.

8. Collaborate with other government sectors and agencies to implement an awareness programme for all divisions at least twice a year.
9. Improve the Climate Change Unit website for more effective and efficient sharing, dissemination and updating of climate change information and news.

Objective 4: Education and training

Integrate climate change in school curricula, tertiary courses, and vocational, non-formal education and training programmes.

Strategies

1. Review and update the current primary and secondary curricula, and the tertiary and vocational education courses to ensure inclusion of local, accurate and current climate change information, and to encourage student research around the issue of climate change.
   1.1 The Curriculum Development Unit to assess and review teaching materials on climate change regularly, given the dynamic nature of climate change science, research and international progress.
2. Develop appropriate educational materials and learning tools on climate change for students with special needs in early intervention programmes, in special and mainstream primary and secondary schools, and in tertiary institutions.
3. Review and update non-formal education programmes and training materials to incorporate climate change information where appropriate.
4. Build capacity of provincial administrators, Roko Tui, advisory councillors, community leaders, village headmen, youth leaders, faith-based organisations and NGOs to deliver accurate information, integrate local content, and promote critical thinking about climate change.
5. Ensure that education and training programmes are designed to allow and encourage individuals to understand climate change, and to take action on mitigation and adaptation.
6. Develop appropriate training tools on climate change for government officers involved in awareness and training programmes in all government departments.

Objective 5: Adaptation

Reduce the vulnerability and enhance the resilience of Fiji's communities to the impacts of climate change and disasters.

Strategies

1. Integrate related disaster risk reduction and climate change adaptation strategies and actions into national and sectoral planning to streamline responses.
2. Include vulnerability assessments and climate change impact projections into resource management planning, such as integrated coastal and watershed management plans.
3. Incorporate climate change impact projections into infrastructure and urban and rural planning.
4. Develop sustainable adaptation technologies and systems that take traditional knowledge into account and are culturally acceptable.
5. Support the ecosystem-based approach throughout Fiji, recognising that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience.
6. Develop and make accessible hazard maps of coastal, riverine, urban and inland areas in Fiji, using the comprehensive hazard assessment and risk management (CHARM) tool to guide all development planning.
7. Assess poverty, health and food security issues to determine their vulnerability to climate change, and consider these vulnerabilities in future policies and initiatives.

8. Improve disaster response capacity and access to public health facilities, emergency services, communication services and evacuation centres.
9. Build the capacity of the health and agriculture sectors to respond effectively to climate sensitive diseases, including the strengthening of disease surveillance and control systems, and early warning mechanisms for climate sensitive human and livestock diseases.
10. Use appropriate consultation mechanisms for the participation of all members of the community in the planning, management and implementation of adaptation measures.
11. Mobilise resources and all sectors to support the implementation of relevant national adaptation strategies and plans, such as the *National Climate Change Adaptation Strategy*, the planned joint national action plan for CCA and DRM and the *National Disaster Risk Management Plan*.
12. Strengthen early warning systems to ensure effective and timely communication to the public, with particular attention paid to isolated, hazard-prone and disadvantaged areas.
13. Implement best practice adaptation measures, based on sound scientific research, and lessons learnt from local, regional and international experiences.
14. Undertake national research to identify effective adaptation measures to support sector-specific adaptation and disaster risk reduction responses.
15. Establish a monitoring and evaluation system to determine the success of national, sectoral and local adaptation initiatives.

Objective 6: Mitigation

Reduce Fiji's greenhouse gas emissions and implement initiatives to increase the sequestration and storage of greenhouse gases.

Strategies

1. Develop joint programmes and cooperation agreements between relevant sectors to reduce and avoid greenhouse gas (GHG) emissions.
2. Develop and implement national, industrial, commercial (such as the tourism, agriculture and mining sectors) and household energy efficiency programmes, including provision of rebates, incentives and disincentives.
3. Assess and utilise appropriate renewable energy sources, such as wave, tidal, solar, wind, hydro, geothermal, biofuel and biomass.
4. Support the implementation of the Fiji REDD-Plus Policy, the Fiji Biodiversity Strategy and Action Plan, the National Air Pollution Control Strategy, the Ozone Depleting Substances Decree, the National Energy Policy, the Clean Development Mechanism Policy Guideline and other relevant national polices and strategies on the reduction of GHG emissions, deforestation, forest degradation and the enhancement of forest carbon stocks.
5. Access international financing instruments to support renewable energy, energy efficiency, waste management and carbon trading initiatives.
6. Control and reduce emissions from existing private and public vehicles.
7. Control the ages of imported and second-hand vehicles and introduce alternative fuel powered vehicles.
8. Develop activities and infrastructure that promote the reduction and avoidance of fossil fuel consumption (for example, construct proper walking and cycling lanes).
9. Support the enforcement of legislation on open burning in residential and commercial locations, as stated by the Environment Management Act (2005).
10. Formalise collaboration arrangements and commitments of members of committees working in the area of climate change mitigation, such as the Carbon Trading Technical Team, and the Fiji REDD-Plus Steering Committee.

11. Establish a national monitoring and evaluation system to calculate GHG emissions and assess Fiji's mitigation efforts.

Objective 7: Financing

Ensure sustainable financing for climate change efforts.

Strategies

1. Ensure that national budgeting processes include the assignment of funds for climate change mitigation and adaptation research, planning and programme implementation.
2. Develop innovative approaches and schemes to generate funds for adaptation activities at local and national level.
3. Support the UNFCCC National Focal Point to efficiently and effectively access and deliver funds from regional and international sources.
4. Develop an overview of climate change funding and costs in order to monitor the efficiency and effectiveness of funding mechanisms and project delivery.
5. Ensure adequate distribution of climate change funding, such as GEF and the Adaptation Fund, into climate change-related projects in all government agencies.
6. Secretariat of the NCCCT to collaborate with the Development Partners of Climate Change (DPCC) Committee in sharing information and coordinating and streamlining donor-funded projects.
7. Improve financial reporting to the Ministry of Finance to ensure proper disbursement and utilisation of funds.
8. Develop an analysis of the economics of climate change adaptation and mitigation in Fiji to identify cost-effective and cost-ineffective approaches.
9. Support and develop the capacity of government agencies and local NGOS and CBOs in proposal formulation and reporting in order to improve access to funds from regional and international sources.
10. Provide adequate resources to the Climate Change Unit.
11. Implement recommendations from the 'Mainstreaming climate change into national development and budgeting' feasibility study (supported by the Global Climate Change Alliance Facility).
12. Develop projects and initiatives with carbon financing potential.

Objective 8: International and Pacific region participation

Effectively participate in and contribute to international and Pacific region climate change negotiations, discussions, commitments and outcomes.

Strategies

1. Strengthen international negotiation skills of Fiji delegation members and improve their understanding of international policies relating to climate change.
2. Ensure maximum preparation for international and Pacific regional meetings relating to climate change by encouraging cross-sectoral engagement and capacity building.
3. Ensure Fiji's fulfilment of international reporting requirements through streamlined reporting of climate change issues to the three Rio Conventions (UNFCCC, CBD and UNCCD) and systematic monitoring across all sectors.
4. Support a stronger and better coordinated Pacific position on climate change by initiating a collective Pacific regional approach at global negotiations on climate change issues.
5. Facilitate the development of a national and regional supporting mechanism for neighbouring Pacific Island countries that are highly vulnerable to the impacts of climate change.

8. Policy monitoring and review

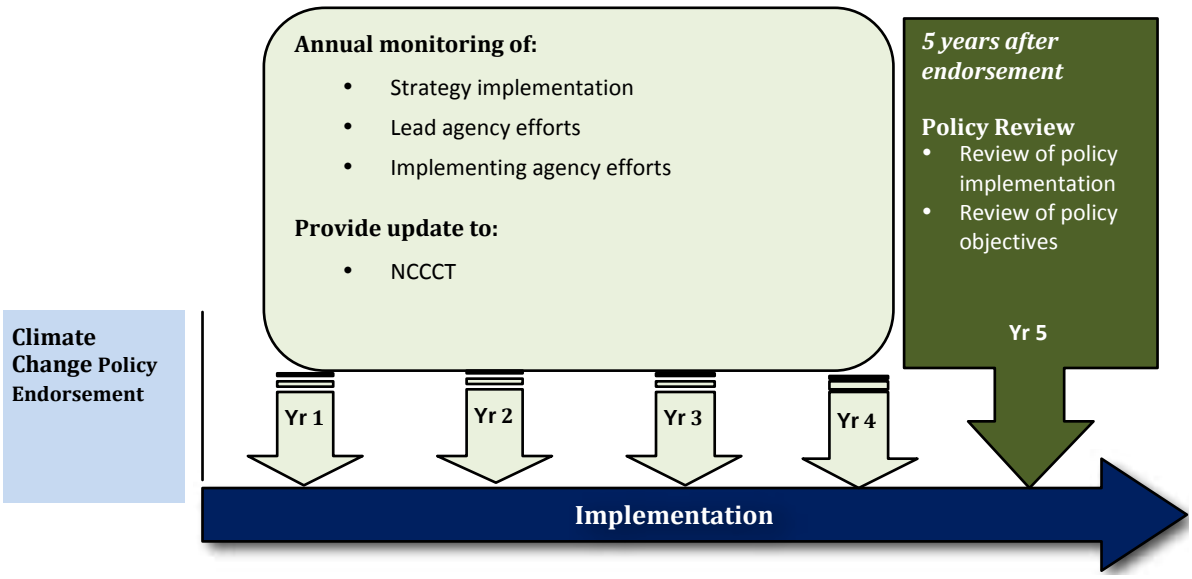
Policy monitoring

To ensure effective and timely implementation, the Climate Change Unit, in collaboration with implementing and lead agencies, will monitor the implementation of the policy. Based on the quarterly progress reports (refer to section 9.1) the Climate Change Unit will submit an annual progress report to the NCCCT and the National Environment Council (NEC) on the implementation of the policy.

Policy review

The policy review process will be facilitated by a task team assigned by the chairperson of the NCCCT. The policy will be reviewed five years after its adoption to assess and ensure its relevance and continued implementation in an efficient and effective manner. The review process should develop recommended changes to the policy objectives, strategies and milestones. The monitoring and review mechanism timeline is illustrated in Figure 3.

Figure 3. Monitoring and review timeline

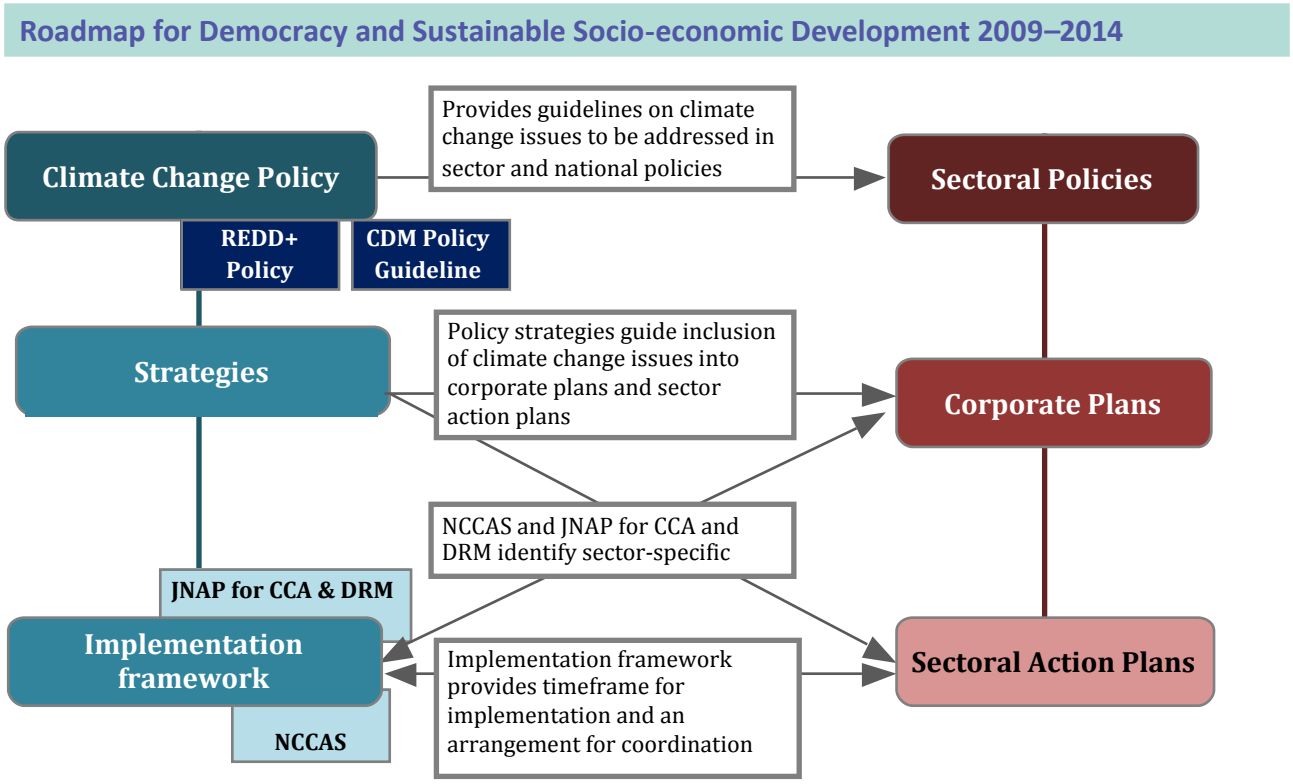


9. Implementation

The policy implementation framework (Table 9) describes the policy strategies and identifies the agencies responsible for their implementation. The framework will inform sectoral annual corporate plans.

The NCCAS and JNAP for CCA and DRM provide detailed and sector-specific actions for implementation of adaptation measures. These actions feed into the overall National Climate Change Policy strategies.

Figure 4. An overview of the implementation of climate change policy through government planning processes



The JNAP will provide additional direction on the implementation of adaptation and disaster risk management strategies identified in the climate change policy. The NCCAS in turn will provide specific land-based sector strategies that feed into the JNAP.

Progress Reporting

To ensure effective and timely implementation, the Climate Change Unit will review the progress of each of the strategies as appropriate, and regularly report to both the National Climate Change Country Team and the National Environment Council at their quarterly meetings. The progress reporting hierarchy is illustrated in Figure 5.

Figure 5. Progress reporting hierarchy

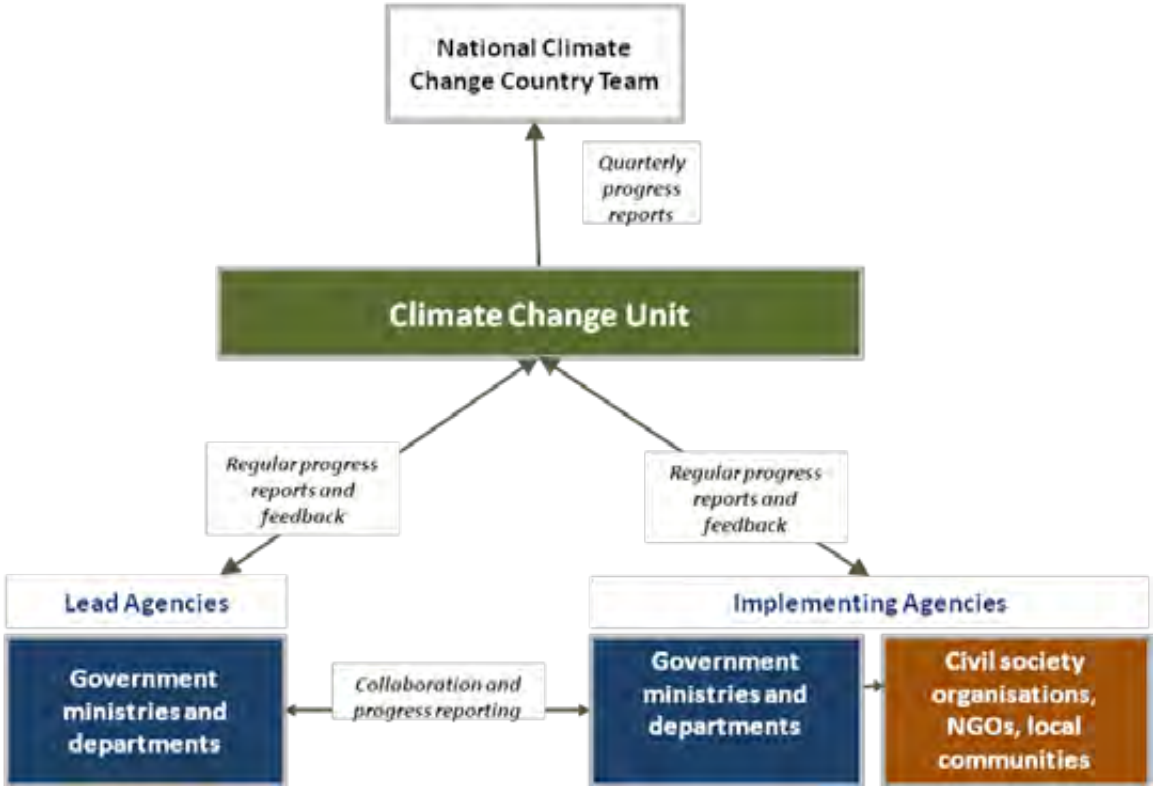


Photo: Manasa Katonivualiku

Table 9 Policy Implementation Framework

	STRATEGIES	TIMEFRAME					Lead agency	Implementing agency
		2012	2013	2014	2015	2016		
	Objective 1: Mainstreaming							
1	Incorporate climate change into National Plans and budgets in line with the Climate Change Policy Framework.						Ministry of Strategic Planning, National Development, and Statistics	Line ministries
2	Ensure that reviews of national and sectoral policies align with the Climate Change Policy.						Climate Change Unit	Line ministries; Solicitor General's Office
3	Consider the Climate Change Policy in legislative review processes and develop cooperative and coordinated agreements between sectors to ensure enforcement.						Solicitor General's Office	Solicitor General's Office; all government agencies
4	Consider lessons learnt and recommendations of national and local-level reports, projects and studies relating to climate change in the national, divisional and local planning processes.						Climate Change Unit	Line ministries; Ministry of Provincial Development; Department of Local Government
5	Consider climate change implications in all strategic national development planning, including land use planning, development assessment, infrastructure and settlement planning.						Ministry of Strategic Planning, National Development, and Statistics	Climate Change Unit; Ministry of Agriculture; Ministry of Fisheries and Forestry; Ministry of Works, Transport and Public Utilities; Department of Tourism; Ministry of Health; Department of Housing; Department of Urban Development
6	Ensure all sectors coordinate climate change adaptation and disaster risk reduction efforts to enhance aid effectiveness and streamline implementation.						Ministry of Strategic Planning, National Development and Statistics	Line ministries; Climate Change Unit
7	Task the Climate Change Unit with facilitating the design and implementation of a national monitoring and evaluation tool to assess and improve on climate change integration in sectors, including enforcement of climate change related legislation.						Climate Change Unit	Ministry of Strategic Planning, National Development and Statistics
8	Include climate change programmes in the responsibilities of all government departments.						Climate Change Unit	Ministry of Strategic Planning, National Development and Statistics; Ministry of Provincial Development; line ministries

	STRATEGIES	TIMEFRAME					Lead agency	Implementing agency
		2012	2013	2014	2015	2016		
9	Review public health and social policies to ensure consideration of climate change impact projections and appropriate mitigation and adaptation measures.						Ministry of Strategic Planning, National Development, and Statistics	Climate Change Unit; Ministry of Health; Department of Social Welfare
10	Review the national building code to ensure consideration of climate change impact projections and appropriate climate change resilience measures.						Climate Change Unit	Ministry of Local Government, Urban Development, Housing and Environment; Department of Tourism
11	Review the terms of reference of the NCCCT to ensure effective and efficient guidance and review of climate change projects in Fiji.						Climate Change Unit	Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Ministry of Health; Ministry of Agriculture; NDMO; Ministry of Works, Transport & Public Utilities; Ministry of Local Government, Urban Development, Housing and Environment; Department of Tourism
12	Strengthen partnerships and establish an effective communication mechanism between Government agencies, CBOs, Faith-based Organisations, NGOs, municipal councils, private sector, professional and academic institutions, and communities to allow effective and sustainable integration of climate change into their programmes and activities.						Climate Change Unit	Ministry of Strategic Planning, National Development, and Statistics; Ministry of Provincial Development; Pacific Council of Churches; Ministry of Fisheries & Forests; Department of Lands; Ministry of Foreign Affairs; Ministry of Health; Department of Local Government; Department of Urban Development; Ministry of Agriculture; NDMO; Department of Energy; Fiji Meteorological Services; NGOs
	Objective 2: Data Collection, Storage and Sharing							
1	Establish, within the Climate Change Unit, a clearing house mechanism for climate change data and information (research and projections on climate variability, climate trends, etc.) to foster data accuracy and efficient information sharing.						Climate Change Unit	Fiji Meteorological Services; Ministry of Information; GIZ, SPC
2	Establish collaboration with all relevant sectors and regional and international agencies on the collection and sharing of climate change-related data.						Climate Change Unit	Ministry of Fisheries & Forests; Ministry of Lands & Mineral Resources; Ministry of Agriculture; NDMO; Department of Energy; Fiji Meteorological Services; NGOs
3	Ensure data management is aligned with internationally best practice standards such as the IPCC good practice guidance.						Climate Change Unit	Ministry of Fisheries & Forests; Ministry of Lands & Mineral Resources; Ministry of Agriculture; NDMO; Department of Energy; Fiji Meteorological Services; NGOs

	STRATEGIES	TIMEFRAME					Lead agency	Implementing agency
		2012	2013	2014	2015	2016		
4	Collaborate with relevant regional and international research and academic institutions to update climate change related data and information.						Climate Change Unit	SOPAC; SP; USP; FNU; University of Fiji; SPREP; IUCN; Forum Secretariat; NGOs
5	Strengthen the national weather and climate monitoring network.						Fiji Meteorological Services	SOPAC; SPC; USP; SPREP; IUCN; Forum Secretariat; NGOs
6	Adopt innovative and sustainable approaches to data management.						Climate Change Unit	Fiji Meteorological Services; Ministry of Information;
7	Encourage and promote robust research to provide sound climate change-related data.						Climate Change Unit	Ministry of Education; USP; FNU; University of Fiji
	Objective 3: Awareness Raising							
1	Conduct awareness raising workshops and sessions for policy makers, decision makers and local and national planners on climate change issues.						Climate Change Unit	Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Ministry of Works, Transport & Public Utilities; Department of Tourism; NGOs
2	Use a range of available communication technologies to conduct outreach activities related to climate change adaptation and mitigation.						Climate Change Unit	Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Ministry of Works, Transport & Public Utilities; Department of Tourism; NGOs
3	Support community-based organisations and faith-based organisations to raise climate change awareness within local communities.						Climate Change Unit	Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Department of Works; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Energy; Department Tourism; NGOs
4	Establish an effective communication and networking mechanism on climate change issues among government departments, NGOs, CBOs, faith-based organisations, municipal councils, the private sector, and professional and academic institutions.						Climate Change Unit	Ministry of Strategic Planning, National Development, and Statistics; Ministry of Provincial Development; Pacific Council of Churches, Regional Development, Department of Local Government; Department of Urban Development; Fiji Meteorological Services; NGOs

	STRATEGIES	TIMEFRAME					Lead agency	Implementing agency
		2012	2013	2014	2015	2016		
5	Produce regular information briefs, such as quarterly newsletters, on climate change-related information in Fiji, and utilise effective distribution channels.						Climate Change Unit	Ministry of Information
6	Produce a suite of awareness-raising materials to allow communication to people with special needs						Climate Change Unit	Ministry of Education; Ministry of Itaukei & Multi Ethnic Affairs; Ministry of Information, NGOs
7	Develop locally appropriate awareness materials in all common vernaculars.						Climate Change Unit	Ministry of Education; Ministry of Itaukei & Multi Ethnic Affairs; Ministry of Information NGOs
8	Collaborate with other government sectors and agencies to implement an awareness programme for all divisions at least twice a year.						Climate Change Unit	Ministry of Education; NGOs; Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Department of Works; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Energy; Department of Tourism
9	Improve the Climate Change Unit website for more effective and efficient sharing and dissemination of climate change information and news.						Climate Change Unit	Ministry of Fisheries & Forests; Ministry of Agriculture; Ministry of Information; NDMO, Department of Energy, Fiji Meteorological Services; NGOs
	Objective 4: Education and Training							
1	Review and update the current primary and secondary curricula and tertiary and vocational education courses to ensure inclusion of local, accurate and current climate change information, and to encourage student research around the issue of climate change.						Ministry of Education	Ministry of Education; tertiary institutions; Climate Change Unit
1.1	Curriculum Development Unit (CDU) to assess and review teaching materials on climate change regularly, given the dynamic nature of climate change science, research and international progress.						Ministry of Education	Ministry of Education (CDU); vocational and tertiary institutions; Climate Change Unit
2	Develop appropriate educational materials and learning tools on climate change for children with special needs in early intervention programmes, in special and mainstream schools, and in tertiary institutions.						Ministry of Education	Ministry of Education; Climate Change Unit
3	Review and update non-formal education programmes and training materials to incorporate climate change information where appropriate.						Ministry of Education	Ministry of Education; tertiary institutions; NGOs

	STRATEGIES	TIMEFRAME					Lead agency	Implementing agency
		2012	2013	2014	2015	2016		
4	Build capacity of provincial administrators, *Roko Tui*, advisory councillors, community leaders, village headmen, youth leaders, faith-based organisations and NGOs to deliver accurate information, integrate local content, and promote critical thinking about climate change.						Ministry of Education	Ministry of Education; Ministry of Provincial Development; Climate Change Unit
5	Ensure education and training programmes are designed to allow and encourage individuals to understand climate change, and to take action on mitigation and adaptation.						Ministry of Education	Ministry of Education (CDU)
6	Develop appropriate training tools on climate change for government officers involved in awareness and training programmes in all government departments.						Climate Change Unit	Ministry of Education; tertiary institutions; government departments
	Objective 5: Adaptation							
1	Integrate related disaster risk reduction and climate change adaptation strategies and actions into national and sectoral planning to streamline responses.						Ministry of Strategic Planning, National Development, and Statistics	Climate Change Unit; NDMO; line ministries, SOPAC
2	Include vulnerability assessment and climate change impact projections into resource management planning, such as integrated coastal and watershed management plans.						Climate Change Unit	Department of Environment (biodiversity); line ministries
3	Incorporate climate change impact projections into infrastructure and urban and rural planning.						Department of Lands	Climate Change Unit; Department of Forests; Department of Lands; Department of Agriculture; DTCP; Department of Environment; NGOs
4	Develop adaptation technologies that take traditional knowledge into account and are culturally acceptable.						NDMO	Ministry of Fisheries & Forests; Department of Lands; DTCP; Fiji Meteorological Services; Department of Environment
5	Support the ecosystem-based approach throughout Fiji, recognising that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience.						Climate Change Unit	Department of Environment; Ministry of Primary Industries; NDMO; Fiji Meteorological Services; NGOs
6	Develop and make accessible hazard maps of coastal, riverine, urban and inland areas in Fiji, using the comprehensive hazard assessment and risk management (CHARM) tool to guide all development planning.						NDMO	Climate Change Unit; Department of Environment; Ministry of Primary Industries; NDMO; Fiji Meteorological Services; NGOs
7	Assess poverty, health and food security issues to determine their vulnerability to climate change, and consider these vulnerabilities in future policies and initiatives.						Climate Change Unit	Ministry of Fisheries & Forests; Ministry of Education; Ministry of Health; Ministry of Agriculture; Ministry of Itaukei & Multi Ethnic Affairs; Department of Energy; NGOs

	STRATEGIES	TIMEFRAME					Lead agency	Implementing agency
		2012	2013	2014	2015	2016		
8	Improve disaster response capacity and access to public health facilities, emergency services, communication services and evacuation centres.						NDMO	Ministry of Fisheries & Forests; Ministry of Health; Department Local Government; Ministry of Primary Industries; NDMO; Department of Energy; Ministry of Information; Fiji Meteorological Services
9	Build the capacity of the health and agriculture sectors to respond effectively to climate sensitive diseases, including the strengthening of disease surveillance and control systems, and early warning mechanisms for climate sensitive human and livestock diseases.						Ministry of Health Department of Agriculture	Ministry of Health and Department of Agriculture
10	Use appropriate consultation mechanisms for the participation of all members of the community in the planning, management and implementation of adaptation measures.						Climate Change Unit	Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Department of Works; Ministry of Health; Department of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Energy; Fiji Meteorological Services; Department of Tourism; NGOs
11	Mobilise resources and all sectors to support the implementation of relevant national adaptation strategies and plans, such as the National Climate Change Adaptation Strategy, the planned Joint National Action Plan for CCA and DRM and the National Disaster Risk Management Plan.						Climate Change Unit	Ministry of Provincial Development. Ministry of Fisheries & Forests; Department of Lands; Department of Works; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Energy; Fiji Meteorological Services; Department of Tourism; NGOs
12	Strengthen early warning systems to ensure effective and timely communication to the public, with particular attention paid to isolated, hazard-prone and disadvantaged areas.						Fiji Meteorological Services	Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Department of Works; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Energy; Fiji Meteorological Services; Department of Tourism; NGOs
13	Implement best practice adaptation measures, based on sound scientific research, and lessons learnt from local, regional and international experiences.						Climate Change Unit	Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Department of Works; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment ; Ministry of Agriculture; NDMO; Department of Energy; Fiji Meteorological Services; Tourism; NGOs

	STRATEGIES	TIMEFRAME					Lead agency	Implementing agency
		2012	2013	2014	2015	2016		
14	Undertake national research to identify effective adaptation measures to support sector-specific adaptation and disaster risk reduction responses.						Climate Change Unit	Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Department of Works; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Energy; Fiji Meteorological Services; Department of Tourism; NGOs
15	Establish a monitoring and evaluation system to determine the success of national, sectoral and local adaptation initiatives						Climate Change Unit	Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Department of Works; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Energy; Fiji Meteorological Services; Department Tourism; NGOs
	Objective 6: Mitigation							
1	Develop joint programmes and cooperation agreements between relevant sectors to reduce and avoid greenhouse gas emissions.						Department of Energy	All government agencies and statutory bodies; NGOs
2	Develop and implement national, industrial, commercial (such as the tourism, agriculture, and mining sectors) and household energy efficiency programmes, including provision of rebates, incentives and disincentives.						Department of Energy	Department of Energy; Department of Public Enterprise; Department of Tourism
3	Assess and utilise appropriate renewable energy sources, such as wave, tidal, solar, wind, hydro, geothermal, biofuel and biomass.						Department of Energy	Department of Energy and government statutory; Fiji Meteorological Services
4	Support the implementation of the *Fiji REDD-Plus Policy*, the *Fiji Biodiversity Strategy and Action Plan*, the *National Air Pollution Control Strategy*, the Ozone Depleting Substances Decree, the *National Energy Policy*, the *Clean Development Mechanism Policy Guideline* and other relevant national polices and strategies on the reduction of greenhouse gas emissions, deforestation, forest degradation and the enhancement of forest carbon stocks.						Climate Change Unit	Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Ministry of Works ,Transport and Public Utilities; Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Tourism; NGOs

	STRATEGIES	TIMEFRAME					Lead agency	Implementing agency
		2012	2013	2014	2015	2016		
5	Access international financing instruments to support renewable energy, energy efficiency, waste management and carbon trading initiatives.						Climate Change Unit	Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Department of Works; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Energy; Fiji Meteorological Services; Department of Tourism; NGOs
6	Control and reduce emissions from existing private and public vehicles.						Department of Transport	Department of Transport and LTA
7	Control the ages of imported and second-hand vehicles and introduce alternative fuel powered vehicles.						Department of Transport	Department of Transport; Department of Energy
8	Develop activities and infrastructure that promote the reduction and avoidance of fossil fuel consumption (for example, construct proper walking and cycling lanes)						Department of Local Government	Ministry of Works ,Transport and Public Utilities,
9	Support the enforcement of legislation on open burning in residential and commercial locations, as stated by the Environment Management Act (2005).						Department of Environment	Department of Environment
10	Formalise collaboration arrangements and commitments of members of committees working in the area of climate change mitigation, such as the Carbon Trading Technical Team, and the Fiji REDD+ Steering Committee.						Climate Change Unit	Ministry of Fisheries & Forests; Department of Lands; Department of Transport; Department of Local Government; Department of Energy; Department of Tourism; NGOs
11	Establish a national monitoring and evaluation system to calculate GHG emissions and assess Fiji's mitigation efforts.						Climate Change Unit	Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Department of Works; Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Energy; Fiji Meteorological Services; Department of Tourism; NGOs

	STRATEGIES	TIMEFRAME					Lead agency	Implementing agency
		2012	2013	2014	2015	2016		
	Objective 7: Financing							
1	Ensure that national budgeting processes include the assignment of funds for climate change mitigation and adaptation research, planning and programme implementation.						Ministry of Strategic Planning, National Development, and Statistics	Climate Change Unit and Ministry of Finance
2	Develop innovative approaches and schemes to generate funds for adaptation activities at local and national level.						Climate Change Unit	Climate Change Unit; Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Ministry of Works Transport and Public Utilities; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Tourism; NGOs
3	Support the UNFCCC National Focal Point to efficiently and effectively access and deliver funds from regional and international sources.						Climate Change Unit	Climate Change Unit; Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Ministry of Works Transport and Public Utilities; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Tourism; NGOs
4	Develop an overview of climate change funding and costs in order to monitor the efficiency and effectiveness of funding mechanisms and project delivery.						Climate Change Unit	Climate Change Unit; Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Ministry of Works Transport and Public Utilities; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Tourism; NGOs
5	Ensure adequate distribution of climate change funding, such as GEF and the Adaptation Fund, into climate change-related projects in all government agencies.						Climate Change Unit	Climate Change Unit; Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Ministry of Works Transport and Public Utilities; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Tourism; NGOs

	STRATEGIES	TIMEFRAME					Lead agency	Implementing agency
		2012	2013	2014	2015	2016		
6	Secretariat of the NCCCT to collaborate with the Development Partners of Climate Change Committee (DPCC) in sharing information, coordinating and streamlining donor-funded projects.						Climate Change	Climate Change Unit; Ministry of Provincial Development; Ministry of Fisheries & Forests; Department of Lands; Ministry of Works ,Transport and Public Utilities; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Energy; Fiji Meteorological Services; Housing; Urban Development; Tourism; NGOs
7	Improve financial reporting to the Ministry of Finance to ensure proper disbursement and utilisation of funds.						Ministry of Finance	Ministry of Finance and Climate Change
8	Develop an analysis of the economics of climate change adaptation and mitigation in Fiji to identify cost-effective and cost-ineffective approaches.						Ministry of Strategic Planning, National Development, and Statistics	Ministry of Strategic Planning, National Development, and Statistics; Ministry of Finance and Climate Change
9	Support and develop capacity of Government Agencies and local NGOS and CBOs in proposal formulation and reporting to improve access to funds from regional and international sources.						Climate Change Unit	Climate Change Unit; Provincial Councils; Ministry of Fisheries & Forests; Department of Lands; Ministry of Works ,Transport and Public Utilities; Ministry of Health; Ministry of Local Government, Urban Development, Housing and Environment; Ministry of Agriculture; NDMO; Department of Tourism; NGOs
10	Provide adequate resources to the Climate Change Unit.						Ministry of Finance	Climate Change Unit
11	Implement recommendations from the 'Mainstreaming climate change into national development and budgeting' feasibility study (supported by the Global Climate Change Alliance Facility).						Ministry of Strategic Planning, National Development, and Statistics	Climate Change Unit; Ministry of Finance
12	Develop projects and initiatives with carbon financing potential.						Climate Change Unit	Government Agencies; Private Sector; NGOs

	STRATEGIES	TIMEFRAME					Lead agency	Implementing agency
		2012	2013	2014	2015	2016		
	Objective 8: International and Pacific Region Participation							
1	Strengthen international negotiation skills of Fiji delegation members and improve understanding of international policies related to climate change.						Climate Change Unit	Climate Change Unit
2	Ensure maximum preparation for international and Pacific regional meetings relating to climate change by encouraging cross-sectoral engagement and capacity building.						Climate Change Unit	Climate Change Unit; Ministry of Strategic Planning, National Development, and Statistics, Department of Environment, line ministries
3	Ensure Fiji's fulfilment of international reporting requirements through streamlined reporting of climate change issues to the three Rio Conventions (UNFCCC, CBD and UNCCD) and systematic monitoring across all sectors.						Climate Change Unit	Climate Change Unit; Ministry of Strategic Planning, National Development, and Statistics; Department of Environment; Ministry of Agriculture
5	Support a stronger and better coordinated Pacific position by initiating a collective Pacific regional approach to global negotiations on climate change issues.						Climate Change Unit	Climate Change Unit
6	Facilitate the development of a national and regional supporting mechanism for neighbouring Pacific Island countries that are highly vulnerable to the impacts of climate change.						Climate Change Unit	Climate Change Unit

10. Annexes

Annex 1: Climate change in Fiji

Introduction

This brief report provides a description of Fiji's past, present and future climate. The climate data records are from seven high quality sites dating from 1961 to 2010. The ocean data are from the Lautoka tide gauge (South Pacific Sea Level and Climate Monitoring Project), which has been in operation since October 1992.

The annual and seasonal trends in air temperature, rainfall, sea surface temperature, sea level and tropical cyclones are presented.

Climate risk profiles at selected sites are also presented as return periods of extreme rainfall, air temperature, sea level and surface winds for 2025, 2050, 2075 and 2100 time scales. Climate risks are based on the output of global climate models and future emission scenarios, which are based on average conditions and with the assumption of no change in variability in observed conditions. The climate risks are for a grid square covering much of Viti Levu.

The national climate risk profile is reflective of the changes, using seven sites across the country. This will assist in planning, policy development and decision making, as well as undertaking climate change adaptation and disaster risk reduction work.

Climate variability

The climate of Fiji varies over different timescales; major features that drive our climate are:

- the El Niño Southern Oscillation (ENSO) phenomenon (occurs every four years on average);
- the South Pacific Convergence Zone; and
- the trade winds.

The ENSO, phenomenon whose extremes are El Niño and La Niña events, is one of the most important drivers of inter-annual climate variations in Fiji. It has a strong influence on rainfall, temperature, and tropical cyclones. Droughts are usually associated with El Niño events, while floods are usually associated with La Niña events, depressions and tropical cyclones. Other modes of variability are associated with the Pacific Decadal Oscillation and the Southern Annular Mode on 10 to 30 year timescales.

Fiji experiences a distinct wet season from November to April and a dry season from May to October. The seasonal cycle is strongly affected by the relative position of the South Pacific Convergence Zone (SPCZ), which is most intense during the wet season and close to the country. The trade winds bring orographic rainfall to the eastern parts of the country. Approximately 70% of the national annual average rainfall, over the period 1961 to 2010, occurred during the wet season.

Climate trends in Fiji

Rainfall, 1961 to 2010

Rainfall data for the last 50 years show no significant decreasing or increasing trend. However, there has been substantial variation in annual rainfall (Figure A1-1). The observed annual and seasonal trends in rainfall are as follows:

- a very weak positive linear trend in annual rainfall; an annual increase of about 0.65mm/year (approximately 0.03%/year);
- a weak decreasing linear trend in wet season rainfall, with a seasonal decrease of 1.30mm/season (approximately 0.08%/year);
- a weak increasing linear trend in dry season rainfall, with a seasonal increase of about 0.76mm/season (approximately 0.11%/year).

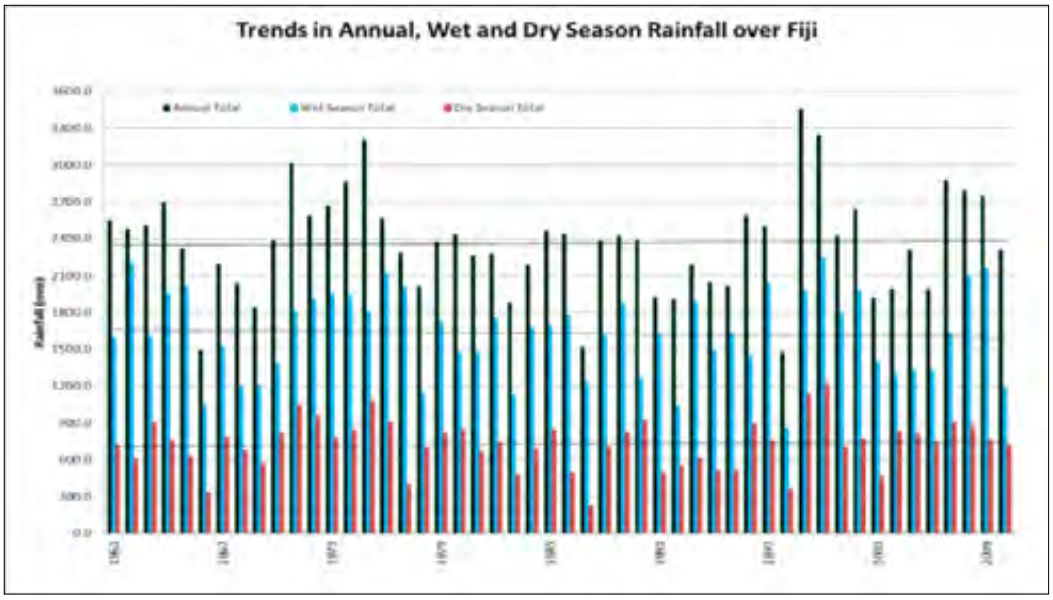


Figure A1-1: High inter-annual variation in annual and seasonal rainfall over Fiji, 1961 to 2010
Data source: Fiji Meteorological Services 2011

Air temperatures, 1961 to 2010

Consistent with the global pattern of warming, both the annual and seasonal maximum and minimum air temperatures over Fiji are increasing (Figure A1-2 and A1-3). The annual, warm and cool season minimum temperatures have been increasing at a rate of 0.12°C/decade, 0.14°C/decade and 0.10°C/decade respectively, and the annual, warm and cool season maximum air temperatures have increased at a rate of 0.23°C/decade, 0.24°C/decade and 0.19°C/decade respectively. The observed annual and seasonal trends are as follows:

Minimum temperature

- an increasing trend in annual minimum temperature of 0.6˚C;
- an increasing trend in warm season minimum temperature of 0.7˚C;
- an increasing trend in the cool season minimum temperature of 0.6˚C.

Maximum temperature

- an increasing trend in annual maximum temperature of 1.1˚C;
- an increasing trend in warm season maximum temperature of 1.2˚C;
- an increasing trend in cool season maximum temperature of 1.0˚C.

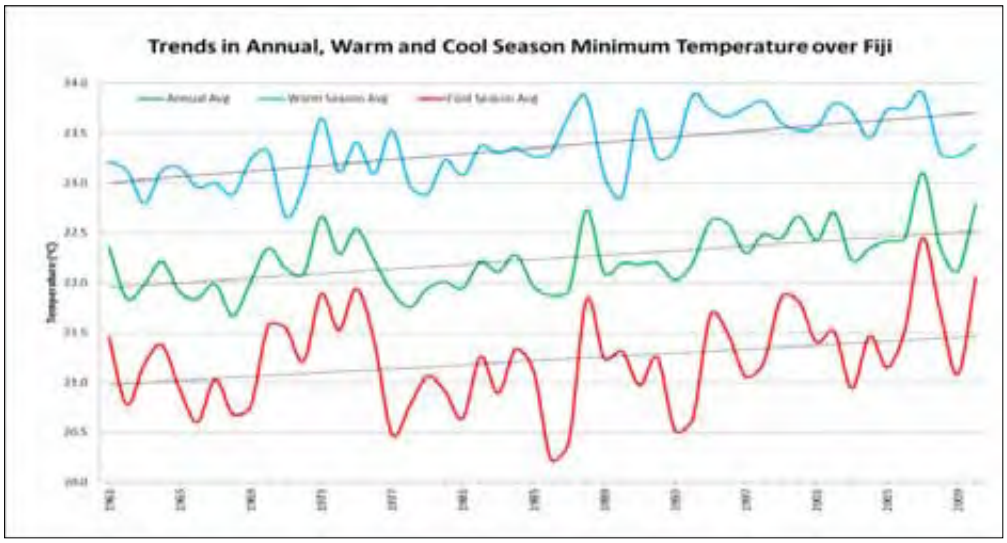


Figure A1-2: Inter-annual and seasonal variation in minimum temperature over Fiji, 1961 to 2010
Data source: Fiji Meteorological Services 2011

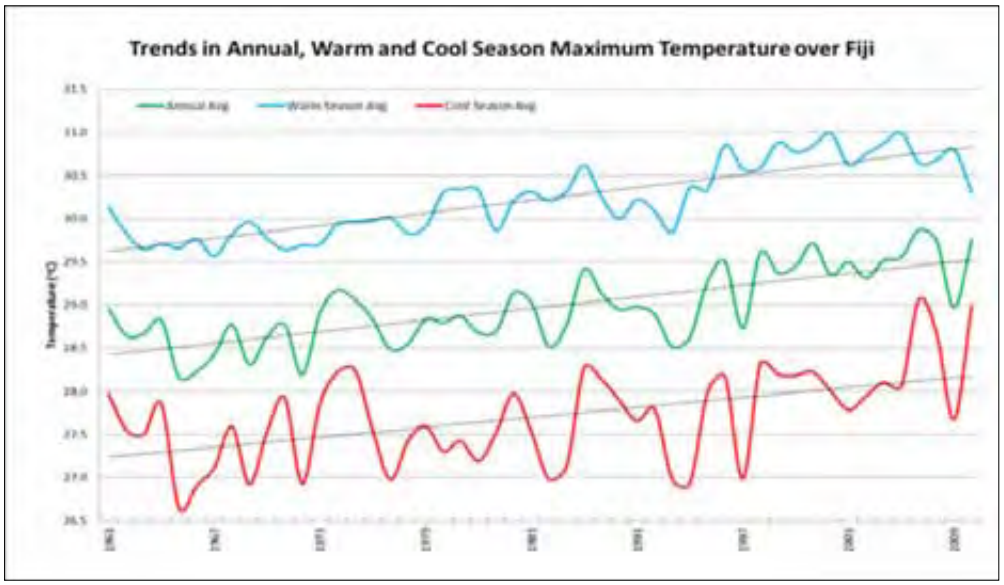


Figure A1-3: Inter-annual and seasonal variation in maximum temperature over Fiji, 1961 to 2010
Data source: Fiji Meteorological Services 2011

Photo: Matt Capper

Sea surface temperature, 1993-2010

The time period for which we have sea surface temperature measurements (SST) from the Lautoka tide gauge is too short to deduce any conclusive long-term trend. However, the SST has been increasing at a rate of 0.5˚C/decade over the 1993 to 2010 period (Figure A1-4). Variations in the annual SST include the influence of El Niño Southern Oscillation (ENSO).

Figure A1-4: Annual sea surface temperature trends at the Lautoka tide gauge, 1993–2010
Data source: South Pacific Sea Level and Climate Monitoring Project.

Sea levels, 1993-2010

The mean monthly sea levels at the Lautoka tide gauge have been increasing (after accounting for the precise levelling and inverted barometric pressure effect) at a rate of 4.6 mm/decade (Figure A1-5). Satellite observations, however, indicate that the sea level is changing at the faster rate of 6 mm/year over the same period.

Given that the sea level record is relatively short, it is still too early to deduce realistic long-term sea level rise. Variations in the mean sea level include the influence of ENSO.

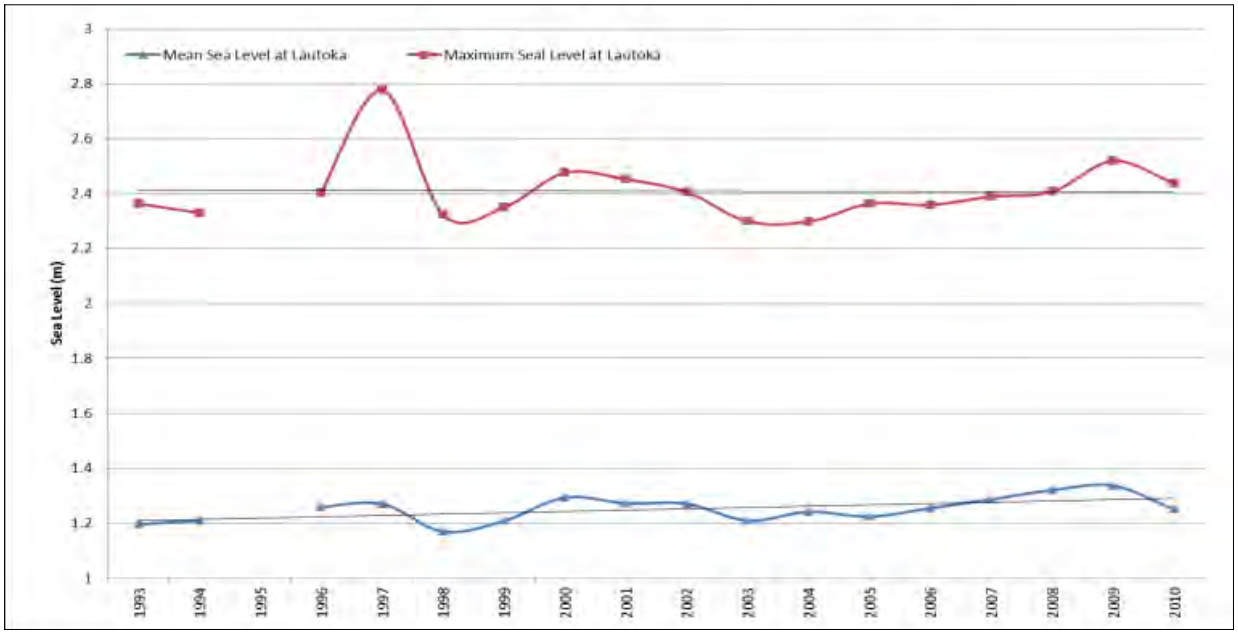


Figure A1-5: Trends in mean and maximum sea levels at Lautoka tide gauge, 1993–2010
Data source: South Pacific Sea Level and Climate Monitoring Project.

Tropical cyclones

Tropical cyclones are one of the most severe extreme events to affect Fiji on numerous occasions in the past four decades. They usually affect Fiji from November to April but have occurred in October and May. On average, one or two cyclones affect some part of Fiji every season, with the greatest risk during the El Niño season. There have been seasons when Fiji has had no cyclones and seasons with four cyclones (1984/85) and five cyclones (1992/93). A decreasing trend in both the number of tropical cyclones and cyclones with hurricane intensity affecting Fiji has been observed in the last four decades (Figure A1-6).

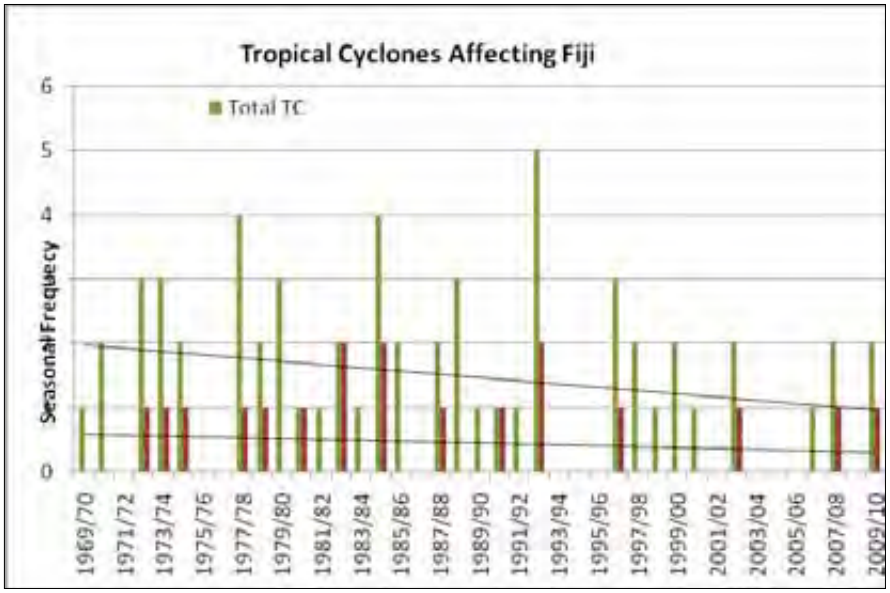


Figure A1-6: Seasonal frequency and hurricane intensity of tropical cyclones affecting Fiji from 1969/70 to 2009/10.
Source: Fiji Meteorological Services, 2011

Droughts

Major droughts (meteorological) in Fiji have been associated with El Niño events. During moderate to strong El Nino events, the annual rainfall is reduced by as much as 20-50% over most parts of Fiji, as experienced during the 1982/83, 1986/87, 1992/93 and 1997/98 events.

Floods

Large-scale flooding in Fiji is mostly associated with prolonged heavy rainfall during the passage of a tropical cyclone, tropical depression and/or enhanced, slow moving convergence zone. Localised flash flooding during the wet season (November to April) is quite common.

Sea flooding

Sea flooding is usually associated with the passage of tropical cyclones close to the coast. However, heavy swells, generated by deep depressions and/or intense high pressure systems some distance away from Fiji have also caused flooding to low-lying coastal areas. At times heavy swells coincide with king tides to cause flooding and damage to coastal areas.

Climate projections (global climate models)

By 2030:
The most likely projected change for Fiji is for ***warmer temperatures and little change*** in rainfall with annual mean temperature increases of 0.7˚C and negligible (–1%) change in mean annual rainfall, which is predicted by 69% of the models. ***Warmer and drier*** change in projected climate is predicted by 6% of the models with annual mean air temperature increases of 0.6°C and annual mean rainfall decreases of 6%. ***Warmer and wetter*** conditions are represented by 13% of the models with annual mean air temperature increases of 0.8°C and annual mean rainfall increases of 7%.

By 2055:
The majority of the models (569.) project ***hotter temperaturesand little change*** in rainfall, with annual mean air temperature increases of 1.9°C and annual mean rainfall decreases of 1%. The other likely high impact projected climate is for ***hotter and much drier*** conditions, which is predicted by 6% of the models, with annual mean air temperature increases of 1.8°C and annual mean rainfall decreases of 16%. ***Hotter and much wetter*** conditions are predicted by 13% of the models, with annual mean air temperature increases of 2.3°C and annual mean rainfall increases of 21%.

By 2090:
Nine out of 16 models project ***hotter temperatures and little change*** in rainfall with annual mean air temperature increases of 1.9°C and annual mean rainfall decreases of 1%. The other likely high impact projected climate is for ***hotter and much drier*** conditions, which is predicted by 6% of the models, with annual mean air temperature increases of 1.8°C and annual mean rainfall decreases of 16%. ***Hotter and much wetter*** conditions are predicted by two out of 18 models, with annual mean air temperature increases of 2.3°C and annual mean rainfall increases of 21%.

By 2100:
The sea level projections are based on the fourth IPCC assessment report that global sea level changes are expected to be ranging from 0.21 to 0.48 metres by end of the century (IPCC 2007a). However, there is significant uncertainty surrounding ice-sheet contributions to sea level rise and a larger rise than that projected cannot be excluded.

Climatic variables
The projected change in climatic variables for Fiji under the A1B emission scenario (a balanced emphasis on all energy sources) relative to 1981–2000 average for the 21st century is shown in Table A1-1. An ensemble of 16 models has been used for these projections.

Table A1-1. Projections at an interval of 19 years from 2020 till 2099 under A1B emission scenario

Variable	2020–2039		2045–2064		2080–2099		Confidence
	Best guess	Likely range	Best guess	Likely range	Best guess	Likely range	
Mean air temperature (°C)	0.7	0.4–0.9	1.0	0.7–1.5	1.9	1.3–2.6	Moderate
Maximum air temperature (°C)	0.7	0.4–0.7	1.0	0.7–1.3	2.0	1.2–2.2	Low
Minimum air temperature (°C)	0.7	0.4–0.7	1.0	0.7–1.3	2.0	1.2–2.2	Low
Mean rainfall (%)	–0.5	–5.5–8.1	–1.0	–9.4–13.7	–1.2	–16.4–24.1	Moderate

Source: Fiji Meteorological Services, 2011

Climate risk profile

Return periods (years)
The return period is used as a measure of the likelihood of an extreme event. It is a statistical estimate of how often an extreme event of a given magnitude is likely to be equalled or exceeded. This method is used to provide a climate risk associated with extreme events for Fiji.

Maximum rainfall
The maximum daily rainfall of 200 mm is projected to become less frequent by 2100 at various locations in Fiji (Figure A1-7).

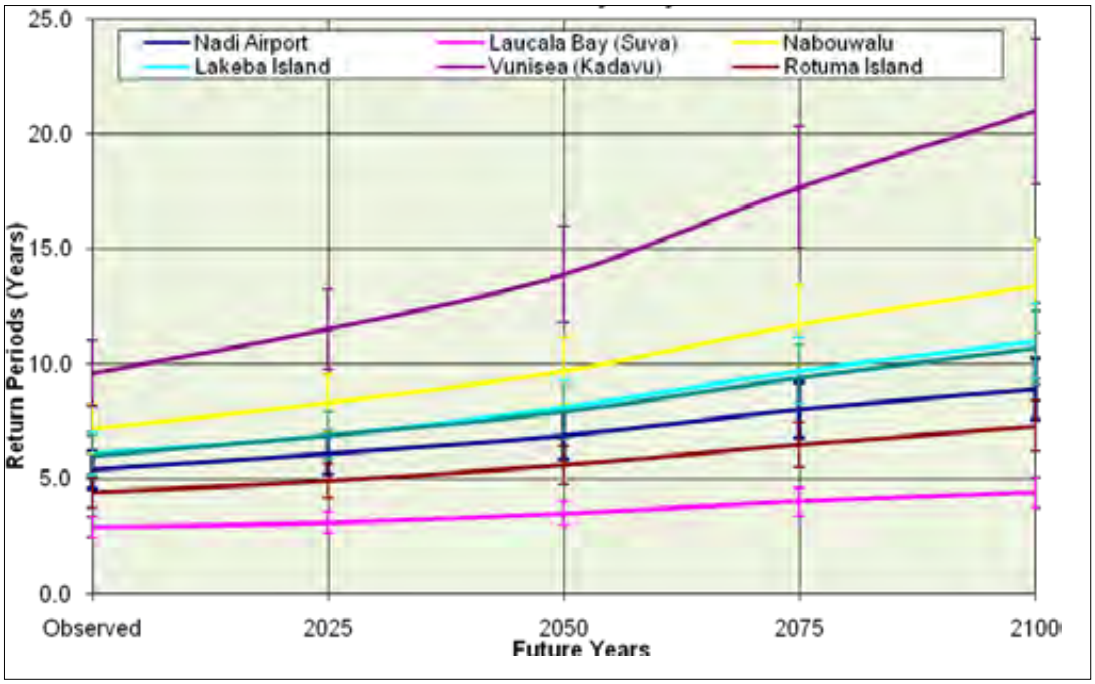


Figure A1- 7: Projections for daily maximum rainfall of 200 mm at various locations in Fiji projected to 2100
Data source: Fiji Meteorological Services 2011


Photo: Christine Fung

Maximum temperature

The recurrence of the maximum temperature exceeding 35˚C is expected to shorten in future and become a normal occurrence by 2100 (Figure A1-8).

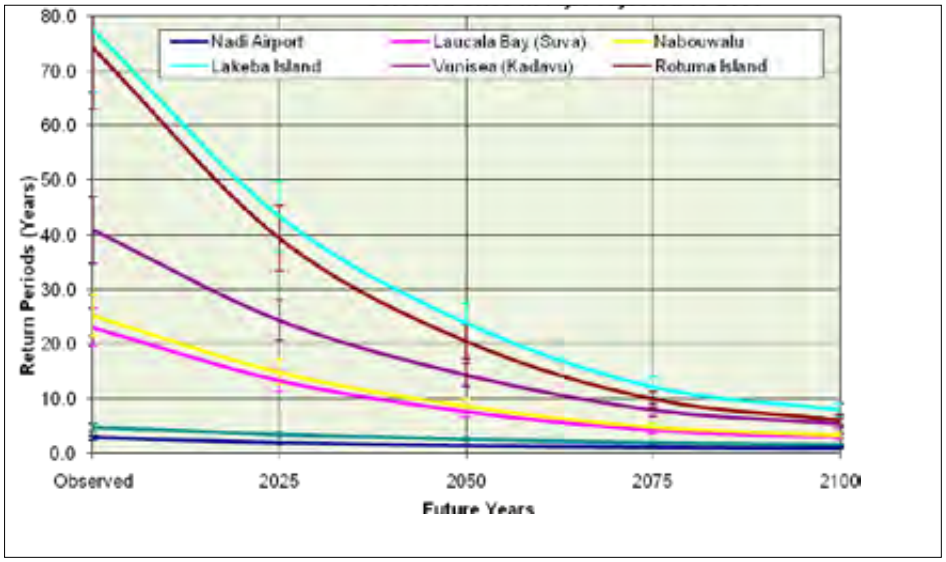


Figure A1-8: Projections for daily maximum temperature of 35˚C at various locations in Fiji projected to 2100
Data source: Fiji Meteorological Services 2011

Minimum temperature

The return period of daily minimum temperature of 16˚C at selected locations in Fiji is becoming more frequent than currently observed (Figure A1-9).

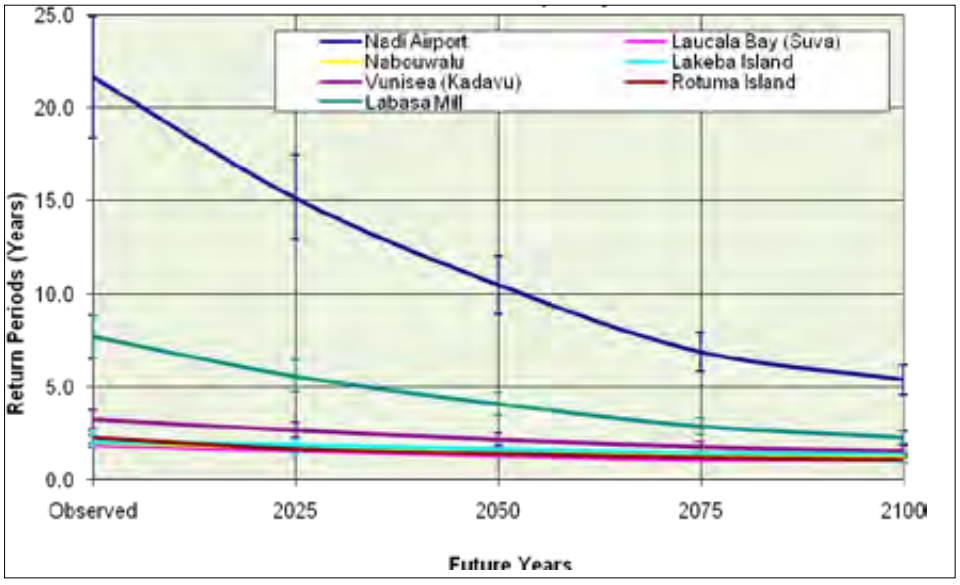


Figure A1-9: Projections for daily minimum temperature of 16˚C at various locations in Fiji projected to 2100
Data source: Fiji Meteorological Services 2011

Maximum winds

Maximum winds exceeding 80 knots at selected locations in Fiji are expected to become more frequent by 2100 than currently observed (Figure A1-10).

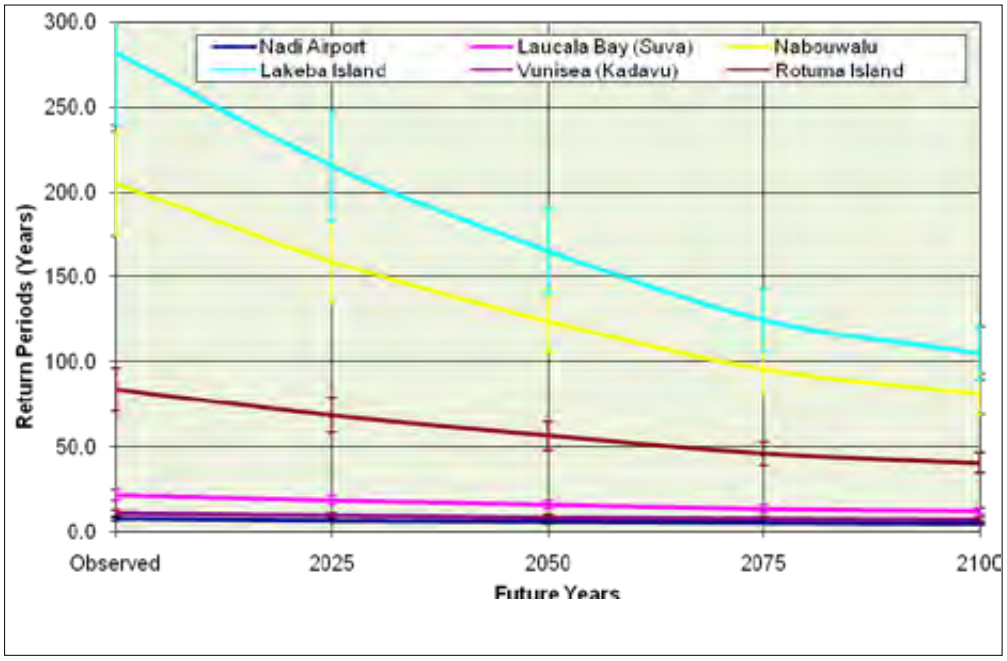


Figure A1-10: Climate risk of maximum winds of 80 knots at various locations in Fiji projected to 2100
Data source: Fiji Meteorological Services 2011

Maximum sea levels

Maximum sea level currently observed at Lautoka and Suva tide gauges are expected to become more frequent by at least by 2050 and become a normal occurrence by 2100 (Figure A1-11).

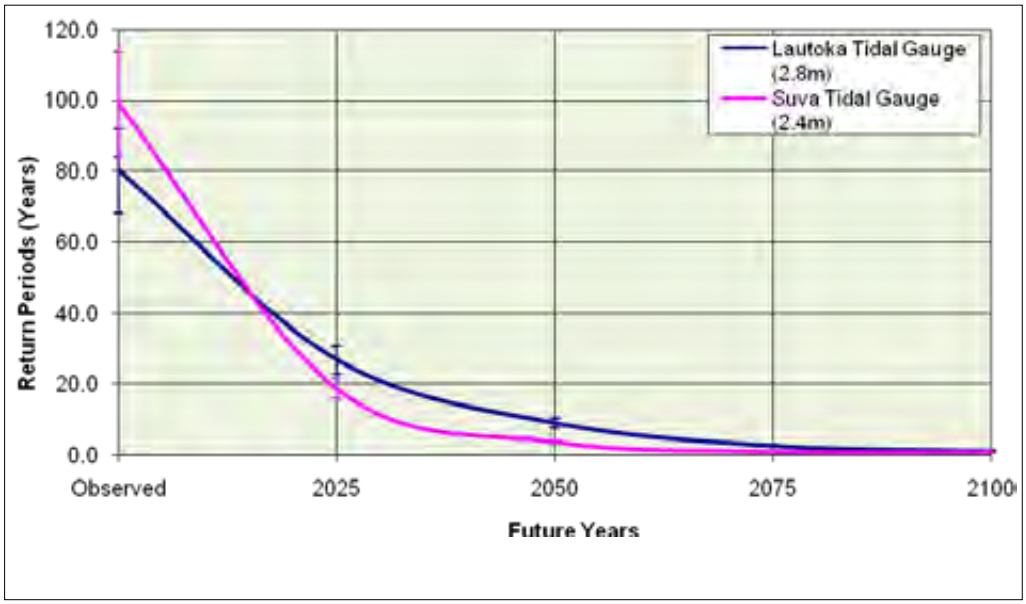


Figure A1-11: Climate risk of maximum sea level at various locations in Fiji projected to 2100
Data source: Fiji Meteorological Services 2011

Annex 2: Existing climate change related legislation, policies, plans and programmes

Sector	Legislation, policies, plans and programmes
Agriculture	• Disaster Risk Management Strategy for the Agriculture Sector, 2010. • The national climate change adaptation strategy under development will contain sector specific strategies and actions to allow adaptation of the agricultural sector to climate change
Health	• Public Health Act (Cap. 111), 2002 • Fiji Food and Nutrition Policy, 2008 • The Ministry of Health is working with the World Health Organization to address climate change impacts on public health.
Biodiversity/ Environment	• Environment Management Act, 2005 • Endangered and Protected Species Act, 2002 • Endangered and Protected Species Regulations, 2003 • National Biodiversity Strategy and Action Plan, 2007 • National Biodiversity Strategy and Action Plan Implementation Framework, 2010–2014. • The national climate change adaptation strategy under development will contain sector specific strategies and actions to address climate change impacts on terrestrial biodiversity. • National Environment Strategy, 1993 • CDM Policy Guideline, 2010 • Fiji's Initial National Communication under the UNFCCC (INC), 2005 • Integrated Coastal Management Framework of the Republic of Fiji, 2011
Marine and Fisheries	• Fisheries Act, 1988 • Fisheries Act (Amendment) Decree, 1991 • The national climate change adaptation strategy under development will contain sector specific strategies and actions to address climate change impacts on mangrove areas. • The Integrated coastal management plan currently under development may address the impacts of climate change on water catchments and coastal environments.
Forestry	• Forest Act, 1979 • Forest Decree, 1992 • Fiji Forest Policy Statement, 2007 • Fiji REDD-Plus Policy, 2011 • A Mangrove Management Plan for Fiji, Phase 1–1985 and Phase 2–1987
Water Resources	• Draft National Resources and Sanitation Policy, 2011 • Rural water policy (draft), 2011 (provision of sustainable rural water supplies) • Draft Climate Change Adaptation Strategy, 2011
Land Management	• Native Lands (Ed. 1978) • Native Lands (Amendment) Act, 2002 • Native Land Trust (revised edition 1985) • Native Land Trust (Amendment) Decree, 1988 • Native Land Trust (Amendment) Decree, 2000 • Native Land Trust (Amendment) Act, 2002 • Irrigation (revised edition 1985) • Land Conservation and Improvement (revised edition 1985) • Land Development Act (revised edition 1985) • National Action Plan under the UNCCD (NAP), 2007 • Rural Land Use Policy (2nd edition) 2006 • National Integrated Coastal Management (ICM) Framework, 2011
Disaster Management	• Natural Disaster Management Act, 1998 • Disaster Risk Reduction and Disaster Management: A Framework for Action 2005-2015
Energy	• Fiji National Energy Policy, 2006

National frameworks, strategies and action plans

- The People's Charter for Change, Peace and Progress (Government of Fiji's five year development plan), 2008
- Roadmap for Democratic, Sustainable, Socio-Economic Development 2009–2014
- Fiji Sustainable Economic and Empowerment Development Strategy (SEEDS), 2008–2010
- Fiji National Strategic Development Plan (SDP), 2007–2011
- National Trust For Fiji (Ed. 1978)
- Natural Areas Protection Act, 1988
- Rivers and Streams Act (revised edition 1985)
- Housing Policy, 2011
- National climate change adaptation strategy (draft)
- Joint national action plan (in progress)

Regional frameworks, strategies and action plans

- Pacific Islands Framework for Action on Climate Change, 2006–2015
- Regional Framework for Action for Disaster Risk Reduction and Disaster Management 2005–2015
- The Pacific Plan for Strengthening Regional Cooperation and Integration, 2005
- Pacific Leader's Call to Action Climate Change (Annex A to the 2009 Forum Leaders' Communiqué)
- Alliance of Small Island States (AOSIS) Declaration on Climate Change, 2009
- Pacific Island Adaptation Initiative (2003–2015)
- Yokohama Plan for Action Initiative (2003–2015)
- Forest and Tree Genetic Resource Conservation, Management and Sustainable Use in Pacific Island Countries and Territories: Priorities, Strategies and Actions, 2007–2015
- Towards a Food Secure Pacific: Framework for Action on Food Security in the Pacific, 2010
- Pacific Culture and Education Strategy, 2010–2015, 2010
- Pacific Regional Action Plan on Sustainable Water Management, 2002
- Towards an energy secure Pacific – A Framework for Action on Energy Security in the Pacific, 2011

Photo: Christine Fung

Annex 3: Sectoral implications of climate change

Agriculture

Impacts on the agricultural sector

Agriculture is the basis of Fiji's national economy. Losses in agricultural productivity could lead to economic losses in the order of USD 23–52 million by 2050, equivalent to 2–3% of Fiji's GDP (World Bank 2000). Mechanisms through which climate change may impact on the agricultural sector are outlined below:

- seasonal changes in rainfall and temperature could affect agro-climatic conditions, altering growing seasons; planting and harvesting calendars; water availability; and pest, weed and disease populations. The projected impacts of climate change for agriculture include extended periods of drought and loss of soil fertility (SPREP and IPCC 2007a).
- evapotranspiration, photosynthesis and biomass production is altered (Rosegrant, Ewing, Burton et. al. 2008).
- alteration to land suitability (GIZ 2010), due to salt water intrusion, coastal and river-bank erosion and exposure to salt water spray and heat stress on soils.
- increased CO_2 levels may lead to a positive growth response in a number of staples under controlled conditions, also known as the 'carbon fertilisation effect' (Rosegrant, Ewing, Burton et. al. 2008).
- reduced food security in terms of food production, food quality, nutritional availability, affordability and access.

Agricultural and land management practices undertaken in rural areas can also affect the level of impact brought about by climate change. Changes in natural landscapes for agricultural development cause a decline in regulatory ecosystem services, including those responsible for reducing people's exposure to floods (Millennium Ecosystem Assessment 2005).

Impacts on sugar production

Projections of the impact of climate change on sugar production were conducted as part of the preparation of for *Fiji's First National Communication under the Framework Convention on Climate Change* in 2005. Using the period from 1992 to 1999, when Fiji was subjected to two El Niño events and an unusually high number of tropical cyclones, as an analogue for future conditions under climate change it might be assumed that over the next 50 years (DoE/UNFCCC 2005):

- 47% of the years will have the expected production of four million tonnes,
- -/+33% of the years will have half of the expected production,
- 20% of the years will have three-quarters of the expected production.

In addition to damage to crops, flooding can also cause significant damage to mill operations and key transport infrastructure assets such as tramlines. In a review of the impacts of the 2009 floods on the sugar belt, Lal, Rita and Khatri (2009) estimate that the total cost of the floods (growers' farms, non-farm costs, millers' costs, damage to the cane access roads and other infrastructure) was about FJD24 million (Figure A3-1).

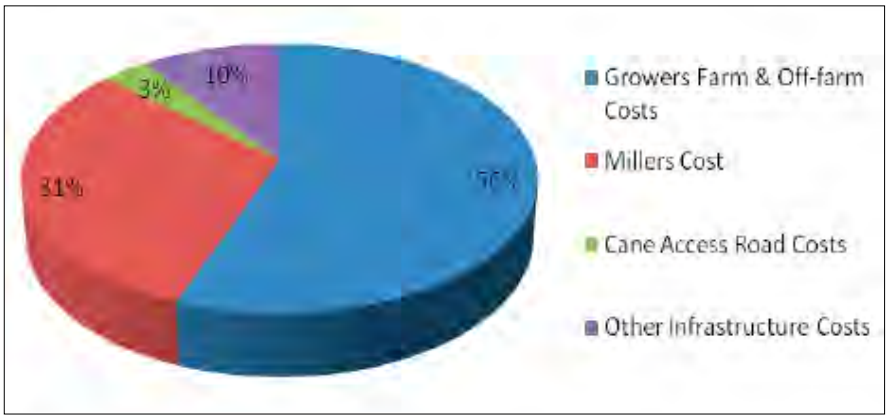


Figure A3-1. Total economic cost of the 2009 floods in Fiji
Source: Lal et al. 2009

Impacts on root crop production

Projections of the impact of climate change on root crop production were conducted as part of the preparation of the *Fiji's First National Communication under the Framework Convention on Climate Change* in 2005). Using the PLANTGRO model, the following patterns were projected for dalo and yam production (DoE 2005).

- Projected changes in mean conditions will have little effect on dalo production, with the exception of the extreme low-rainfall scenario (using the DKRZ GCM –German Climate Computing Centre's Global Climate Model), which would result in a halving of the land area providing high yields. It is likely that yam production will remain unaffected, although if rainfall increases significantly, yam yields may fall slightly.
- When El Niño conditions are factored in, reductions in production of 30–40% might be recorded in one out of three years, with a further one in five years affected by the residual effects of the ENSO events.
- Using the same ENSO assumptions we find a converse response for yam production. In one out of three years, yam production might be expected to remain the same or increase. On the other hand, yields may decrease in around half of the remaining years, especially when La Niña conditions prevail.

Existing resilience in the agricultural sector

Current agricultural practices in Fiji provide a level of resilience to the projected impacts of climate change, including:

- diverse traditional crop species that are resilient to flood, drought and saltwater;
- diverse traditional crop species that are resistant to disease spread;
- traditional agroforestry and integrated farming practices.

Adaptation in the agricultural sector

Adaptation measures include:

- improved land management practices. In a review of the 2009 floods on the sugar belt, Lal et al. (2009) note that management practices in Fiji have deteriorated since Soil erosion, exacerbated by the practice of increased burning of cane, exposes bare cane fields to the elements. with even short periods of intensive rain, excessive soil landslides seem to have become common, silting up drains, rivers.
- further diversification of crop species;
- switching to more durable crop species (resilient to flood,


Photo: Rainer Blank

Mitigation in the agricultural sector

Agriculture contributes 13.5% of global greenhouse gas emissions. Of this, soil represents 6%, and livestock and manure represent 5.1%. Key areas where the agriculture sector can contribute to the reduction of greenhouse gas emissions and increased sequestration are listed below.

- the use of fuel-efficient farming equipment;
- farming practices that maintain or increase forest cover (agroforestry);
- ensuring minimal soil tillage and soil cover to prevent release of carbon in soil;
- reducing the use of fertilisers that can be converted and released as greenhouse gases;
- intensification of small scale commercial and subsistence agricultural activities to optimise production can minimise forest clearance;
- capturing methane gas from manure.

Human health and welfare

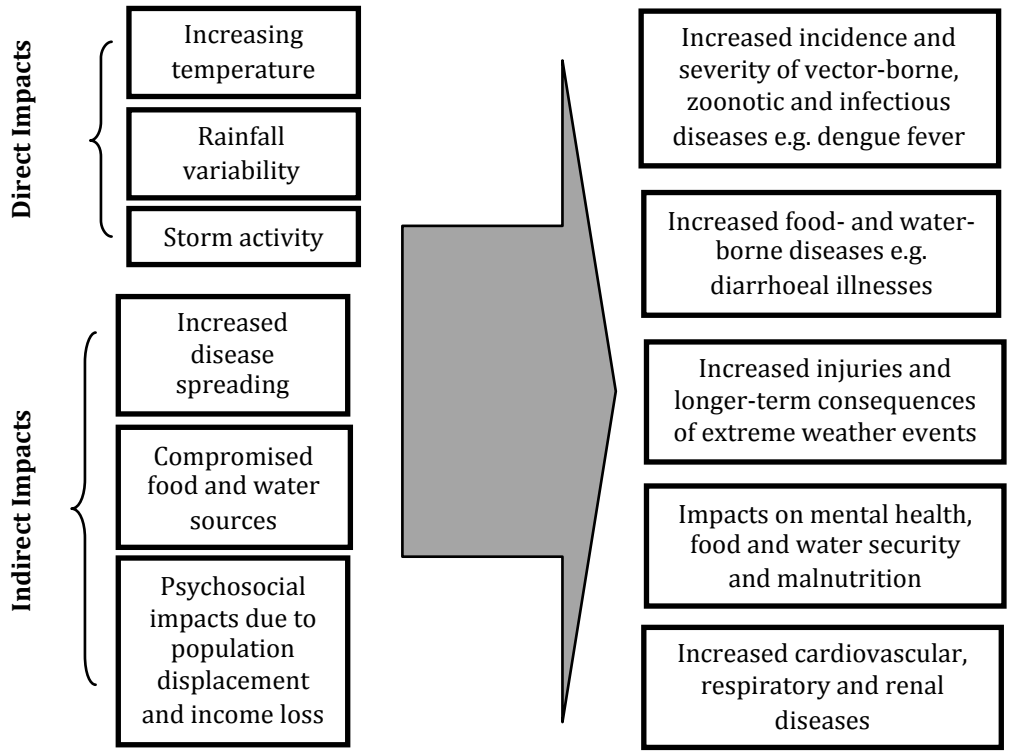
Impacts on human health and welfare

Climate change is already affecting human health via various pathways (McMichael, Campbell-Ledrum, Kovats et al. 2004) and future impacts will continue to be harmful (McMichael, Woodruff and Hales 2006). Lower socio-economic groups, children, the elderly and those exposed to poor environmental and living conditions will bear a disproportionate burden of the health impacts of climate change.

The direct and indirect impacts of climate change on human health are summarised below:
In particular, four communicable diseases are thought to be sensitive to climate change in Fiji: dengue fever, typhoid fever, leptospirosis and diarrhoeal illnesses. Findings of previous studies on the climate sensitivity and public health costs of dengue fever and diarrhoeal illnesses are summarised below.

A. Dengue fever

Dengue fever is a growing public health concern in Fiji. Since 1957, six outbreaks have been experienced in Fiji. Modelling by Hales, Weinstein, Souares and Woodward (1999) demonstrate a positive correlation between the El Nino Southern Oscillation and dengue outbreaks in Fiji. El Nino periods create drought conditions, which create water shortages. During such times, it is common for people to store water in open containers, creating breeding grounds for the *Aedes* mosquito (Ram, Mataitoga and Seruvatu et al. 1983). The 1997/98 drought and associated dengue fever outbreak resulted in 24,000 people affected by the disease, 13 dead and a health bill of USD 3–6m (World Bank 2000). Worst case scenario modelling using the PACCLIM model places 45% of the Viti Levu population at extreme risk of dengue fever, with an economic impact of USD 1–6m/year by 2050 (World Bank 2000). PACCLIM modelling also suggests an increase in the frequency of outbreaks, the number of people infected and changes to the seasonality of outbreaks; it may even become endemic (DoE 2005).



B. Diarrhoeal illnesses

Similarly, it has been projected that diarrhoeal illnesses may become more common as Fiji becomes warmer and wetter, and also if droughts and tropical cyclones occur more frequently, disrupting water supplies and sanitation systems. In other words, diarrhoeal illnesses are sensitive to both drought and wet conditions. Taking into account the under-reporting of infant diarrhoeal cases, a 1°C rise in temperature, as expected by 2050, could lead to 1,000 additional cases per month. On average, this increased incidence of diarrhoeal illnesses is expected to cost the Fiji economy USD 300,000 per year by 2050 (World Bank 2000).


Photo: Matt Capper

C. Leptospirosis and typhoid fever

Epidemiological studies indicate that the incidence of leptospirosis and typhoid fever increases following cyclones and/or flash flooding events. Groups most at risk of leptospirosis infections are young males working in agricultural environments contaminated by infected animal waste following periods of heavy rainfall or flooding (Ghosh, Khan and Kishore 2010; Ram, Beg, Kapadia, Ram and Rao 1985). Similarly, contaminated water sources and damaged water infrastructure following cyclones and floods, as well as unhygienic food preparation during mass gatherings in many communities are known to cause typhoid outbreaks in Fiji (Jenkins 2010; Ram, Beg and Kapadia et al.1983).

Resilience in human health and welfare

Human health and welfare are vulnerable to many social, economic, political and environmental factors. Resilient socio-politico-economic and environmental systems will boost resilience against climate change.

Social capital and traditional knowledge of medicines, cures and food sources during and following natural disasters are sources of individual and community resilience. However, if locations of traditional medicines, cures and food sources are vulnerable to climate impacts like flooding and storm surges, traditional knowledge may be rendered weak. Furthermore, economic, physical and political capital is often pre-requisite for social capital — the latter may not exist without the former.

In addition to individual and community resilience, institutional resilience is important for human health and welfare. The ability of the health care system to detect climate-sensitive disease outbreaks and to respond effectively is critical in building resilience in human health and welfare.

Adaptation in human health and welfare

The World Health Organization (WHO 2009) promotes the strengthening of public health systems and the implementation of no-regrets, or win-win actions, to adapt to climate change. Some health adaptation activities are described below.

Broader public health intervention	Adaptation activities
Improving responses to public health emergencies caused by extreme climate events	Strengthening disaster risk reduction
	Developing or improving disease early warning system.
Strengthening surveillance and control of communicable diseases	Facilitating rapid and accurate disease notification
	Integrated vector management
	Improving access to primary health care
Improving social and environmental health determinants	Providing clean water, improving sanitation and household disinfection
	Improving social indicators, including educating and empowering women
	Enhancing community resilience
Equitable access to public health	Identifying and protecting the health of the most vulnerable groups in society
Long-term, adaptable health planning	Health vulnerability assessments.
	Prioritise health adaptation activities
	Climate proof water, health and sanitation infrastructure

(WHO 2009)

Marine and fisheries

Impacts on the marine and fisheries sector

The fisheries sector stands to be significantly affected by climate change. Climate and related oceanic variations are already having significant impacts on fish catches, both subsistence and commercial (SPREP nd). Within Fiji, the combination of high rainfall accompanying cyclonic activity, storm events and steep bare slopes causes rapid run-off, river floods and sediment discharges into the near-shore coral reef habitats, which badly affects the fisheries sector (World Bank nd). Coral bleaching is also likely to have adverse effects on coastal biological diversity and fisheries (DoE 2005).

Variations in tuna catches are especially significant during El Niño and La Nina years. For example, the El Niño of 1997/98 negatively affected skipjack tuna catches, highlighting the sensitivity of fish stocks to changes in the climate. Changes in migration patterns and depth of fish stocks are the two main factors affecting the distribution and availability of tuna during such periods, and it is expected that changes in climate may cause migratory shifts in tuna aggregations to other locations (SPREP nd).

Other impacts include increased danger of foreshore foraging and fishing expeditions as a result of increased incidence of extreme weather events.

Existing resilience in the marine and fisheries sector

Current aspects of the marine and fisheries sector provide a level of resilience to the projected impacts of climate change, such as:

- mangrove areas, coral reefs and other coastal zones provide physical buffers to extreme weather events;
- healthy reef ecosystems are more resilient to the impacts of climate change such as ocean acidification and increasing sea water temperature.

Adaptation in the marine and fisheries sector

Adaptation measures within the marine and fisheries sector include:

- preservation of mangrove areas, coral reefs and other coastal zones;
- alternatives to commercial fishing practices to diversify and increase stock sustainability;
- improved watershed management to reduce river bed and bank stability;
- increased construction standards to minimise soil run-off and erosion during construction activities;
- more rigid development conditions to restrict development on dunes and foreshore areas;
- increased safety measures and codes of conduct to reduce risk of injury or death during fishing trips as a result of inclement weather.

Photo: Wolf Forstreuter

Forestry

According to the Fiji Forestry Department Annual Report 2005, of Fiji's landmass of 1.8 million hectares, approximately 51% has some form of forest cover, where 42% is native forest and the remaining 9% is exotic pine and mahogany plantations.

Impacts on the forestry sector

The forestry sector can be affected by climate change in the following ways:

- higher temperatures will make forests more vulnerable to fires;
- higher temperatures and changes in rainfall patterns could lead to increased occurrence of invasive species and pests;
- forest health could be reduced due to salt water intrusion, coastal and river-bank erosion, exposure to salt water spray and heat stress on the soil;
- floods, droughts and cyclones might physically damage forest plantations, natural forest and associated infrastructure;
- changing temperature and rainfall patterns might cause shifting habitats and boundaries of certain tree species, as well as pollinators and seed dispersers;
- changing temperature and rainfall patterns can affect the flowering behaviour of certain tree species;
- the loss of arable land due to climate change will place added pressure on forest areas.

Existing resilience in the forestry sector

Current aspects of the forestry sector in Fiji provide a level of resilience to the projected impacts of climate change, as follows:

- healthy forest ecosystems increase the resilience of forest communities through the provision of various ecosystem services and food security;
- healthy forest ecosystems increase the climate change resilience of many flora and fauna;
- forests maintain land stability and waterway condition.

Adaptation in the forestry sector

Forestry management plays a significant role in catchment management and therefore can play a role in either minimising or exacerbating the impacts of extreme rainfall events and floods. Poor forestry management can result in river bank instability and siltation of rivers, contributing to flooding and changes to water quality throughout the catchment. With the increased likelihood of extreme rainfall events, the importance of integrated catchment management is heightened.

Mitigation in the forestry sector

Forests are critical components of the climate system due to their potential for sequestering greenhouse gases. Forestry management practices will have a significant impact on Fiji's net greenhouse gas emissions. The Forestry sector contributes 17.4% of global greenhouse gas emissions (IPCC 2007b). An assessment of Fiji's national forest carbon stock was conducted in 2010.[1] Table A3-2 shows that the total national forest carbon stock was assessed at 192,270,000 tCO_2e in 2010, most of it associated with indigenous forests.

1 *The assessment report noted concerns regarding data quality for the 2010 forest carbon stock assessment.*

Table A3-2. Fiji forest carbon stock assessment, 2010

National forest carbon stock assessment					
	Total land	Total forest	Indigenous forest	Plantation pine	Plantation mahogany
Area (1,000 ha)	1,827	985	899	45	41
tCO_2e/ha		195	175	613	350
1,000 tCO_2e		192,270	157,325	27,590	14,355

Increased sequestration and reduced emissions can be achieved through:

- sustainable management of forests (a huge carbon reservoir);
- promotion of reforestation, afforestation and enrichment planting, as only growing forests are continually sequestering carbon dioxide from the atmosphere;
- sustainable management of mangrove areas and swamp land, which store huge amounts of carbon.

Communications

Impacts on communications

Cyclones, storm surges and other extreme weather events can damage infrastructure, leading to disruption of communication.

Existing resilience in communication systems

Certain aspects of the communication systems in Fiji currently provide a level of resilience to the projected impacts of climate change, as follows:

- wide telecommunication and internet networks with good national coverage provide channels for education, emergency calls and warnings;
- mobile phone services provide for instant and easily accessible funds, transferred from overseas, which can assist in responding to disasters and damage.

Photo: Manasa Katonivualiku

Transport

Impacts on the transport sector

Transport networks could be affected by climate change primarily through the disruption of land, sea and air transportation resulting from cyclones, storm surges or other extreme weather events. Furthermore, failure of transport infrastructure can increase the impacts of extreme weather events by isolating victims from food, water and medical treatment.

Mitigation in the transport sector

The transport sector is the largest consumer of petroleum products in Fiji. The Fiji National Energy Policy 2005 outlines the following specific policies for the transport sector, which will contribute to reduction in greenhouse gas emissions from the transport sector:

- government will co-ordinate and integrate transport, energy, land use, economic development, environment and other policies;
- government will review import duties and licensing fees for vehicles with a view to introducing incentives for energy-efficient vehicles;
- government will continue through its LTA and with support from the Department of Energy to monitor vehicle engine performance and smoke emissions;
- government will educate the public in transport efficiency matters such as vehicle choice, driving habits, vehicle operation and maintenance and the use of alternative public transport.

Water resources

Impacts on water resources and infrastructure

Among the most important effects of climate change are the impacts of changes in rainfall on water supply. The 1997/98 El Nino-related drought event, one of the worst on record, caused USD 140–165 million worth of damage, equivalent to about 10% of Fiji's GDP. The drought affected food supplies, commercial crops, livestock and the water supply of schools and communities.

Models of two streams in Viti Levu—the Teidamu and Nakauvadra creeks—indicate that rainfall variations could cause a 10% change in water flow by 2050 and a 20% change by 2100. The direction of the change would depend on whether rainfall increases or decreases. For larger rivers, an increase in rainfall could lead to extensive flood damage (World Bank nd). Provided the distribution system is fully efficient, the impact of a decreasing rainfall scenario would not become substantial until the second part of the century. Under a worst-case scenario and moderate population growth, demand would exceed supply by 38% by 2100, compared to an 18% shortfall in the absence of climate change. The deficit caused by climate change is smaller than the amount currently lost to leakage and water losses (29%), suggesting that more aggressive leak repair would be a logical adaptation strategy (World Bank nd).

Adaptation in water resources and infrastructure

Consistent and safe water supply is critical. According to the projected changes, water infrastructure in Fiji needs to have the capacity to deal with more extreme rainfall events and long-term water shortages. Assets will also need to be resilient to physical damage caused by extreme weather events and cyclones. Failure of the sewerage network during or after an extreme weather event will result in further impacts, including risks of diarrheal diseases and pollution of waterways. Adaptation options for water resources in Fiji include:

- increased water capacity and structural strength of dams;
- diversification of water supply sources and storage types;
- changes to consumer pricing mechanisms for water use;
- institutional development such as the creation of catchment and water authorities;
- increased network capacity to deal with a growing population and climatic extremes;
- upgrade and replacement of aged water supply, wastewater and stormwater infrastructure;
- encouragement of efficient water use in residential, commercial and industrial sectors;
- education and awareness activities at community level to improve awareness of water conservation.

Wastewater infrastructure is similarly critical to maintaining the health of residents. To ensure continued health and safety of residents, sewerage infrastructure must be resilient to the projected increases in extreme weather events. Failure of the sewerage network during or after an extreme weather event may result in sewage overflows, which may increase the spread of diseases and infections and put fresh water and food sources at risk by polluting waterways.

Stormwater infrastructure is critical in times of heavy rain, flooding and storm surge. The capacity and speed with which the system can allow water to be removed from roads and properties has a significant impact on the level of damage and the time of disruption to normal activities. Reduction of litter in stormwater drains through improving waste collection, and raising awareness of the link between litter and stormwater drainage capacity can improve the capacity of stormwater drainage networks.

Mitigation in water resources and infrastructure

Changes to sludge management and storage can reduce methane emissions and hence the contribution of the water sector to Fiji's greenhouse gas emissions.

Waste and waste infrastructure

Impacts on waste and infrastructure

Changing climatic conditions will impact on landfill management practices.

Mitigation through waste and infrastructure

The following initiatives can reduce the greenhouse gas emissions associate with waste and waste infrastructure in Fiji:

- reduction of household waste burning;
- promotion of household composting, including use of compost toilets;
- improvements to landfill management;
- increased recycling facilities and collection.

Energy and energy infrastructure

Impacts on the energy sector

Electricity distribution lines are susceptible to strong winds and other extreme weather conditions. Fallen power lines can not only cut off residents from electricity, but can also be physical hazards and cause forest fires.

Mitigation in the energy sector

GHG emissions in Fiji are dominated by the transport and energy sectors (DoE 2005). While Fiji is a minor emitter on a global scale, it is important that Fiji continues to reduce its greenhouse gas emissions for the purposes of meeting its obligation to the UNFCCC and participating in technology-transfer opportunities with other countries. To have a significant reduction in the national emissions of GHG gases, mitigation measures will need to target the release of carbon dioxide from this sector (DoE 2005).

Strategies for mitigating climate change through reducing energy consumption can be divided into two main types:

- demand-side options: reduce energy consumption while maintaining the level of service desired by the user;
- supply-side options: increase energy-conversion efficiencies, or replace fossil fuels with renewable energy.

In Fiji, the major barriers to improved energy efficiency include lack of information, inadequate pricing signals, lack of standards (for imported appliances and machinery) and conflicting incentives for producers and consumers.

Other factors are also affecting energy efficiency. Perceptions, fashions, habits, traditions and culture all affect people's energy choices (Fiji National Energy Policy 2005).

The Department of Energy is responsible for implementing programmes to improve the efficiency of energy production, providing incentives to encourage consumers to improve energy efficiency, and supporting the introduction of renewable energies. Specific government policies in the area of renewable energies, as outlined in the Fiji National Energy Policy, relate to:

- the use of hydropower, wind and geothermal resources;
- research and resource assessment of wave energy, current and ocean thermal energy systems;
- standards, guidelines and codes of practice for renewable energy and renewable energy information systems;
- duty, tax and excise incentives for renewable energy efficient equipment;
- production and use of biofuels derived from agricultural products (monitoring potential conflicts and competition with food production);
- carbon credit trading, the clean development mechanism and emission certificates.

Tourism

Tourism is the fastest growing industry in Fiji. Fiji receives more than 500,000 visitors per year. The tourism hot spots are the artificially extended Denarau Island, the area around Nadi Airport (Fiji's main entry point), the neighbouring Mamanuca and Yasawa islands, and the south coast (also called the coral coast) of Viti Levu, the largest island in Fiji (Lengefeld 2010). Tourism contributes about 17% to GDP (DoE 2005). The tourism sector has grown significantly in recent years. In 1998, total tourism earnings were estimated at FJD 527.1 million. The tourism sector employs approximately 40,000 people and this stands to increase in the near future with the building of more hotels and resorts (DoE 2005).

Impacts on the tourism sector

The tourism sector can be affected by climate change in the following ways:

- damage to buildings and infrastructure from sea level rise, storm surge, cyclones, floods, salt-spray, coastal erosion and landslides;
- disruption of access by land, sea and air;
- decrease in tourist arrivals due to changing weather conditions and patterns, and degradation of pristine natural attractions;
- increasing costs to implementation of adaptation measures, that would be subsequently absorbed by tourists and related service providers;
- growth in the tourism sector may be hindered by the need for increased capital investment and increased climate-related challenges.

Existing resilience in the tourism sector

The diversity of tourism destinations and services available in Fiji could minimise disruption caused by extreme weather events.

Adaptation in the tourism sector

The tourism sector could adapt to climate change through initiatives in the following areas:

- conservation of natural barriers including mangroves and reefs;
- construction of buildings away from foreshore areas, river banks and flood plains;
- replacement of aged and weakened buildings and structures;
- utilisation of cyclone and flood resilient construction methods;
- utilisation of construction materials resilient to strong winds, water damage, high solar radiation and salt spray;
- increased diversity of transport methods/routes and development of contingency plans to address disrupted travel routes.

Mitigation in the tourism sector

The tourism sector can contribute to reduced greenhouse gas emissions in a number of ways, including:

- increased energy efficiency and use of renewable energy in tourist facilities (green tourism);
- utilisation of fuel efficient equipment and vehicles.

Education

Widespread education on climate change is critical for Fiji to cope with the impacts of climate change. Formal, informal and non-formal climate change education programs can play an active role on mitigation and adaptation activities. As the issue of climate change is addressed across sectors the need to establish appropriate mechanism in the education sector is necessary.

Formal education

It is important that the future population will be able to understand and have informed views on the implications of climate change. Therefore, the advancement of formal education should be included in the medium and long term, such as including climate change in the current primary and secondary curricula and tertiary courses of the formal education system.

The scope of the current curricula of primary and secondary schools to impart correct information on climate change is limited. It is necessary to develop formal curriculum on climate change for primary and secondary schools. This will also need capacity building programmes in the Ministry of Education, teacher training institutions and schools to develop and deliver education and training on climate change issues.

Climate change education also needs to be delivered to students with special needs. This includes training of trainers on developing special needs education curriculum and teaching tools and incorporating climate change into special education and early intervention curricula.

Informal education

The informal education sector addresses information needs at the community level or at an informal setting. Formulation of climate change education programmes can also take place at the community level and/or at household level. Local communities and the general public should be encouraged to proactively seek out more information on climate change and be more involved in related events and functions. This can be facilitated through attractive and informative awareness programmes.

The support for informal education can be project-based. This can then be incorporated into other work programmes. These other programmes could support the distribution of vernacular information and experiences to ensure that other communities benefit.

Non-formal education

Various agencies and education providers conduct learning activities and programmes on climate change outside the formal education structure. This includes workshops, community courses, interest-based courses, short courses, and conferences that will have climate change-related learning objectives.

Coordination of education programmes among different sectors and linking up non-governmental organisation learning programmes with government can strengthen the impact of non-formal education.

The UNESCO definition of education is: 'a life-long process which enables the continuous development of a person's capabilities as an individual and as a member of society'.

The UNESCO definition distinguishes three types of education:
Formal education is the hierarchically structured, chronologically graded educational system running from primary through to tertiary institutions.

Formal learning takes place in education and training institutions, leading to recognised diplomas and qualifications (from: http://diakvallalkozas.ktk.nyme.hu/definition.htm).

Informal education is the process whereby every individual acquires attitudes, values, skills and knowledge from daily experience, such as from family, friends, peer groups, the media, and other influences and factors in the person's environment.

Informal learning is a natural accompaniment to everyday life. Unlike formal and non-formal learning, informal learning is not necessarily intentional learning, and so may well not be recognised even by individuals themselves as contributing to their knowledge and skills (from: http://diakvallalkozas.ktk.nyme.hu/definition.htm).

Informal education for instance comprises the following activities: (a) - visits to museums or to scientific and other fairs and exhibits, etc.; (b) - listening to radio broadcasting or watching TV programmes on educational or scientific themes; (c) - reading texts on sciences, education, technology, etc. in journals and magazines; (d) - participating in scientific contests, etc.; (e) attending lectures and conferences (from: http://www.techne-dib.com.br/downloads/6.pdf).

Non-formal education is organised educational activity outside the established formal system that is intended to serve an identifiable clientele with identifiable learning objectives.

Non-formal learning takes place alongside the mainstream systems of education and training and does not typically lead to formalised certificates. Non-formal learning may be provided in the workplace and through the activities of civil society organisations and groups (such as in youth organisations, trades unions and political parties. It can also be provided through organisations or services that have been set up to complement formal systems (such as arts, music and sports classes or private tutoring to prepare for examinations)) (from: http://diakvallalkozas.ktk.nyme.hu/definition.htm).

Urban development and housing

Impacts on urban development and housing

Climate change will affect urban development and housing in the following ways:

- extreme events such flooding and cyclones incur an economic cost to townships.
- extreme events or natural disasters will affect the lives of people in poorly built or poorly located houses; marginal communities are likely to be more severely affected.
- added pressure on services and utilities to cope with demands brought about by extreme events such as heat-waves, water shortages and disease outbreaks.
- land loss and reduction of arable land could lead to migration to urban centres, resulting in over-crowding.
- floods, storm surges, cyclones and other extreme weather events can damage houses and residential buildings, and have the potential to put their occupants in danger during or after an extreme weather event.

Official statistics indicate that 164 houses were completely destroyed in the country during the 2009 Navua floods (Lal et al. 2009). The floods incurred an economic cost to households of FJD 6.7 million (Holland 2008 in Lal et al. 2009). As a source of protection and safety, houses form a critical component of resilience against climate change. Poorly built or poorly located houses have the potential to put their occupants in danger during or after an extreme weather event or natural disaster.

Existing resilience in the urban development and housing

Some aspects of Fiji's urban areas and housing, including traditional building practices, provide a level of resilience to extreme weather events.

Mitigation in urban development and housing

Reduction of greenhouse gas emissions associated with the urban development and housing sector can occur through:

- increased energy efficiency and use of renewable energy in residential, commercial and industrial sectors;
- reduction of household waste burning.

Adaptation in urban development and housing

The urban development and housing sector can adapt to climate change through initiatives in the following areas:

- construction of buildings and structures away from foreshore areas, riverbanks and floodplains;
- utilisation of cyclone and flood resilient construction methods;
- utilisation of construction materials resilient to strong winds, water damage, high solar radiation and salt spray;
- flood control through: diversion channels; the building of weirs, cut-off channels, retarding basins and dams; and river-improvement activities such as channel widening, dyke construction and river-bed excavation;
- catchment management, including reforestation, land-use controls, protection of wetlands and soil conservation.

Photo: Christine Fung

11. Glossary

Term	Definition / Description	Source
Acidification (ocean)	A decrease in the pH of sea water due to the uptake of anthropogenic carbon dioxide.	
Adaptation (to climate change)	Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.	IPCC 2007a
Aquifer	A geological formation, group of formations or part of a formation, which contains sufficient saturated permeable material to transmit and yield significant quantities of water.	
Carbon dioxide	'A naturally occurring gas, and also a by-product of burning fossil fuels and biomass, as well as land-use changes and other industrial processes. It is the principal anthropogenic greenhouse gas that affects the Earth's radiative balance. It is the reference gas against which other greenhouse gases are measured and therefore has a Global Warming Potential of 1'	IPCC 2007c
Carbon sequestration	The process of removing carbon from the atmosphere and depositing it in a reservoir.	IPCC 2007b
Clean development mechanism	Defined in Article 12 of the Kyoto Protocol, the CDM is intended to meet two objectives: (1) to assist parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the convention; and (2) to assist parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments. Certified Emission Reduction Units from CDM projects undertaken in Non-Annex I countries that limit or reduce GHG emissions, when certified by operational entities designated by Conference of the Parties/ Meeting of the Parties, can be accrued to the investor (government or industry) from parties in Annex B. A share of the proceeds from certified project activities is used to cover administrative expenses as well as to assist developing country parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.	IPCC 2007b
Climate	The long-term average weather of a region, including typical weather patterns, the frequency and intensity of storms, cold spells and heat waves	
Climate change	A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and is in addition to natural climate variability observed over comparable time periods.	United Nations 1992
Climate sensitive diseases	Diseases that may be influenced by climate change and diseases that may be more rapidly spread under certain climatic conditions, including childhood malnutrition, diarrhoeal illnesses, typhoid, leptospirosis, ciguatera and vector borne diseases, including dengue fever.	
Climate variability	Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability).	IPCC 2007a

Term	Definition / Description	Source
Coastal erosion	A long-term trend of shoreline retreat and/or loss of beach sediment volume over several decades. 'Cutback' is a more suitable term for a dynamically 'stable' shoreline to describe the temporary loss of beach volume or shoreline retreat during a storm (before the volume gets replenished over ensuing weeks and months)	
Coral bleaching	The paling in colour which results if a coral loses its symbiotic, energy-providing organisms.	IPCC 2007a
Deforestation	The conversion of forest to another land use *or* the long-term reduction of the tree canopy cover below the minimum 10 percent threshold	FAO 2004
Emissions	The release of substances (e.g. greenhouse gases) into the atmosphere	
Emission trading	A market-based approach to achieving environmental objectives. It allows those reducing greenhouse gas emissions below their emission cap to use or trade the excess reductions to offset emissions at another source inside or outside the country. In general, trading can occur at the intra-company, domestic, and international levels.	IPCC 2007b
Energy efficiency	Reducing the amount of energy used for a given service or level of activity in order to produce the same level of end-use service. […]. For example, using compact fluorescent light globes reduces the amount of electricity required for lighting.	Victoria Environment Protection Authority (Australia)
El Niño-Southern Oscillation (ENSO)	The term El Niño was initially used to describe a warm-water current that periodically flows along the coast of Ecuador and Perú, disrupting the local fishery. It has since become identified with a basin-wide warming of the tropical Pacific Ocean east of the dateline. This oceanic event is associated with a fluctuation of a global-scale tropical and subtropical surface pressure pattern called the Southern Oscillation. This coupled atmosphere-ocean phenomenon, with preferred time scales of two to about seven years, is collectively known as the El Niño-Southern Oscillation (ENSO). It is often measured by the surface pressure anomaly difference between Darwin and Tahiti and the sea surface temperatures in the central and eastern equatorial Pacific. During an ENSO event, the prevailing trade winds weaken, reducing upwelling and altering ocean currents, such that the sea surface temperatures warm, further weakening the trade winds. This event has a great impact on the wind, sea surface temperature and precipitation patterns in the tropical Pacific. It has climatic effects throughout the Pacific region and in many other parts of the world, through global teleconnections. The cold phase of ENSO is called La Niña.	IPPC 2007a
Extreme weather events	An event that is rare at a particular place and time of year. Definitions of 'rare' vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of the observed probability density function.	IPCC 2007a
Forest degradation	Changes within the forest which negatively affect the structure or function of the stand or site, and thereby lower the capacity to supply products and/or services.	FAO 2004
Fresh water lens	A specific type of aquifer found on small islands consisting of a freshwater zone overlying and in contact with seawater. Between the freshwater zone and the seawater, a transition zone occurs, where salinity gradually increases with depth.	

Term	Definition / Description	Source
Greenhouse gases	'Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds. This property causes the greenhouse effect. Water vapour (H2O), carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4) and ozone (O3) are the primary greenhouse gases in the earth's atmosphere. Moreover, there are a number of entirely human-made greenhouse gases in the atmosphere, such as the halocarbons and other chlorine and bromine-containing substances, dealt with under the Montreal Protocol. Besides carbon dioxide, nitrous oxide and methane, the Kyoto Protocol deals with the greenhouse gases sulphur hexafluoride, hydrofluorocarbons, and perfluorocarbons.'	IPCC 2007b
Infrastructure	The basic equipment, utilities, productive enterprises, installations and services essential for the development, operation and growth of an organisation, city, or nation.	
Inter-annual variability	Variability between years.	
Intergovernmental Panel on Climate Change (IPCC)	The IPCC surveys world-wide scientific and technical literature and publishes assessment reports that are widely recognised as the most credible existing sources of information on climate change. The IPCC also works on methodologies and responds to specific requests from the UNFCCC's subsidiary bodies. The IPCC is independent of the Convention.	
Mitigation	In the context of climate change, a human intervention to reduce the sources or enhance the sinks of greenhouse gases. Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to solar energy or wind power, improving the insulation of buildings, and expanding forests and other 'sinks' to remove greater amounts of carbon dioxide from the atmosphere.	IPCC 2007b
Natural disaster	Any event or force of nature that has catastrophic consequences, such as avalanche, earthquake, flood, forest fire, hurricane, lightning, tornado, tsunami, and volcanic eruption.	
Ozone depletion	Accelerated chemical destruction of the stratospheric ozone layer by the presence of substances produced by human activities.	IPCC 2007b
Reforestation	'The direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land. For the first commitment period[1], reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989'	UNFCCC 2002
Renewable energy	Is obtained from the continuing or repetitive currents of energy occurring in the natural environment and includes non-carbon technologies such as solar energy, hydropower, wind, tide and waves and geothermal heat, as well as carbon-neutral technologies such as biomass. (Extracted from the entry for *Energy* in the glossary of terms Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change)	IPCC 2007b
Resilience	The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change.	IPCC 2007a

Term	Definition / Description	Source
Saltwater intrusion / encroachment	Displacement of fresh surface water or groundwater by the advance of salt water due to its greater density. This usually occurs in coastal and estuarine areas due to reducing land-based influence (e.g., either from reduced *runoff* and associated *groundwater recharge*, or from excessive water withdrawals from *aquifers*) or increasing marine influence (e.g., *relative sealevel rise*).	IPCC 2007a
Sea level rise	Sea level can change, both globally and locally, due to (i) changes in the shape of the ocean basins, (ii) changes in the total mass of water and (iii) changes in water density. Factors leading to sea level rise under global warming include both increases in the total mass of water from the melting of land-based snow and ice, and changes in water density from an increase in ocean water temperatures and salinity changes. *Relative sea level rise* occurs where there is a local increase in the level of the ocean relative to the land, which might be due to ocean rise and/or land level subsidence.	IPCC 2007c
Sequestration	Carbon storage in terrestrial or marine reservoirs. Biological sequestration includes direct removal of CO_2 from the atmosphere through land-use change, afforestation, reforestation, carbon storage in landfills and practices that enhance soil carbon in agriculture.	IPCC 2007b
Sink	Any process, activity or mechanism that removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas or aerosol from the atmosphere.	IPCC, 2007c
Storm surge	The temporary increase, at a particular locality, in the height of the sea due to extreme meteorological conditions (low atmospheric pressure and/or strong winds). The storm surge is defined as being the excess above the level expected from the tidal variation alone at that time and place.	IPCC 2007a
Sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.	UNFCCC
Thermal expansion	In connection with sea-level rise, this refers to the increase in volume (and decrease in density) that results from warming water. A warming of the ocean leads to an expansion of the ocean volume and hence an increase in sea level.	IPCC 2007a
Vector borne diseases	Diseases that result from an infection transmitted to humans and other animals by blood-feeding anthropods, such as mosquitoes, ticks, and fleas. Examples of vector-borne diseases are dengue fever, viral encephalitis, Lyme disease and malaria.	
Vulnerability	The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.	IPCC 2007a

1 *Parties to the Kyoto Protocol agreed on emission targets for the first commitment period, which stretches from 1 January 2008 to 31 December 2012.*

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