Cook Islands Second National Communication

under the

United Nations Framework Convention for Climate Change

NATIONAL ENVIRONMENT SERVICE
TU'ANGA TAPOROPORO
COOK ISLANDS

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GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

This report was compiled by the National Environment Service of the Government of the Cook Islands.
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Foreword

OFFICE OF THE PRIME MINISTER

RAROTONGA, COOK ISLANDS

I am pleased to present this Second national communication report and to share with parties the steps taken to implement the United Nations Framework Convention on Climate Change ratified in 1993. Since the 1999 Initial national Communication we have ratified the Kyoto Protocol and enhanced our attention to strategic planning for climate change and disaster risk management, environmentally sound sustainable energy supply, along with institutional arrangements and resourcing necessary to extend beyond assessments to implementation.

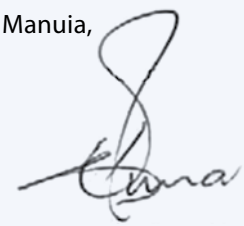
Although our green house gases (GHG) emissions are insignificant compared to the rest of the world, the second GHG Inventory found emissions have increased with reliance on fossil fuels for development. We now have targets for renewable energy to reduce this dependence and I am proud to say we are now on a pathway towards a cleaner and greener Cook Islands.

This report brings attention to impacts on our vulnerable sectors such as coastal, marine, water, agriculture, biodiversity, human health and socio-economic activities like tourism, pearl farming and agriculture. It is clear that climate change is affecting our people, culture and ecosystems and our Cook Islands' way of life. As a Small Islands Developing State with many low lying atolls, science indicates the Cook Islands will see worsening climate changes. Significant adaptation efforts are required to respond to this. At the same time, global efforts to reduce GHG emissions need to be scaled up to minimise global temperature increase exceeding 1.5°C.

Activities and initiatives related to adaptation, mitigation, training and public outreach are expected to advance further using this report as a key resource. My governments' commitment to addressing climate change and renewable energy means we have recently established an office to coordinate and lead work in these areas under my guidance. While we demonstrate commitment however, we are in need of much greater, predictable and accessible, financial and technical support from our international partners to address this problem which is not of our doing, yet undermines our development priorities and threatens our sovereignty

Meitaki Maata to the compilers and contributors, the National Climate Change Country Team, and staff of the National Environment Service who worked hard to help put this document together. We appreciate the Global Environment Facility and partners' financial support, the United Nations Development Programme in its role as implementing agency, and the National Communications Support Programme and Pacific regional organisations technical inputs.

Kia Manuia,



Hon. Henry Puna

Prime Minister and Minister For Environment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Message from the Director of National Environment Service

NATIONAL ENVIRONMENT SERVICE
TU'ANGA TAPOROPORO
COOK ISLANDS

For the Cook Islands, responding to the impacts of climate change is about our people, our livelihood, our culture and our traditional values first and foremost. While at the global level, legally binding agreements are still to be reached in many aspects of climate change, we will not allow the lack of progress internationally to delay action needed on the ground. The Cook Islands wants to insure and ensure our existence here on earth. We are a big ocean country as well as a small island developing country.

Adaptation to climate change is very important and a 'no-regret' approach should be adopted particularly for our outlying atoll islands and we urge our donor community to recognize that urgent actions need to take place immediately.

National Environment Service reaffirms its commitment to support and make sure that climate change impacts are integrated into the forefront of planning and development of our environment. As environment is a key pillar in our sustainable development, climate change is one major threat that will hinder the country's needs now and into the future.

The second national communication project had been implemented over the last 5 years and various assessments had been undertaken which will be very useful for everyone from the different government ministries, non-government organisations as well as students I encourage readers to also refer to the various reports prepared as part of the second national communication project. These are:

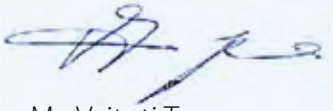
1. National Institute of Water and Atmospheric Research Ltd (NIWA): *Module 3: The Cook Islands Climate – Variation and Change, 2009*, NIWA Client Report: AKL2009-032.
2. Will McGoldrick and Kevin Hosking: *Second National Greenhouse Gas Inventory 2000–2006 and Second National Greenhouse Gas Inventory: Methodologies.*
3. Gerhard Zieroth: *Mitigation Analysis and Technology Needs Assessments – Mitigation.*
4. Coastal Zone Management (Australia) Pty Ltd: *Draft: Climate Change Adaptation Technology Needs Assessment for the Cook Islands, Synthesis Report*.
5. Youth & Sports Division Ministry of Internal Affairs, International Youth Day 2008, *Youth & Climate Change: Time for Action*, Final Report. 2008.
6. *Andersons Ltd, Energy Audit and Energy Efficiency Guidelines 2009.*

These are available through the NES website www.environment.gov.ck

The Cook Islands second national communication report is a stocktake of what the Cook Islands has done in the area of climate change since the initial national communication in 1999. This report will help us to get more guidance on where the Cook Islands sees itself in the future in the face of climate change. It highlights what we have done and what the gaps and constraints are.

This report is the outcome of a lot of hard work by my staff especially Tania Temata, Pasha Carruthers and Mii Matamaki, colleagues from other ministries as well as the multi-stakeholder National Climate Change Country Team. I wish to acknowledge and thank these people for their efforts. Let us all continue this partnership and make climate change a priority for everyone. Climate Change is everyone's business.

E Kura Mana to Tatou Aorangi: Our environment, our heritage is a precious gift to us all.



Mr. Vaitoti Tupa,

Director, National Environnent Service
TU'ANGA TAPOROPORO

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Cook Islands Maori Glossary

Ariki: The person invested with the traditional title or rank of office of Ariki (chief)

Aronga Mana: A group of traditional leaders

Kakerori: Rarotonga flycatcher (*Pomarea dimidiata*)

Kia Vai Teateamamao: Be Prepared

Makatea: Raised Coral

Pārau: Black-lipped pearl oyster (*Pinctada margaritifera)*

Ra'ui: Traditional Conservation System

Reva akako'u maana: Green House Gas

Taro: *Colocasia esculenta*

Te Aponga Uira: Rarotonga Power Supply

Te Kaveinga Nui: National Sustainable Development Plan

Tutaka: Environmental Health inspection

Vairakau Maori: Traditional Cook Islands Medicine

Abbreviations and Acronyms

ADB	Asian Development Bank
AIACC	Assessment of Impacts and Adaptation to Climate Change
AWS	Automatic Weather Stations
CBD	Convention on Biological Diversity
CBDAMPIC	Capacity Building for the Development of Adaptation Measures in Pacific Island Countries
CDM	Clean Development Mechanism
CFL	Compact Fluorescent Light bulb
CHARM	Comprehensive Hazard and Risk Management
CICAN	Cook Islands Climate Action Network
CIDA	Canadian International Development Assistance
CIG	Cook Islands Government
CIIWP	Cook Islands International Waters Project
CIRC	Cook Islands Red Cross
CLIMAP	Climate Change Adaptation Programme
COP	Conference of the Parties to the Framework Convention on Climate Change
COPED	Coastal Protection Energy Dissipater
CPU	Coastal Protection Units
CRT	Cathode ray tube
CROP	Council of Regional Organizations in the Pacific
DRM-NAP	Disaster Risk Management National Action Plan
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessments
EMCI	Emergency Management Cook Islands
ENSO	El Niño Southern Oscillation
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GCOS	Global Climate Observation System
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Green House Gases
GIS	Geographical Information System
GNP	Gross National Product

GUAN	Global Upper Air Network
HFC	Hydrofluorocarbon
IGCI	International Global Change Institute
HFC	Hydrofluorocarbon
INC	Initial National Communication (to UNFCCC)
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resource Management
JNAP	Joint National Action Plan for Disaster Risk Management and Climate Change Adaptation
LCD	Liquid crystal display
LDC	Least Developed Country
LED	Light-emitting diode
MDGs	Millennium Development Goals
MMR	Ministry of Marine Resources
MOA	Ministry of Agriculture
MOIP	Ministry of Infrastructure and Planning
MW	Mega Watt
NAP	National Action Plan
NAPA	National Adaptation Programme for Action
NBSAP	National Biodiversity Strategy and Action Plan
NCCCT	National Climate Change Country Team
NCSA	National Capacity Self Assessment
NES	National Environment Service
NESAF	National Environment Strategic Action Framework
NGO	Non Government Organisation
NIWA	National Institute of Water and Atmospheric Research
NSDP	National Sustainable Development Plan
NZAID	New Zealand Agency for International Development
NZ MEPS	New Zealand minimum energy performance standard
ODA	Overseas Development Assistance
PACC	Pacific Adaptation to Climate Change
PICCAP	Pacific Islands Climate Change Assistance Programme
PICs	Pacific Island Countries
PIFACC	Pacific Islands Framework for Action on Climate Change
PIGGAREP	Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project
PIREP	Pacific Island Renewable Energy program
RE	Renewable Energy
REEP	Renewable Energy and Efficiency Program
SEAFRAME	Sea Level Fine Resolution Acoustic Measuring Equipment
2NC	Second National Communication (to UNFCCC)
SOEs	State Owned Enterprises
SOPAC	Secretariat of the Pacific Applied Geosciences Commission
SPC	Secretariat of the Pacific Community
SPCZ	South Pacific Convergence Zone
SPREP	Secretariat of the Pacific Regional Environment Programme
SPSLCMP	South Pacific Sea Level and Climate Monitoring Project
TAU	Te Aponga Uira
t CO2 e	Tonne of carbon dioxide equivalent
TNA-A	Technology Needs Assessment – Adaptation
UN	United Nations
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
WHO	World Health Organisation
WMO	World Meteorological Organisation
WWF	World Wide Fund for Nature

Executive Summary

Bicycles ready during Move Rarotonga event to raise awareness on climate change © NES

Children of Nassau who are on the frontline of Climate Change © NES

This report is the Cook Islands' Second National Communication (2NC) under the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol. The report outlines activities the Cook Islands has been carrying out to meet its requirements under the Convention and how the country has moved towards addressing climate change since the Initial National Communication (INC) in 1999.

National Circumstances

The Cook Islands comprise 15 small islands scattered over 2 million square kilometres of the South Pacific Ocean between 8 degrees and 24 degrees south and longitude 157 degrees and 166 degrees west. There is a total land area of 237 square kilometres. These coordinates and measurements have changed since the first national communications with the use of satellite imagery as well as ongoing maritime boundary negotiations. The islands are divided geographically into six low lying atolls in the Northern group and nine Southern group raised atoll and volcanic islands. The capital Avarua is on the main island of Rarotonga in the Southern group. The other 14 islands are referred to as the Pa Enua.

In 2006, the population of the Cook Islands was 19,569 with the significant majority (72%) living on Rarotonga, 21% in the Southern group and 7% in the Northern group. The tourism sector is now one of the Cook Islands' main revenue sources along with financial services, black pearl exports, fisheries and agriculture. After two years of contraction, the Cook Islands' economy in 2011 shows positive growth prospects for the next two years.

In terms of planning, the key socio-economic document sitting within the national vision framework "Te Kaveinga Nui 2020" for the Cook Islands is the National Sustainable Development Plan (NSDP) 2007–2010, 2011–2015, 2016–2020. Its objective is "*to build a sustainable future that meets our economic management, environment integrity, social stability, and our Cook Islands Maori culture, and the needs of our future generations*".

The NSDP strategies are national priorities and all sector and government agencies planning is aligned to these strategies. While none of the Strategic Goals explicitly reference climate change; several references are cross cutting across the goals. Currently the NSDP, the National Environment Strategic Action Framework (NESAF), the National Action Plan for Disaster Risk Management (NAPDRM), and the Renewable Energy Road Map are under review, with preparation of the strategies to 2015 underway.

The Government of the Cook Islands has increased its focus on addressing climate change since the INC, including through engagement of an enhanced multi-stakeholder climate change country team, more active participation in international negotiations, national capacity building and awareness raising, and recently the establishment, within the Office of the Prime Minister, of new coordination offices for renewable energy and climate change. Local Non-Government Organisations (NGOs) have also increased their involvement in climate change related activities. A number of externally supported pilot projects and planning activities have been undertaken since the INC.

Climate Trends

The climate in the Cook Islands is sub-tropical to tropical. The islands lie within the extensive and persistent trade wind zone of the South Pacific and are relatively free from the influence of large land masses or continents. The two dominant seasons, a warmer wet season (November to April) and a cooler dry season (May to October) are largely dependent on the position and intensity of the South Pacific Convergence Zone (SPCZ). Tropical cyclones, generally forming on the SPCZ between November and April, are major meteorological features which also affect the Cook Islands and are influenced by climate change.

There is strong evidence that indicates that long-term weather patterns are shifting, although there is some uncertainty about specific parameters and the rate of future trends. Climate trends and projections analysed through the 2NC indicate cause for even more concern with increasing temperatures, rainfall and winds, rising sea levels, and in the frequency, intensity and duration of extreme events. There is comparatively higher risk and more is now known about the likely impacts as well as emerging issues such as ocean acidification than was reflected in the INC.

Vulnerability and Adaptation

Cook Islands life and culture are interdependent and related to land, ocean and environment. The changes in climate parameters and adverse impacts related to climate variability and change are a significant threat to the biodiversity and ecosystems, the lives of its people and the economic viability of the islands.

Key vulnerabilities to climate change have not changed significantly since the INC however as part of a comprehensive approach toward understanding and documenting fully its vulnerabilities, the Government along with a wide range of relevant and interested stakeholders has begun to prepare vulnerability assessments for each of the islands in the country. In combination with the analyses of climate trends a clearer picture of both the impacts and the adaptation options to cope with these is emerging.

The vulnerability of the coastal zone, coral reefs and marine resources is significant given it is where most people live and work. The ocean and subsistence agriculture are sources that Cook Islanders have always relied on for food. Other sectors such as water supply and quality, and liquid and solid waste are increasingly vulnerable to changes in climate parameters such as rainfall, storm events, droughts, and sea level rise. These effects in turn will impact upon the lifestyles and conditions of the people in the Cook Islands both socially and economically.

Some adaptation measures across vulnerable sectors have been identified and are increasingly being mainstreamed in external development partners' activities in the Cook Islands as well as domestically by the Government and Non-Government sectors. However, existing national development priorities and resource constraints have limited wide scale implementation of climate change adaptation to date.

Climate change adaptation is an additional burden to the Cook Islands existing development priorities which would be minimised if the international community takes more action to reduce emissions. The costs of dealing with extreme events have increased significantly in the past decade and slower-onset events are generating alarming land tenure and security implications for parts of the Cook Islands. Therefore the Government is seeking external support and innovative risk management mechanisms for adaptation.

Greenhouse Gas Emissions Inventory

The Cook Islands Inventory for Greenhouse Gases has been calculated for the year 2000–2006 using the 2006 IPCC Guidelines. The Cook Islands currently emits 69,574 t CO2-e. This is a 34% increase from the first inventory which was published in 1999 and covered emissions for 1994.

This increase reflects the growth in the economy with the main drivers being tourism and transport sectors leading to an increase in demand on energy use.

Emissions in the energy sector increased more than other sectors. The Cook Islands Industrial Sector has changed little since the INC, as the Cook Islands is a service oriented economy rather than industrial There were some significant reductions in the land use emissions sector due to the introduction of the Rarotonga and Aitutaki managed landfills in 2003 which replaced open burning. Since the 2006 inventory overall emissions are likely to have continued to increase, however there are capacity limitations to collecting the data and conducting the GHG analyses more regularly.

Mitigation Measures

There are now emissions mitigation measures in development for the Cook Islands, some of which are captured in the Renewable Energy Chart. The Mitigation Technology Needs Assessment conducted under the 2NC found it is important the Cook Islands adopt technologies that are proven in regions with similar climatic and economic conditions. Such technologies can be demonstrated, promoted and disseminated through the private sector, i.e. GHG mitigation needs to achieve lower carbon growth and be supportive of national development priorities and local business opportunities.

It is estimated that 2MW of renewable energy replacing 2MW of diesel on Rarotonga would reduce 10,005 t CO2-e per year. This would provide the additional benefit of increasing security of energy supply and reducing dependence on imported fossil fuels. This is consistent with the long-term objective of the Cook Islands Government of self-sufficiency of energy resources. Hence there is a lot of political will manifested in the 2010 Government's targets of 50% renewable energy by 2015.

Work undertaken for sustainable land management can also contribute to emissions reduction and waste emissions management strategies such as the introduction of properly designed land fills could to be extended to the other Pa Enua for further reductions in the land use sector.

An effective mitigation strategy needs to address a number of institutional barriers. There is a need for some policy changes in order to improve the enabling framework for renewable energy and energy efficiency investments and for improved management of municipal and agricultural wastes. In the energy sector, institutional arrangements have been in flux over the past decade. An adequately resourced regulatory body that could set and enforce rules, regulations and performance standards promoting efficiency and the development of indigenous resources is required.

Other Relevant Information

In addressing climate change since the INC there has been more recognition of the importance of having enhanced research and systematic observations, technology development and transfer, as well as education, training and public awareness, but there is currently very limited resources to support these areas.

RESEARCH AND SYSTEMATIC OBSERVATION

There are a number of research programmes ongoing in the Cook Islands. For climate parameters these have mainly been established in the areas of Meteorological Services, Disaster Management, Agriculture and Marine Resources. Environment and Health also have monitoring programmes related to impacts. New research needs related to climate change that Cook Islands can generate include effects on oceans and food security, as well as on peoples migration within the Cook Islands.

TECHNOLOGY TRANSFER

Through the 2NC, a Technology Needs Assessment was undertaken for adaptation and for mitigation. The difficulty found is how to translate the needs identified to implementable programmes or projects. This is particularly due to the broad definition of technology which encompasses strategies, plans, training and other soft technologies as well as hard technology or infrastructural solutions.

There is a national awareness that technology transfer be undertaken with due regard to environmental integrity, particularly in the context of SIDS with remote and fragile ecosystems. For adaptation it seems particularly difficult to identify transferable technologies that are feasible.

Opportunities for emission reductions in the Cook Islands are small on the global scale and the Cook Islands location makes tapping into carbon markets and utilising the Clean Development Mechanism (CDM) under the Kyoto Protocol as a way of facilitating technology transfer difficult. However, with the introduction of an Emissions Trading Scheme in New Zealand, interest in developing CDM projects in the Pacific is growing.

EDUCATION, TRAINING AND PUBLIC AWARENESS

Since the INC the Cook Islands has advanced significantly in the implementation of Article Six of the UNFCCC, recognising that climate change needs to be included and mainstreamed in the current curricula of the formal education system and noting that relevant environmental issues are also taught as part of the Social Studies, Science and Maori curriculums. In addition there are more pertinent tertiary courses available both locally and on-line.

There is also an increased understanding of the issue of climate change amongst the general public since the INC. The NES has been proactive in providing awareness materials especially for the Pacific Year of Climate Change in 2009, as well as undertaking capacity building during community vulnerability assessments, energy audits and other opportunities.

Constraints and Gaps

A number of key gaps and constraints have been identified by participating stakeholders since the INC. Possible initiatives to address these gaps and constraints are:

- Comprehensive climate and risk information availability through research and assessments for all islands to improve understanding of specific vulnerabilities and current and future resilience and to provide a basis for education and awareness.
- Capacity building on implementation of renewable energy technologies for longer term operations of these energy systems over current imported fossil fuels and diesel powered energy.
- Institutional strengthening of the national body to oversee climate change issues, to ensure a coordinated and wider network of government and non-government stakeholders are involved in climate policy development and project design and implementation
- Greater integration of climate change in all planning and implementation including socio-economic programs and projects.
- Enforcement of climate adaptation and mitigation relevant policy and regulations with the capacity and capability of national human resources.
- Participatory approaches to address land issues which impede sustainable development with due consideration of traditional tenure systems at national and local levels.
- Financing of climate activities and budget constraints in light of other development priorities.
- Improved availability of affordable quality consultants through ongoing capacity building and resourcing at the national level.

- Proactive engagement in the international negotiations so that obligations under UNFCCC are not excessively burdensome for SIDS.

Conclusion

The Cook Islands are confronted with increasingly severe climate impacts and higher vulnerability due to climate change. While scientific and technical research, studies and programs seek to highlight in more specific detail the levels of impacts, vulnerabilities and resilience, many communities on small isolated low lying atolls and on the higher volcanic islands of the Cook Islands look to the Government to identify how and where it can address many of these impacts in a socio-economic context as a part of their ongoing priorities.

While a Party to the Kyoto Protocol and to the UNFCCC, the Cook Islands has participated and accessed multilateral funds provided under the Convention on regional and national climate projects, many of which have been identified in this and the previous National Communication.

Nevertheless, the Cook Islands continue to incur a higher cost and burden for increasing impacts of climate change. While addressing these impacts is a priority, the Cook Islands are constrained severely through priorities to other key sectors, such as health and education. For its part the Cook island Government is moving toward a coordinated approach to addressing climate change through legislative, policy, and sector level activities, that in turn will assist it to cope with a changing climate.

Akako'u'anga Manako

Participants during the Move Rarotonga event to raise awareness on climate change © NES

USP Students graduating including from climate change courses © NES

Ko te rua (2) ripoti teia a te Kuki Airani tei tata'ia i raro ake i te Koreromotu o te Taui'anga Reva no teia nei ao. Kua riro teia ripoti i te akamarama atu ki teia nei ao e te akapeea nei te Kuki Airani i te akarakara atuanga i teia manamanata ko te taui'anga reva. Ka akakite katoa teia ripoti i te au angaanga ta teia patireia i rave mei te tuatau o te ripoti mua i te mataiti 1999.

Turanga o te Ipukarea

E tai ngauru ma rima (15) enua rikiriki i te Kuki Airani nei. Kua akatu'anga ia te enua e tai ngauru ma rima ko te pa enua tokerau e te pa enua tonga. Tuketuke te tu o teia au enua rikiriki mei te enua akaaka, te enua makatea e pera te enua e maunga tona. Ko Avarua te oire maata i runga ia Rarotonga te enua maata i te Kuki Airani nei.

I te mataiti 2006, kua tae te tare numero tangata i te Kuki Airani ki te 19,569. Kua tae ki te 72% o teia tare tangata e noo ana ki runga ia Rarotonga, e 21% e noo ana i te pa enua tonga e, e 7% e nooa ki te pa enua tokerau. Na te tu'anga o te turoto e apai mai ana te moni maata ki roto i te patireia e aru atu ko te tu'anga o te moni (koia oki te au aronga i vao ake i te patireia e pangika mai ana i ta ratou moni i te Kuki Airani nei), ko te tuanga o te poe parau, te tautai e te tanutanu.

'Te Kaveinga Nui', ko te parani teia a te patireia tei akanooia no te mataiti 2007–2010, 2011–2015, 2016–2020. Ko te orama no teia parani nei a te patireia koia oki '*te oraanga tu rangatira kia tau ki te anoano o te iti tangata, e kia tau ki ta tatou peu Maori e te aotini taporoporoia o te patireia*'.

Ko te akakoroanga o teia parani koia oki ko te akatupu'anga i te ora'anga meitaki no te iti tangata Kuki Airani e pera te uki a muri mai. Kia riro te au parani rikiriki a te au putuputu'anga i roto i te Kavamani i te aru atu i te anoano o te 'Kaveinga Nui'. No atu oki e kare okotai o te au koro e aru ana i teia tumu manako o te taui'anga reva kua riro ra te koro a(4), rima (5) e te ono (6) i te turu atu i teia manako.

Mei te mataiti 1999 i te ripoti mua a te Kuki Airani, kua maata takiri te au angaanga takapini atu i te tumu manako o te taui'anga reva. Kua akanoo ia tetai kumiti no te taui'anga reva, kua akamatutuia te au mata tei mata atu i te Kuki Airani ki teia au uipaanga i teia nei ao e pera te au akamatakite'anga i te iti tangata no teia manamanata o te taui'anga vera. Kua akanoo katoa ia tetai opati no te taui'anga reva e te opati no te taangaanga akaou i te reva natura i teia mataiti nei i ko i te Tipatimani o te Parai Minita. Kua taokotai katoa mai oki te au putuputuanga i vao ake i te kavamani i te akarakara atu i teia manako.

Reva o te Kuki Airani

Ko te turanga reva o te Kuki Airani, e reva maanaana ua te reira, kare e anu roa e kare e vera roa. E rua oki o te Kuki Airani tuatau e taui ana te turanga o te reva, e tuatau maro mei roto i te marama Me ki Okotopa e te tuatau ma'u'u e te uriia mei te marama Noema ki Aperira. Ko te reva o te Kuki Airani, kua akamou'ia te reira ki runga i tetai kou reva koia oki ko te South Pacific Convergence Zone (SPCZ). I te tuatau maro, ka kitea teia kou reva i te tua tokerau o te pa enua tonga e e a'angi mai ana te matangi muri. Inara i te tuatau ma'u'u, ka apai mai teia kou reva i te reva kino e te uaua. Ko te uriia e akamata mai ana aia no teia kou reva ko te SPCZ i te marama Noema ki Aperira.

Kua kite ia mai e te aronga kite pakari e te taui nei te turanga o te reva inara e manamanata tetai no runga i te tuatau e tupu ei teia au taui'anga. I roto i te angaanga tei akapapaia no te rua o te ripoti a te Kuki Airani, kua akara matatio ia te vaito o te vera, te tuatau uaua e te matangi, te vaito tinamou o te tai e pera te tuatau manamanata mei te uriia. Kua akakite mai te ripoti mua i te au manamanata te tupu nei, e i teia tuatau nei, kua nakirokiro mai te aronga ki te pakari i te au tamanamanata te ka tupu i te taui'anga reva.

Turanga manamanata e te au Ravenga Paruru

Kua akamouia te oraanga o te iti tangata Kuki Airani ki runga i te tango natura. Te riro nei te taui'anga reva i te tamanamanata i te oraanga o te iti tangata e pera te au mea natura i roto i te Kuki Airani.

Ko te tamanamanata a te taui'anga reva ka akatupu ki te iti tangata o te Kuki Airani, kare te reira e taui rava mei te ripoti mua teia oti atu. Kua akamata ra te kavamani i te kimikimi oonu atu i teia au manamanata i runga i te au enua tatakitai. Kapiti ki te au akarakara atu anga o te reva kua mataratara mai i te au ravenga paruru i to tatou iti tangata e te au ngutuare.

Ka ngoie ua te au ngai e noo nei te maataanga o te tangata e pera te au ngai angaanga e te pitiniti i te manamanata o te taui'anga reva. Ko teia ngai tei te pae tai te reira. Ko te kai enua e te kai moana, ko teia te tuanga e irinaki ana te iti tangata i te angai i to ratou ngutuare tangata. Ko teia katoa tetai au ngai te ka tamanamanata ia e te taui'anga reva. Ko tetai au tuanga mei te turanga o te vai e pera te repo e te tita, ka maata rava atu tana au takinokino anga me tapiriia mai te au manamanata o te reva mei te ua pakari e pera te uriia. Ka riro teia au tamanamanata anga i te tamanamanata i te oraanga o te iti tangata Kuki Airani.

Ka akanooia tetai au ravenga paruru no teia au tamanamanata anga e te akara nei te Kavamani o teia ra e pera to au patana i vao ake i te Kuki Airani e eaa tikai te takaianga tau i te akatupu atu i teia au ravenga.

Ko te au manamanata e tupu nei mei te uriia, ka pou tetai akamoni maata i te tauturu atu i te iti tangata e uake ka tupu ake. Ka riro te reira ei aka apainga ki runga i ta tatou akapouanga moni no te patireia e no reira te Kavamani o teia tuatau, te akara atu nei i te tauturu a to tatou au patana enua i vao mai i te akatupu i tetai tuanga moni ei tauturu i te patireia i teia tuanga.

Tare reva akakou maana

I te mataiti 2006, kua tae te tare reva akako'u maana a te Kuki Airani e tuku ana ki roto i te mareva kite 69, 574 tane. Kua maata takiri me akaaiteia kite ripoti mua i te mataiti, kua tere atu i te 34 patene te maata. Kua akapapuia mai teia akamaataanga e te tuanga turoto e te au apinga akaoro e kua maata takiri oki te reira i te Kuki Airani nei.

Ko te ta'anga'anga inu te tuanga maatamaata rava atu i roto i teia tareanga. Te anoanoia nei i reira kia akaiti ia mai teia tare ki raro na roto i te taangaanga anga i te au apinga ke mei te vera o te ra, te matangi kia kore tatou e irinaki roa i te inu e akau ia mai nei ki to tatou patireia. Ka mama mai te moni ki runga i to tatou iti tangata.

Akaitianga i te tare reva kino

Kua akamata te Kuki Airani i te akarakara atu i te au ravenga te ka akaiti mai te tare reva kino e tukuia nei i roto i te mareva. Kua riro tetai au matini te ka taangaanga akaou i te au reva natura i te akamatutu atu i teia takaianga a te Kavamani no te tuatau ki mua. Ka akamaroiroi katoa te Kavamani i te tuaanga o te pitiniti kia turu mai i teia tamanakoanga ei akamaroiroi i te iti tangata no runga i teia kaveinga tiratiratu.

Kua akanoo oki te Kavamani i tetai au takete tinamou kia akamaroiroi ia te iti tangata kia turu i teia au takaianga. Ko te Kaveinga o te Kavamani o teia tuatau kia taeria e 50% o to tatou taangaanga uira, na te reva natura te reira te turu e kare na te inu e te penitini.

Me akara katoa tatou i te tuanga o te akateretere meitaki no te taangaanga o te enua ka kapiti katoa ia mei te ngai titirianga tita/repo. Ka riro katoa oki te parani meitaki anga o teia au ngai titirianga tita i te akaiti mai i te reva kino e tukuia atu ana ki roto i te mareva na teia tuanga i te akaitianga i te tare reva kino.

Ka anoanoia kia matutu te au turanga angaanga no te akaiti atu i te tare reva kino e tuku ia nei ki roto i te mareva e me matutu teia, ka tiratiratu te Kaveinga no te Kuki Airani.

Tetai uatu manako tau

I te akarakara atu anga i teia manamanata no te taui'anga reva ka anoanoia te au kimikimi e te akaramatatio no te reva, te au matini tau e pera te akamatakiteanga no te au tuatau ka aere ia mai. Ka riro i reira teia au takaianga i te tauturu i te Kuki Airani no runga i te taui'anga reva.

KIMIKIMI E TE AKARA MATATIO NO TE REVA

E manganui uatu te au porokaramu te raveia nei i teia tuatau e te opati o te akarakara reva, tipatimani o te tanutanu, te tuanga taporoporo e te vai atura no runga i te taui'anga reva. Te vai katoa nei ra tetai au ngai kia tau kia kimikimi iatu rai te turanga mei te tamanamanata i runga i te tai moana, te turanga o te kai e pera te teretereanga tangata mei tetai enua ki tetai i roto i te Kuki Airani no te manamanata o te taui'anga reva.

AU MATINI TAU

I raro ake i te porokaramu o te taui'anga reva, kua raveia tetai akarakara atu anga no runga i te au matini te ka tau kia ta'anga'angaia no te ravenga paruru e te akaiti mai i te manamanata o te taui'anga reva. Inara tuketuke oki teia au matini e kare ko te au mea ta'anga'anga uira ua. Ka piri katoa mai te au parani e te tereni anga. E mea tau rai kia ta'anga'anga tatou i te au matini ta'anga'anga i te vera o te ra e te matangi tei tau ki to tatou enua e te reva. Ko teia au matini kia tau rai e ka tano katoa ki to tatou au taeake i te pa enua patipika. Kia riro teia ei kimianga moni puapinga na te aronga i vao ake i te Kavamani e ko te tumuanga o teia angaanga koia oki ko te akaiti mai anga i te tare reva akako'u maana e tukuia nei ki roto i te mareva.

Akamatakiteanga

Kare te tumu manako o te taui'anga reva i akanoo ia ake ki roto i te au apii e te Maraurau o te Apii. Inara, ka anoanoia te reira kia tauru ia atu no te uki tamariki ki mua, kia marama ratou i te au manamanata ta te taui'anga reva ka akatupu mei te maranga anga o te vaito tinamou o te tai. Kia kite ra te katoatoa e te apii'ia nei te au manako o te aorangi i te apii te ka totoa atu rai te apii o te taui'anga reva mei teia au manako. Ka rauaka katoa oki i te tangata i te aere atu ki runga i te roro uira i te rave atu i tetai au apiianga no runga i te taui'anga reva kia rauka mai tetai peapa teitei no ratou i teia tuatau nei.

Mei te tuatau mai o te ripoti mua i te mataiti 1999, kua marama mai te iti tangata no runga i teia tumu tapura ko te taui'anga reva. E rave putuputu ana oki te Tuanga Taporoporo i tetai au akamatakite'anga no teia manamanata, te au kino tana ka akatupu e pera tetai au ravenga taau tangata ka rave i te paruru atu iakoe no te tuatau manamanata.

Au manamanata e te ngai tai'i i te amani'anga i teia ripoti.

Mei te ripoti mua, kua akara katoa ia tetai au tu'anga ka inangaroia i te akara matatio atu. Ko teia tei tukuna ki raro;

- Kia raveia tetai kimikimi'anga i te au enua katoatoa o te Kuki Airani nei no te akarakaraanga i te au manamanata e te au ravenga paruru no te taui'anga reva. Kia riro katoa teia i te akamatakite e te apii i te iti tangata no runga i te taui'anga reva.
- Kia apii e kia akamatutuia te iti tangata no runga i te au matini ka riro i te tangaanga akaou i te au reva natura mei te vera o te ra e te matangi.
- Kia akanooia tetai tu'anga i roto i te Kavamani e ko tana angaanga ka akamou ia te reira ki runga i te taui'anga reva.
- Kia riro te taui'anga reva ei akaraanga ia na te au tangata i te akao atu ki roto i ta ratou au parani.
- Ko te tutaki'anga o te au angaanga a te taui'anga reva e mea ngata te reira no te rava kore o te moni. Kia tauturu ia tetai tu'anga o te taui'anga reva na roto i te Kavamani i te oronga anga i tetai moni e ka anoano katoa ia te tauturu a te au enua mamaata ma te tauturu a te iti tangata Kuki Airani.
- Akamana atu i tetai au ture no runga i te taui'anga reva e kia rava te aronga angaanga.
- Te manamanata o te enua te ka riro ei tapu me kore tamarie i te tupuanga o te Patireia.

Akakou'kou'anga

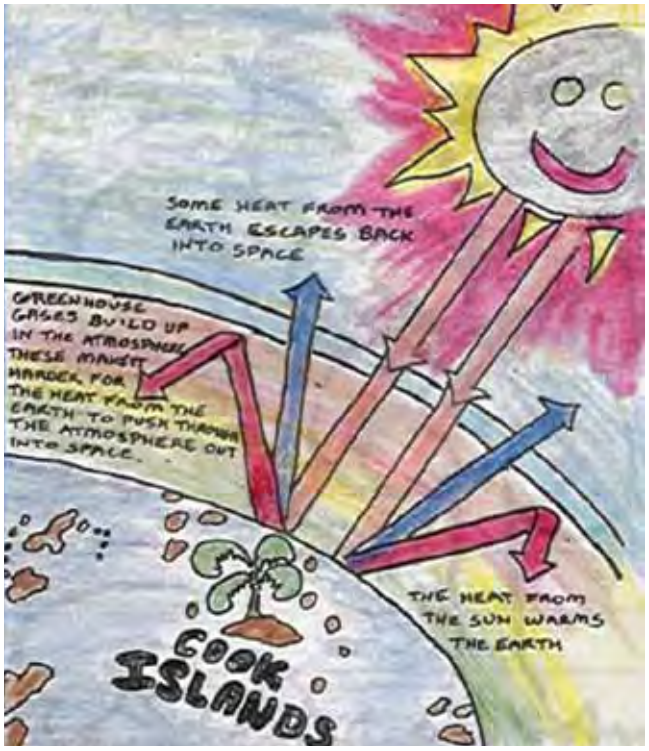
Ka ngoie ua te Kuki Airani i te manamanata o te taui'anga reva. No atu oki e kua akakite mai te aronga kite pakari i te turanga tuketuke o te au manamanata te ka tupu ki runga i to tatou enua tatakitai, kia rauka rai i te Kavamani i te akara matatio atu i teia au ravenga i te rapakau'anga atu i te reira.

Kua taina atu te Kuki Airani i te koreromotu o te taui'anga reva koia ko te United Nations Framework Convention on Climate Change pera te Kyoto Protocol. Ko te ripoti'anga i te tare reva akako'u maana e tukuia nei ki roto i te mareva tetai tumu'anga o teia taina'anga. Kua tataia i reira te rua o te ripoti no te reva akako'u maana e tukuia nei ki roto i te mareva mate ta'anga'anga atu i te akanoo'noo'anga tei akanooia e te au aronga kite pakari teia roto i te putuputuanga Intergovernmental Panel on Climate Change (IPCC).

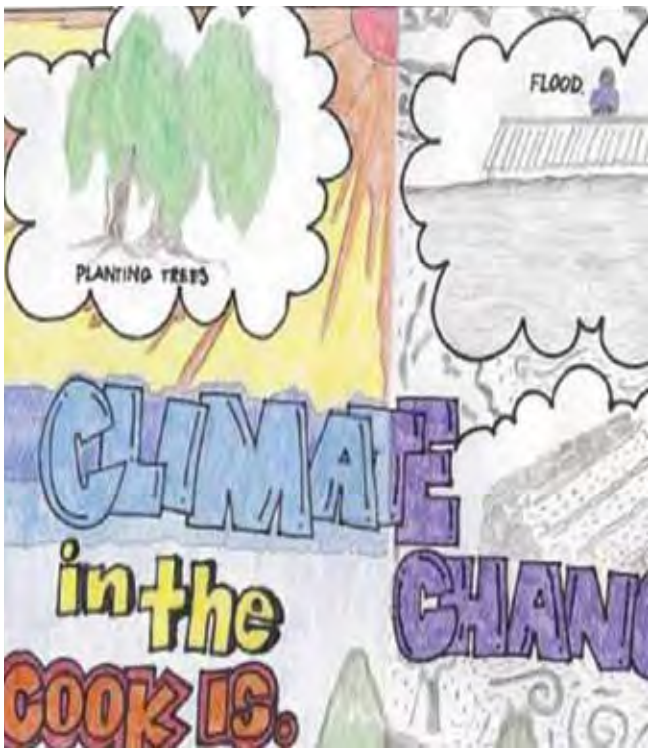
Kua rauka atu i te Kuki Airani i te patipati atu i tetai moni ei tauturu atu i te akarakara atu anga i te manamanata o te taui'anga reva no te mea kua taina atu te Patireia i teia au Koreromotu. Te maata anga o teia au tu'anga angaanga, te akapou'anga o teia au moni, kua tataia te reira i roto i te ripoti mua a te Kuki Airani.

Photos © Joseph Brider

Introduction



Educational coloring page © NES



Art competition entrant © NES

The destabilising threat of greenhouse gas concentrations (GHG) in the atmosphere and its dangerous interferences with the climate system concerns all countries; big and small. Small Islands Developing States (SIDS) like the Cook Islands have comparatively smaller GHG than larger developed countries but are especially vulnerable to the changes that scientific research indicates are happening.

The Cook Islands signed the United Nations Framework Convention on Climate Change (UNFCCC) ON 12 June 1992 at the Rio Summit on Sustainable Development, due to its concern about climate change and the need for cooperative action by all countries to address this issue. The Convention was ratified on 20 April 1993, and entered into force for the Cooks on 21 March 1994.[1] Subsequently the UNFCCC's Kyoto Protocol was signed by the Cook Islands on 16 September 1998, ratified on 27 August 2001, and came into force 16 February 2005.[2]

Under its obligations the Cook Islands published its INC in 1999 which was undertaken within the regional Pacific Islands Climate Change Assistance Program (PICCAP). The INC explained the Cook Islands' high vulnerability to climate change and its capacity and capability to respond to increasing climate changes was difficult due to resource constraints. The INC commenced the gathering of necessary scientific baseline data related to climate change impacts and Cook Islands emissions, including climate observations. While the challenges and some gaps persist, nonetheless there have been significant advances in understanding of expected impacts along with adaptation planning and mitigation measures since the 1999 INC.

This report, the Second National Communication (2NC) for the Cook Islands, has been supported through the United Nations Development Program (UNDP) and the Global Environment Facility (GEF) and reflects a shift from regional to national programmes. The 2NC builds on the first and updates the Cook Islands national circumstances, vulnerabilities and impacts and reports on advances in adaptation planning and mitigation measures since the INC. Across both reports there is also some documentation of traditional knowledge and other relevant anecdotal evidence.

As well as enabling the Cook Islands to meet its obligations to the UNFCCC, the National Communication reports also serve as status reports which show how the Cook Islands is affected by and dealing with climate change. The reports enable tracking of progress against the ultimate objective of the UNFCCC i.e., to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner. Equally important, the reports also facilitate national efforts towards achieving national development objectives and priorities.

1 http://unfccc.int/essential_background/convention/status_of_ratification/items/2631.php

2 http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php

Flow-on benefits have resulted for the Cook Islands due to meeting UNFCCC reporting obligations. For example: the National Climate Change Country Team (NCCCT) established for the INC was expanded for the 2NC and now includes representatives from traditional leaders, the private and community sectors. Extensive capacity building for the NCCCT members has increased the knowledge and elevated the profile of those members who are now considered national and regional experts on climate change.

Other benefits flow from the information in and studies undertaken for the National Communication reports including informing national strategic planning in multiple sectors and development of proposals for multilateral and bilateral funding such as the Global Environment Facility Pacific Island Greenhouse Gas Abatement & Renewable Energy Project – PIGGAREP (USD$1million), Asian Development Bank Pacific Energy Efficiency Programme – ADB PEEP ($400K), and Kyoto Protocol Adaptation Fund Proposal ($4.9million) amongst others.

The Cook Islands has also experienced growing partnerships between Government and NGOs for the participatory approaches undertaken for island specific vulnerability and adaptation assessments, as well as the recognition of the need for transparency and acknowledgement that response requires an informed whole of community approach. The Cook Islands is also able to use findings from the National Communications reports in negotiations at the international level.

In accordance with a recent decision of the Conference of the Parties and pending provision of full agreed costs, the Cook Islands will publish its Third National Communication (3NC) in five years time, with the possibility the Cook Islands receiving support to prepare a biennial update report due in December 2014.

National Circumstances

Cook Islands flag © NES

NATIONAL CONTEXT

As Figure 1 shows, the Cook Islands are 15 small islands located between latitudes 8 degrees and 24 degrees south and longitudes 157 degrees and 166 degrees west. The total land area of 237 square kilometres, over the 15 islands is divided geographically, into a Northern and a Southern group of islands. The Northern group of islands are described primarily as low coral atolls (Palmerston, Suwarrow, Nassau, Pukapuka, Rakahanga, Manihiki and Penrhyn (also known as Tongareva). The Southern group comprises eight islands (Aitutaki, Manuae, Takutea, Atiu, Mitiaro, Mauke, Mangaia and Rarotonga) which are a mix of high volcanic islands and raised coral atoll or makatea islands. The capital Avarua is on the main island of Rarotonga in the Southern group. The other 14 islands are referred to as the Pa Enua.

In the Southern group of the Cook Islands, only Rarotonga is high volcanic, while the rest of the islands are low volcanic surrounded by a raised reef platform or Makatea. The height range for the southern Cook Islands is 5 to 652 meters above mean sea level.

The Northern group of islands, with the exception of Tongareva (Penrhyn) emerge from a large submarine feature known as the Manihiki plateau. These islands are low-lying atolls and a sand cay with a height range of 3 to 9 meters above mean sea level. Tongareva (Penrhyn) is the most remote and largest atoll of the 15 Cook Islands. It is 1365 km north-north-east of Rarotonga, and 9° south of the equator. It sits atop the highest submarine volcano in the Cooks, 4876 m above the ocean floor. It comprises a 77 km ring of coral. The lagoon covers 233km^2 of which 62km^2 contain pearl-shell, making it the largest lagoon in the South Pacific

Figure 1: Map of the Cook Islands

(Carter, 1984). Suwarrow atoll is an uninhabited coral atoll designated as a National Park and has an important seabird breeding colony in the central South Pacific.

An application has been lodged with the United Nations to define and extend the maritime boundaries of the Cook Islands. The full extent of the outer limit of Cook Island's Exclusive Economic Zone (EEZ) before applying delimitations with neighbouring countries is approximately 2 320 000 square kilometres. However, the Cook Islands' EEZ overlaps with the five neighbouring Pacific Island countries of Tokelau, American Samoa, Niue, French Polynesia and Kiribati (Line Group), and agreement is being sought bilaterally. The total area of the provisional EEZ of Cook Islands is computed to be approximately 1 976 000 square kilometres in 2010.[3]

In 2006, the population of the Cook Islands was 19,569 with the significant majority (72%) living on Rarotonga, 21% in the Southern group and 7% in the Northern group. This high concentration of population on the main island puts considerable strain on limited land resources as land is converted to accommodate the growing population and for tourism infrastructure.

3 SOPAC, Pacific Islands Regional Maritime Boundaries Information System (PIRMBIS) Computation of Provisional Median Boundaries for Cook Islands and Tokelau Draft, April 2010, P9

The Cook Islands sources its main revenues from tourism, financial services, black pearl exports, fisheries and agriculture. The Cook Islands is highly sensitive to global events and external shocks that impact on the economy including rising fuel and food costs, distance from markets, out migration of Cook Islands people, as well as climate and environmental change. Population health and well-being is also contingent on maintaining a viable and sustainable environment to support these activities.

The effects of climate change will not occur in isolation from the effects of ongoing and future economic social and environmental changes. While the Cook Islands environment is often considered untouched in relative terms, it is under increasing pressure from economic and subsistence development, in particular increasing tourist numbers. In addition issues such as disparities between Rarotonga and the Pa Enua in income and access to basic needs and services, economic enabling environments and disabilities, gender and population age influences exposure and vulnerability. Women and men of the Cook Islands play different roles in their use of natural resources and provisions of food for the family.

Table 1: Statistics on the geography, geology and agriculture land area use of the Cook Islands

Island	Type	Location	Population (Total head count 2006)	Distance (km) from Rarotonga	Land area (ha)	Highest point (m)	Area used for Agriculture (acres)	Lagoon size (sq. km.) & reef length (km)
Southern								
Mangaia	Raised coral (Makatea)	22.00o S 158.00o W	640	175	5180	169	373.3	Fringing reef, 27 km.
Rarotonga	High island, volcanic	21.00o S 159.75o W	13,890	0	6719	652	1,143.00	Fringing reef, 34 km.
Atiu	Makatea	20.00oS 158.00o W	574	185	2693	72	152.6	Fringing reef, 22 km.
Mauke	Makatea	20.00o S 157.50 W	391	240	1842	29	271.8	Fringing reef, 18 km.
Mitiaro	Makatea	20.00o So 157.00o W	219	230	2228	15	52.5	Fringing reef, 19 km.
Aitutaki	Almost-atoll	19.00o S 159.75o W	2,235	225	1805	124	458	40 sq. km., 45 km.
Manuae	Atoll	19.25o S 159.00o W	0	200	617	10	0	4 sq. km., 17 km.
Takutea	Sand cay	19.75o S 158.25o W	0	190	122	5	0	Fringing reef, 6 km.
Palmerston	Atoll	18.00o S 163.00o W	63	430	202	5	0	35 sq. km., 36 km.
Northern								
Suwarrow	Atoll	13.25o S 163.00o W	0	820	40	5	0	100 sq. km., 57 km.
Nassau	Sand cay	11.50o S 165.50o W	75	1075	121	9	3.9	Fringing reef, 7 km.
Pukapuka	Atoll	11.00o S 166.00o W	507	1145	506	5	56.9	7 sq. km., 40 km.
Manihiki	Atoll	10.50 S 161.00o W	356	1040	544	5	18	40 sq. km., 32 km.
Rakahanga	Atoll	10.00o S 161.00o W	141	1080	390	5	12.7	2 sq. km., 14 km.
Tongareva (Penrhyn)	Atoll	9.00o S 158.00o W	255	1180	985	5	0	180 sq. km., 60 km.

THE ECONOMY

The economy of the Cook Islands is characterised by the high cost of imports and the low value of exports. Primary production is now mainly in agriculture whereas fisheries once dominated the economy, but there has been a strong move towards a service-orientated economy to cater to the demands of the growing tourism industry in recent years.

TOURISM INDUSTRY

The tourism industry has increased at a very rapid rate in the Cook Islands and is now the largest income earner for the nation. The number of visitors to the Cook Islands has more than doubled since 1998 from 48,630 to 101,110 in 2009.[4] The biggest growth in the visitor arrivals to the Cook Islands was in 2000 with an increase of 31% from 55,599 in 1999 to 72,994 in 2000.

The natural and human resources of the Cook Islands are the basic assets upon which tourism depends for its very existence. It is therefore in the direct economic interests of the tourism sector to lobby as forcefully as possible for the conservation and sustainable development of the natural environment. The importance of tourism to the future economy is likely to continue to grow providing the special attraction of the Cook Islands is not destroyed. Such appeal derives from a blend of people, scenery, and nature tourism opportunity however increased pressure on water, land and waste resources has exacerbated an already critical environmental problem.

AGRICULTURE

Pawpaw (*Carica Papaya*) at the Punanga Nui Market © Joseph Brider

While the Cook Islands are largely dependent on imported food a large proportion of the Cook Islands resident population still grow food crops to some extent. About 70% of all households in the Cook Islands are engaged in some form of agricultural activity for subsistence, commercial, or both. Almost all Cook Islanders have access to land, the lagoons and ocean where they may still catch and grow their own subsistence food. In this way agriculture is a key component of the food production system despite the fact that it does not provide significant income generation, i.e., only about one percent of farming households derive all of their income from farming.

MARINE RESOURCES

According to the 2000 agricultural census, about 75% of outer island households responded saying they engage in some form of fishing. In Rarotonga only 29% of households undertake some fishing activity. Of all the households surveyed however only 1% indicated that fishing was a primary commercial activity.[5] From this it is fair to assume fishing is mainly a subsistence food source rather than a large scale commercial activity in the Cook Islands. At the start of 2003 however, larger scale offshore fisheries catching up to 20 tonnes of fish were being exported to markets in Japan and the USA each week.

BLACK PEARL INDUSTRY

Black pearls are the leading export for the Cook Islands, ranking second only to tourism in their importance to the nation's economy. The country produced $NZ18 million worth of pearls in the year 2000, $NZ14 million in 2001 and $NZ6 million in 2002. The large drop in earnings was due to declining pearl prices and disease outbreaks in the Northern group islands of Manihiki (2000) and Tongareva (Penrhyn) (2001). The largest market is Japan which buys about 50% of Cook Islands production. The remainder is divided amongst Europe, Australia, Hawaii and domestic markets. There is also growing interest from mainland USA.

Seventy eight percent of the Cook Islands' black pearl farms are on Manihiki, 20% on Tongareva (Penrhyn) and 2% on Rakahanga. On Manihiki the industry employs about 250 part time and full time workers. Actual production is based on 90 farms seeding about 900,000 oysters annually.

On Manihiki the growth of the pearl industry has stimulated the island's telecommunications, transport and social sectors.

TRADITIONAL LEADERSHIP

Traditional leadership in the Cook Islands refers to the hereditary chiefly system which has undergone numerous changes since the arrival of agents of the London Missionary Society (LMS) in the 1820s.

The House of Ariki is made up of paramount chiefs representing all of the islands in the Cook Islands and advises government on traditional issues. The Ariki (chiefs) remain influential in land and title matters. The institution of the Aronga mana (traditional leaders) has survived the test of time, and is commonly referred to, along with the church and central government, as one of the three pillars of modern Cook Islands society.

4 Cook Islands StatisticsTourism Visitor Arrivals 2009

5 Stenhouse R, Elrick C. and Bond T, ***Climate Change Adaptation Technology Needs Assessment for the Cook Islands***, Synthesis Report. Coastal Zone Management Pty Ltd, Perth, 2008

POPULATION AND SOCIAL SITUATION

The total population of the Cook Islands reported in 2006 by the National Statistics Office was 19,569.

Table 2: Cook Islands Population by Region and Age Groups 2006

REGION	AGE GROUP				
	0-14	14-44	45-59	>59	Total
	Population				
COOK ISLANDS	5,098	8,865	3,287	2,319	19,569
Rarotonga	3,319	6,752	2,488	1,621	14,153
Southern Group excl. Raro	1,239	1,587	627	579	4,032
Northern Group	540	553	172	119	1,384
	Percentage Distribution				
COOK ISLANDS	26.1	45.3	16.8	11.9	100.0
Rarotonga	23.5	47.5	17.6	11.5	72.3
Southern Group excl. Raro	30.7	39.4	15.6	14.4	20.6
Northern Group	39.0	40.0	12.4	8.6	7.1

Source: Ministry of Health; July 2008, Annual Statistics Bulletin 2007

Cruise boat, Rarotonga © NES

Cook Islands is a parliamentary democracy, with Queen Elizabeth II the Head of State, represented by the Governor-General HE Sir Fredrick Goodwin. Cook Islands is a self-governing state 'in free association with New Zealand, an arrangement dating from August 1965. Under the terms of the free association, Cook Islanders hold New Zealand citizenship and enjoy the right of free access to New Zealand.

The political and administrative status of the Cook Islands population as New Zealand citizens makes it difficult to keep track of the current size of the resident population. Today, about three to four times as many Cook Islanders live overseas (mainly in New Zealand with a growing population in Australia) than in the Cook Islands.

Internal migration is an important feature of the demography of the Cook Islands with the 2006 census showing a 24.2% decrease in the population of the Northern group and except for Rarotonga, a slight increase of 0.5% in the population of the Southern group.

The high concentration of the population on Rarotonga is already putting considerable strain on the island's limited land resources as more and more land is converted to accommodate the growing population and for tourism infrastructure. Such high population concentrations have led to environmental problems in areas such as coastal ecosystems, water supply, and liquid and solid waste management. This problem is exacerbated by the increasing number of tourists coming to the Cooks Islands, most of whom spend time on Rarotonga.

Cook Islands has a unicameral parliament with 24 elected members and a parliamentary term of 4 years. There is also a 15-member House of Ariki (Chiefs), established in 1966, composed of six Ariki from Rarotonga and nine from the outer islands. The Ariki advise the Government on land use and customary issues. There is full adult suffrage and registration is compulsory, although voting is not.

The Head of Government is the Prime Minister, the Hon Henry Puna MP, and Cabinet comprises the Prime Minister together with five other Ministers. Elections were last held in November 2010 and the opposition Cook Islands Party (CIP) won a majority, securing 16 of the 24 district seats. The incumbent Democratic Party (DP) won the remaining eight seats

EDUCATION AND TRAINING

Education is compulsory for children aged five to 15 years with the government providing free education at both primary and secondary school levels.

The Ministry of Education of the Cook Islands is responsible for the administration and implementation of education and is working with others in the sector to implement 'Learning for Life, the Education Master Plan (2008–2023)'. This plan focuses on providing equitable access to quality learning opportunities across the full spectrum of human endeavour from birth. Current priorities lie around literacy, numeracy and increasing access to vocational and life skills programmes.

TRANSPORT

During the last decade the transport sector has seen a steady increase in activity in this particular sector of the economy. The increase in the number of newly registered vehicles is in line with overall growth in the economy. There are more flights servicing the Cook Islands along with Air NZ, such as Pacific Blue and Tahiti Nui. Capacity on these airlines continues to grow as well as with domestic Air Rarotonga. The proposed entry of a new domestic airline has been viewed by some in the tourism industry as a positive step in the domestic tourism market increasing capacity and growth in this sector. Cruise liners are also a valuable source of revenue for the nation. The rising number of visits by cruise liners to Rarotonga has given rise to a call for improved passenger terminal facilities to assist in cruise visitor arrivals, and these developments are exposed to climate variability and change.

Table 3: Newly Registered Vehicles

Period YEAR	Total	Motor Cycle	Newly Registered Vehicles			Other Vehicles
			Cars, S/Wagons & Jeeps	Trucks & Buses	Vans & Pickups	
2004	1,588	1,151	293	41	89	14
2005	1,660	1,086	350	58	131	35
2006	1,862	1,323	307	55	141	36
2007	1,648	1,047	355	65	163	18
2008	1,350	882	267	44	137	20

Source: The Bank of the Cook Islands (BCI), Rarotonga

Water Resources

RAROTONGA

The water supply on Rarotonga is captured and piped from 12 water intakes located in the interior of the island. It is delivered with no chemical treatment apart from coarse gravel filter screens. The two ring main system running around the island carries the bulk of the water supply by gravity feed to a distribution system which then feeds the customers except those living at over 30 meter elevations which cannot be supplied by the gravity system. The island water network is also used for agricultural purposes which in itself creates stresses on supply. Households that are not connected to the central system rely on catching rainwater and on-site storage tanks as their source of supply which is augmented by purchasing and carting of water sourced from the islands network during extended dry periods.

Water quality is variable with piped water becoming turbid after extended and intense rainfall periods. Some parts of the delivery network are currently being replaced due to age and heavy corrosion under an ongoing water maintenance program. Water is provided free of charge, because of this high wastage of the resource is experienced, especially by farmers, but also by households who do not fix leaking taps and pipes on their property in a timely manner. It is estimated that the loss on the system sometimes ranges up to 60%-70%. However since there is no metering of the sources or the consumers the losses cannot be determined accurately.

SOUTHERN GROUP ISLANDS

The water supply on the Southern group of islands is operated by government with consumers serviced through a reticulated distribution system. Groundwater is the primary source of water on some islands such as, Aitutaki, Atiu and Mauke; whereas both surface water (four intakes) are used on Mangaia. People on Mitiaro rely on a combination of spring water and rainwater. There is no chemical water treatment on any of the islands thus water quality is non-potable and often brackish indicating that exploitation of the water lens is at the limit of sustainability, with saltwater intrusion an increasing threat. Consumers increasingly rely on augmenting their supplies with rainwater from their own roofs. Community rainfall catchments and storage are also used as a back up supply during extended dry periods.

NORTHERN GROUP ISLANDS

All islands in the Northern group rely on rainwater as their primary source of water supply. Additionally, in most villages, roofs on public buildings and other dedicated rainfall catchment roofs are used to collect rainwater for large community storage facilities which; provide water for the community and are also the sources of water for households that do not have on-site tanks. This system also acts as a back up supply in case of extended dry weather periods.

Most households capture roof runoff and store it on site in storage tanks, which range in size from 2,000 L to 10,000 L, depending on household size and affluence. Water quality is variable as none of the tanks observed had first-flush diversion mechanisms.

Many of the old community tanks are of concrete construction with external steel bands which provide additional support and maintain water tightness. Typically their capacity is 45,000 L. However most of the tanks are old (up to 40 years old) and are in unsound structural condition. Leakage and rusted external steel bands are a common problem.

Several shallow wells are available on all of the atoll islands but are seldom used. The wells are less than five m deep and water quality is also affected by tidal variations. Studies carried out indicated that water quality is acceptable for non-potable use.

BIODIVERSITY

Cook Islands biodiversity is an important feature of the overall environment. To this end Cook Islands biodiversity is fragile and vulnerable to a wide range of environmental and human related impacts. It is critical to the continuing health and survival of the natural features of each island as well as the Cook Islands people who depend on those features for their culture and livelihood. Vegetation varies from mountain rainforest on Rarotonga through lowland limestone forest on Mauke, Atiu, Mangaia and Mitiaro to beach forest on atoll islands and reef islets in the Northern group islands, such as Pukapuka. Marine life is also abundant in close proximity to each island, although the Cook Islands are at the eastern end of the Pacific wide biodiversity gradient.

The Cook Islands currently hosts 173 species of flowering plants, eighteen (18%) of which are endemic. For further details on the Cook Islands please refer to Annex 1.

Key Climate Change Policies and Plans

Coastal scene Rarotonga, an area affected by climate change © NES

Delivery of emergency supplies after cyclone Pat in Aitutaki 2010 © NES

The Cook Islands does not yet have an overall climate change policy but this is being planned for and is a priority in light of the scientific evidence presented in the Intergovernmental Panel on Climate Change (IPCC) reports which state that climate change is happening and human activities are releasing more green house gases (GHG) than ever.[6] Findings from the IPCC as well as those of national studies presented in this report indicate the resulting impacts of shifts in climate elements like rainfall, temperature, wind, sea-level, increased frequency and intensity of extreme climate events like cyclones and storm surges, and ocean acidification threaten the ability of the Cook Islands to meet its sustainable development objectives.

Designing a comprehensive policy is a challenge because a range of domestic bodies are responsible for drafting and influencing policy in relation to climate change and the implementation of the Convention, but their resources are committed to other development priorities. Impacts of climate change affect different sectors and no one agency has a core function related specifically to climate change, although the National Environment Service (NES) has led to date in terms of its responsibilities for multilateral environmental agreements under its Act.[7]

For this reason a functional review of climate change within government was undertaken as part of the 2NC with additional support from the Government of Australia. This functional review was conducted to see how institutional arrangements for climate change can be strengthened within government and receive prominence in the national agenda. As a result, the Government of the Cook Islands established Renewable Energy and Climate Change Coordination offices within the Office of the Prime Minister in 2011. These Offices will start institutionalising and coordinating climate change related activities and initiatives, drive policy work and facilitate implementation.

The National Vision of the Cook Islands is contained in "Te Kaveinga Nui" which sets out a framework called "Living the Cook Islands Visions – A 2020 Challenge":

To enjoy the highest quality of life consistent with the aspirations of our people, and in harmony with our culture and environment

"Te Kaveinga Nui" contains the key planning document, the National Sustainable Development Plan (NSDP) 2007–2010, NSDP 2011–2015, and 2015–2020. The objective of the NSDP is 'to build a sustainable future that meets our economic management, environment integrity, social stability, and our Cook Islands Maori culture, and the needs of our future generations.'

All sector and government agencies planning must be aligned to the NSDP strategies as national priorities. While none of the current Strategic Goals explicitly reference climate change several goals have particular relevance:

- **GOAL 4** "Sustainable use and management of our environment and natural resources",
- **GOAL 5** "Strengthened and affordable basic infrastructure, transport and utilities to support national development"; and
- **GOAL 6** "A safe secure and resilient community".

The NSDP furthermore is aligned with the nation's regional and international commitments such as the Pacific Plan, Millennium Development Goals (MDG), Mauritius Strategy, and multi lateral environmental agreements such as the UNFCCC, Convention to Combat

6 Mimura, N., L. Nurse, R.F. McLean, J. Agard, L. Briguglio, P. Lefale, R. Payet and G. Sem, 2007: Small islands. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 687-716. (Chapter 16, IPCC Fourth Assessment Report) page 691

7 Environment Act 2003, section (9) (3)

Land Degradation & Desertification (CCD) and the Convention on Biological Diversity (CBD).

The National Environment Strategic Action Framework (NESAF) 2005–2009 and 2011–2015 is referenced in the NSDP and provides guidance and direction for achieving the sustainable social and economic progress for the Cook Islands utilising its natural resources and environment wisely. The third goal of the NESAF is to increase resilience by strengthening national capacities for climate change, variability, adaptation and mitigation. Currently both the NSDP and the National Environment Strategic Action Framework are under review, with preparation of the strategies to 2015 underway.

The Cook Islands Disaster Risk Management National Action Plan (DRM-NAP 2008) provides policy direction on preparation for and reducing risk of disasters should they occur as well as response and recovery/rehabilitation. More detail on this is provided in Annex 1. Building upon and updating the DRM-NAP 2008 there is now a Joint National Action Plan for Disaster Risk Management and Climate Change Adaptation (CI JNAP DRM CCA) as well as a Renewable Energy Chart being developed for implementation. The plans aligns with other national planning frameworks such as the NSDP, NESAF and the Cyclone Recovery Reconstruction Plan.

Alongside the development of these strategies and plans are a wide range of consultations and discussions on how climate change would affect society in the Cook Islands and how society would move to mitigate and adapt to those effects. An environment forum was organised and held in Rarotonga, July 2010, where stakeholders discussed the many issues confronting the Cook Islands. A climate change planning week was held in March 2011 and explored in more depth adaptation, mitigation, technologies and sustainable financing. The issues traversed climate change as well as a broader spectrum of sustainable development issues.

Non-Government Organisations have called for more effort on local versus national obligations noting partnerships between community and government are viewed as an important factor to addressing climate change impacts. The responsibilities of policy development and implementation are not clearly articulated under the current arrangements. Recognising NES in its role as an environment manager, as well as Emergency Management Cook Islands are not adequately staffed to meet the workload demand of climate change there is a call for more effective leadership with policy development and project implementation tasks delegated to the relevant sectors in government so the workload is shared and manageable.

Outcomes from these forums are consistent with the national framework strategies and plans identified above and reaffirm that the Cook Islands needs assistance and support from the international community to address the wide range of impacts already being experienced through climate variability in the context of longer term climate change.

INTERNATIONAL POLICY: COOK ISLANDS INVOLVEMENT IN THE UNFCCC & KYOTO PROTOCOL

The Cook Islands has a negligible amount of GHG emissions yet it and other SIDS are being seriously impacted by adverse climate change. Therefore, it is vital for our sustainable development and survival that GHG emissions are reduced to slow climate change enabling ecosystems and ourselves to adapt.

CONFERENCES OF THE PARTIES TO THE UNFCCC, MEETING OF PARTIES TO THE KYOTO PROTOCOL

The Cook Islands signed the UNFCCC on 12 June 1992 and the Kyoto Protocol on 16 September 1998, to work with the international community to avoid dangerous climate change. The UNFCCC and Protocol contain set rules and procedures for which the Cook Islands to adhere to, and participate in the annual Conferences of the Parties (COP) and Meetings of Parties (MOP) now involving over 190 signatory governments to identify ways to address climate change. This participation enables networking and exchanges of information on technical and financial matters as well as voicing of national positions in decisions being taken. The Cook Islands has endeavoured to support a wide range of delegates' participation including non-government and youth representatives, formally accredited with conditions. Over the past decade the Cook Islands delegations have largely consisted of women.

COMMITMENTS UNDER THE CONVENTION AND THE PROTOCOL

Developed countries have assumed legally binding reduction targets under the Kyoto Protocol. There are also Convention obligations on developed countries to assist developing countries including SIDS to address climate change through funding assistance, transferring climate friendly technology, capacity building and meeting their adaptation and mitigation needs. However with other SIDS the Cook Islands have concerns these commitments are not being met.

Developing countries, including SIDS like the Cook Islands, are currently exempt from taking on formal emissions reductions targets, and only have to submit National Communications reports on measures taken to address climate change at regular intervals.

Recognising the need for more action than currently pledged by developed countries in the Kyoto Protocol, at COP 13 in Bali it was agreed to work towards a new legally binding outcome on enhanced action on climate change under the UNFCCC for all Parties. Subsequent decisions that the Cook Islands actively negotiated at COP15 in Copenhagen and COP16 in Cancun have set in motion mechanisms for further actions by all countries.

Table 4: Approach to Climate Change 1999–2010 in relation to National Communication report

	NATIONAL CLIMATE CHANGE COUNTRY TEAM Representing Climate Change Stakeholders		
ISSUES	IMPACTS Temperature, Rainfall, Extreme weather events Sea Level Rise Ocean Acidification Persistent Toxic Substances	ADAPTATION National Priority Response Options	MITIGATION Minimise greenhouse gas emissions (GHGs) to slow global warming
NATIONAL ACTIVITIES	RESEARCH AND SYSTEMATIC OBSERVATIONS Data collection/education: Met Service, GCOS, SLR, SCOPIC, NIWA, PCCSP Use of oceanography to identify sources of Persistent Toxic Substances	MAINSTREAMING INTEGRATION OF ASSESSMENTS Planning: DRM CCA Assessments & Pilot projects: CBDAMPIC, AIACC, CLIMAP (NSDP, Red Cross VCA, WWF), PACC Project Design: KPAF, PASAP	RENEWABLE ENERGY/ENERGY EFFICIENCY LAND USE Barrier studies, PIREP, PIGGAREP Pilot projects: ADBEE
INTERNATIONAL EFFORTS		REPORTING National Communications	
	Intergovernmental panel of scientists (IPCC) Global Monitoring Program for POPs & Mercury	NEGOTIATIONS International & Regional Multilateral: UNFCCC, Pacific Forum, AOSIS, Bilateral	Global Mechanism to reduce GHGs KYOTO PROTOCOL Global mechanism to reduce mercury emissions from source, including coal-fired power stations

ADDRESSING CLIMATE CHANGE

Climate change has been the subject of scientists alarm since the 1970s, and has become an issue of increasing concern for the people of the Cook Islands since signing the Convention in 1992. The Cook Islands have been actively involved in the process of implementing the basic principles and obligations of the UNFCCC.

This included the INC 1997–1999 with the financial support from GEF through UNDP and supported by the regional Pacific Islands Climate Change Assistance Programme (PICCAP), seeking support and implementing adaptation and mitigation activities although on a small scale.

The Ministry of Foreign Affairs and Immigration is the official and political focal point and NES is the operational focal point for the UNFCCC. The NES is the main agency dealing with implementation of regional and international treaties on the environment to which the Cook Islands is a party. The NES is also the main point of contact for the region's environment organisation, the SPREP as well as for facilitating funding access through the GEF.

As a result of the reporting obligation to the UNFCCC, the NES for the Government of the Cook Islands has supported environment officers to oversee the preparation of the 2NC to the UNFCCC, engage in negotiations, provide technical input for the development of proposals, and coordinate community vulnerability and adaptation work.

For the preparation of the INC, the NCCCT was formed to oversee the project. The team consisted of Heads of Ministries and was endorsed by Cabinet. Once the INC was submitted the NCCCT continued to engage in consultations, pilots, and climate change activities on an ad hoc basis over the next six years.

After six years, in mid 2006, when the Cook Islands commenced preparation of its 2NC, the NCCCT was formally re-established. It was expanded to include non-governmental organisations, traditional leaders, religious leaders, intergovernmental organisations as well as individual experts in the communities. The NCCCT is chaired by Meteorological Service, co-chaired by the Office of the Prime Minister, with the NES as its Secretariat.

A number of externally supported pilot projects and planning activities have been implemented and project proposals elaborated under the guidance of the team since its establishment and the INC. The subsequent role of the team has been increased beyond the National Communication to serve as a consultative group and information sharing platform for other climate change related activities and projects.

NATIONAL CLIMATE CHANGE COUNTRY TEAM

The NCCCT role includes evaluating project outputs to ensure that project activities are being carried out in a timely manner and to acceptable levels of quality, reviewing the status and needs of the Cook Islands throughout climate change project implementation phases, and endorsing project outputs. The NCCCT provides a policy and technical platform for such activities, maintaining consistency with national development priorities and objectives, as well as mainstreaming climate change into sectors by ensuring that relevant stakeholders in the country are kept informed and consulted on the development of climate change issues and policies. Expert working groups drawn from team members have occasionally been put in place to assist on specific activities.

From 2006 to 2011 the composition of the NCCCT comprised representatives from the following organisations with the right to second resource personnel for their technical expertise as required.

- Meteorological Services, Cook Islands (CIMS) (Chair)
- National Environment Service (NES) (Secrétariat, UNFCCC OFP)
- Ministry of Foreign Affairs and Immigration (MFAI) (UNFCCC PFP)
- Office of the Prime Minister (OPM) (Vice-Chair)
- Central Policy and Planning Unit at OPM (CPPU)
- Renewable Energy Division at OPM (RED)
- Emergency Management, Cook Islands (EMCI)
- Ministry of Finance and Economic Management (MFEM)
- Aid Management Division
- Ministry of Infrastructure Planning (MOIP)
- Ministry of Internal Affairs (Intaff)
- Ministry of Marine Resources (MMR)
- Ministry of Agriculture (MoA)
- Ministry of Health (MoH)
- Ministry of Education (MoE),
- National Human Resources Department (HRD)
- Tourism Corporation, Cook Islands
- Investment Corporation, Cook Islands (CIIC)
- Te Aponga Uira (TAU) State owned enterprise Electricity Generation)
- Cook Islands Chamber of Commerce and Private Sector
- Cook Islands Association of Non-Governmental Organisations (CIANGO)
- Cook Islands Climate Action Network (CICAN)
- Cook Islands Red Cross (CIRC)
- Traditional Leaders (House of Ariki and Koutu Nui)
- Religious Advisory Council (RAC)

Examples of seconded members include: Crown Law, Information Communication Technology Unit OPM, MFEM Statistics Division, MOIP PACC project staff, Natural Heritage Trust, Pacific Gender Climate Coalition, Island Sustainability Alliance Cook Islands, etcetera. As a result of the work on the Joint National Action Plan for Disaster Risk Management and Climate Change Adaptation (CI JNAP DRM CCA) members of the National Disaster Risk Management Advisory Committee, additional members were added in late 2010 and include vital services, Police, Fire Safety and Telecommunications. Recognising the contributions and involvement of individuals, they are specifically mentioned in the acknowledgement section of this report.

The role and composition of the NCCCT may be further modified as a result of the functional review of climate change and the wider public service, new institutional arrangements, and efforts to further integrate climate change and disaster risk management work, as well as to provide clarity on decision making.

The specific roles and responsibilities of each of these organisations relevant to climate change are elaborated in detail in Annex 2.

DOMESTIC AND REGIONAL PROGRAMS

The Cook Islands approach to climate change since the submission of the INC can be divided into the issues of:

- Impacts.
- Adaptation.
- Mitigation.
- Other relevant programs

At the national level these three areas allow us to categorise activities undertaken in each and highlight the links to the National Communications reporting and other international efforts.

IMPACTS

To enhance understanding of climate change risks and emissions reductions opportunities related to temperature, rainfall, extreme weather events, sea level rise, and ocean acidification; the Cook Islands undertakes research and systematic observations including data collection/education related projects since the INC as follows:

- Global Climate Observing Systems (GCOS)
- Sea level rise (SLR)
- Seasonal Climate Outlook for Pacific Island Countries (SCOPIC)
- National Institute of Water and Atmospheric Research (NIWA)
- Pacific Climate Change Science Program (PCCSP)

These projects are detailed in Annex 3.

ADAPTATION

In developing national priority response options, the Cook Islands has participated in a number of activities towards integration of climate change through assessments and planning particularly for disaster risk management and climate change adaptation. Most of these have been assessments or small scale pilot activities with some larger scale implementation oriented projects under design as follows:

- Capacity Building for the Development of Adaptation Measures in Pacific Island Countries (CBDAMPIC).
- Assessment of Impacts and Adaptation to Climate Change (AIACC).
- Climate Change Adaptation Programme for the Pacific (ADB CLIMAP).
- Comprehensive Hazard and Risk Management (CHARM)
- Strengthening Disaster Management and Mitigation
- Component 1: Strengthening Disaster Risk Management
- Component 2: Preventative Infrastructure Master Plan
- Development of Sustainable Agriculture in the Pacific
- Food Security for Sustainable Livelihoods Programme (FSSLP)
- Pacific Adaptation to Climate Change (PACC)
- Red Cross Preparedness for Climate Change Programme and Vulnerability and Capacity Assessment (VCA)
- World Wide Fund For Nature South Pacific Programme (WWF)
- Managing Climate Risk in Cook Islands' Vulnerable Communities (ADB-SGA-WWF)
- Kyoto Protocol Adaptation Fund Project Proposal Strengthening resilience of our islands and communities (KPAF-SRIC)
- Pacific Adaptation Strategy Assistance Program (PASAP)
- Pukapuka Cyclone Safety Shelter

These projects are detailed in Annex 3.

MITIGATION

Although the Cook Islands contributes few emissions, there is still a willingness to make efforts to minimise greenhouse gas emissions (GHGs) to slow global warming, particularly through renewable energy/energy efficiency and improved land use practices. The main activities thus far have been barrier studies and small pilots:

- Pacific Islands Renewable Energy Program (PIREP)
- Pacific Islands Green house Gas Abatement through Renewable Energy Project (PIGGAREP)
- Energy Efficiency and Conservation ADBEE (light bulbs etc)

- Pacific Environment Community (PEC)
- Island Monitoring and feasibility studies.

These projects are detailed in Annex 3.

REPORTING AND INTERNATIONAL ENGAGEMENT

In addition to the National Communications reporting obligations already outlined, since the INC the Cook Islands has input to a wide range of programmes, assessments, reports and strategies including political declarations at the national, regional and international level to advance efforts to address climate change.

Amongst others these include

- Intergovernmental Panel on Climate Change Special and Assessment Reports
- Pacific Islands Climate Change Assistance Programme (PICCAP)
- Pacific Islands Framework for Action on Climate Change (PIFACC)
- Pacific Plan
- Cairns Compact 2009

These are detailed in Annex 3.

OTHER RELEVANT PROGRAMS

The Cook Islands also undertake other programs since the INC including capacity assessments, and community sustainable development programs. Furthermore, activities include those of disaster risk reduction.

- National Capacity self Assessment (NCSA)
- Community-centred Sustainable Development Programme
- Cyclone Emergency Assistance Loan Project (CEAL)
- Cyclone Pat: Recovery and Reconstruction Project – Aitutaki
- Cyclone Recovery and reconstruction (CRR) and Outer Islands Development (OID) Programmes

These are detailed in Annex 3.

Climate Trends

Bushfire aftermath during a drought, Avana, Rarotonga 2011 © NES

Met Service equipment, Tongareva (Penrhyn) © NES

Generally speaking, the Cook Islands has a mild tropical climate year round with an average rainfall of 1800 – 2040 mm per year and a mean temperature of 24–29 degrees Celsius, although this is variable between the Northern and Southern groups of islands and across the year. However, climate trends assessed through recent work under the Pacific Climate Change Science Programme (PCCSP) 2011 as well as the 2009 NIWA Cook Islands Climate-Variation and Change Report and the ADB Climate Risk Profile as well as the IPCC AR4, indicate cause for serious concern with increasing temperatures and rainfall, rising sea levels, and increases in the frequency, intensity and duration of extreme events.

OBSERVED CLIMATE

Climate is important for energy demand trends and supply options and understanding what exposure, variability and changes are being experienced. The climate of the South Pacific Region is characterised by the interaction between the ocean and atmosphere. The most striking oceanic and climatic fluctuations in the equatorial region are not the seasonal, but interannual changes associated with the El Niño Southern Oscillation (ENSO). This is a natural climate pattern that occurs across the tropical Pacific Ocean and affects weather around the world. ENSO affects virtually every aspect of the system, including sea level, winds, precipitation, and air and water temperature. There are two extreme phases of ENSO: El Niño and La Niña. There is also a neutral phase.

When assessing climate the Cook Islands are divided into Northern and Southern groups (using Rarotonga and Tongareva (Penrhyn) data stations) because their climates differ substantially due to the large distance between the island clusters and their positions relative to the equator. The El Niño-Southern Oscillation has opposite effects on the Northern and Southern groups. In Rarotonga, El Niño events tend to bring drier and cooler conditions than normal, while in the north El Niño usually brings wetter conditions. Ocean temperatures warm in the north during an El Niño event so air temperatures also warm.

The Cook Islands Meteorological Service is working with regional and global institutions to collect manage and analyse climate data and systematic observations. There are also seven weather stations on the Cook Islands, five of which are now automated. This allows for collaboration with other institutions and early warning weather forecasts for key climate patterns and tropical cyclones.

The observed climate in the Cook Islands is sub-tropical to tropical, with a rainfall average of 2040 mm per annum and a mean annual temperature of 24°C[8] . The weather in the Cook Islands depends largely on the South Pacific Convergence Zone (SPCZ). The SPCZ is an area of convergence between the equatorial easterly winds and the higher latitude south-easterly trades, extending across the Pacific from the Solomon Islands to east of the Cook Islands. It is an area of cyclonic wind shear, and is a semi-permanent clouds feature of the Southern Hemisphere with its band of heavy rain caused by air rising over warm waters where winds converge resulting in thunderstorms. It is a critical determinant of the long-term rainfall distribution in the southwest Pacific.

There are two dominant seasons, a warmer wet season (November to April) and a cooler dry season (May to October). During the dry winter season the SPCZ is generally to the north of the Southern Cook Islands and the group is affected predominantly by the dry southeast trades, and during this period the SPCZ is occasionally weak or inactive. However in the wet season the SPCZ is more active and can lie directly over the Southern group bringing unsettled weather and rain. Tropical cyclones, forming on the SPCZ between November and April, are major meteorological features which also affect the Cook Islands.

8 Baldi M, Mullan B, Salinger J, Hosking D, ***Module 3: The Cook Islands Climate – Variation and Change***, 2009, NIWA Client Report: AKL2009-032, page 9.

The recently published findings by the Pacific Climate Change Science Programme (PCCSP)[9] shows annual maximum and minimum temperatures have increased in both Rarotonga and Tongareva (Penrhyn) since 1950 (Figure 2). In Rarotonga, maximum temperatures have increased at a rate of 0.04°C per decade. These temperature increases are consistent with the global pattern of warming. Over the same period, average annual rainfall has decreased at Rarotonga but increased at Tongareva (Penrhyn) (Figure 3) but there is substantial variation between years.

9 Australia Bureau of Meteorology and CSIRO, 2011. *Climate Change in the Pacific: Scientific Assessment and New Research, Volume 2: Country Reports*

Figure 2: Annual average temperature for Rarotonga in the Southern Group.

NB: Light blue bars indicate El Niño years, dark blue bars indicate La Niña years and the grey bars indicate neutral years.

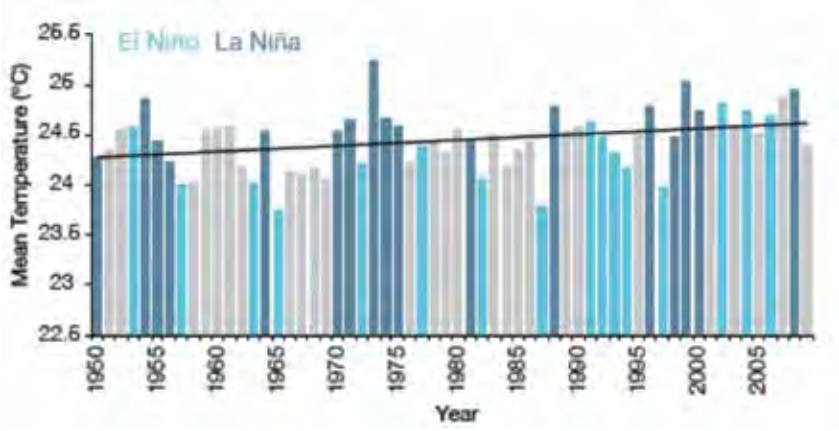
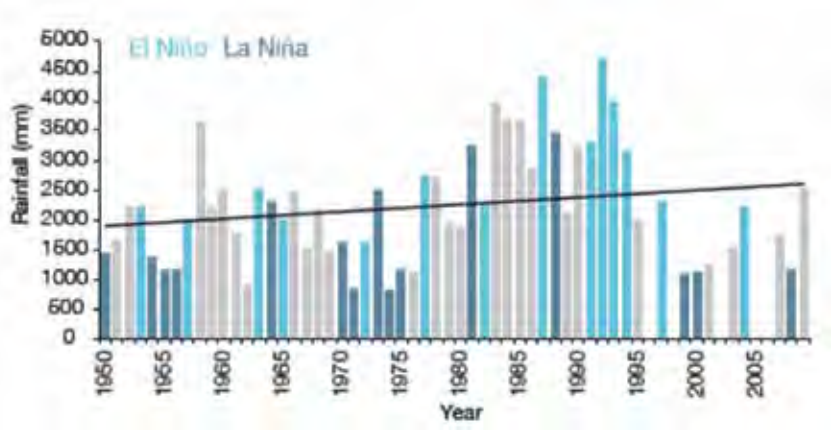


Figure 3: Annual rainfalls for Tongareva (Penrhyn) in the Northern Group.

NB: Light blue bars indicate El Niño years, dark blue bars indicate La Niña years and the grey bars indicate neutral years.



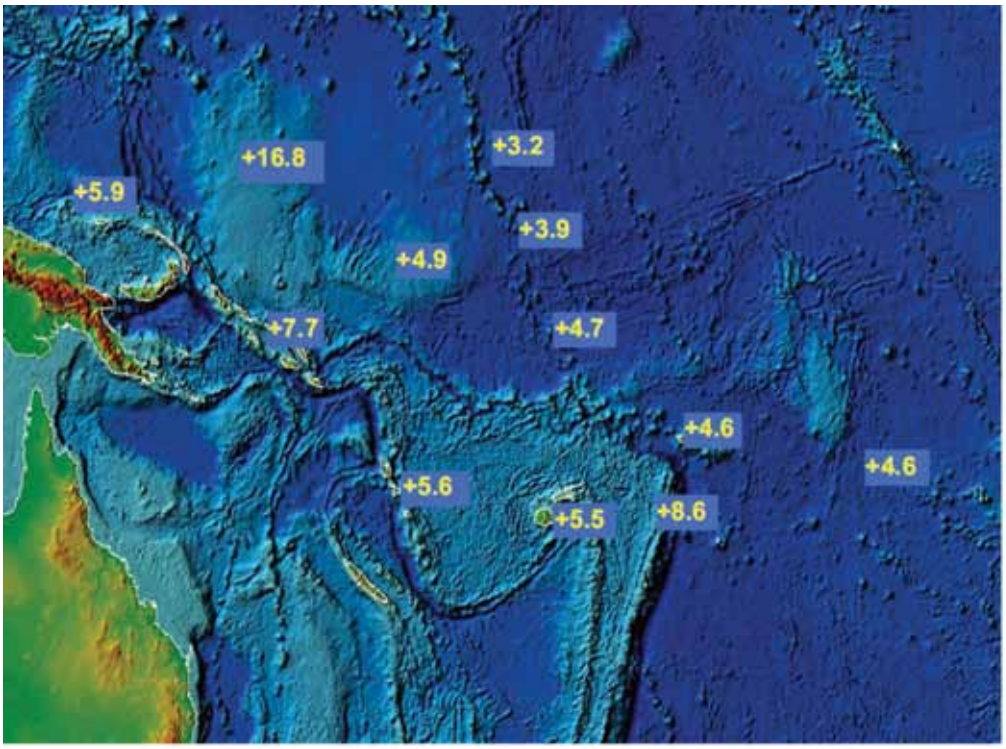
Variation in sea level has been monitored through the tide gauge record since 1977[10] and the South Pacific Sea Level and Climate Monitoring Project satellite data since 1993. As ocean water warms it expands causing the sea level to rise. The melting of glaciers and ice sheets also contributes to sea level rise. Satellite data indicate the sea level has risen near the Cook Islands by about 4 mm per year since 1993. This is slightly larger than the global average of 2.8 –3.6 mm per year. This higher rate of rise may be partly related to natural fluctuations that take place year to year or decade to decade caused by phenomena such as ENSO.

Figure 4 shows the region with net relative sea level trends (in mm/year) after subtracting the effects of the vertical movement of the measuring platform and the inverse barometric pressure effect, utilising all the data collected since the start of the SPSLCMP project in 1993 up to the end of December 2009.[11]

10 South Pacific Sea Level Climate Monitoring Project – see annex 3 for more details

11 Pacific Country Report On Sea Level & Climate: Their Present State Cook Islands, December 2009 Figure 5, P13 AusAID-sponsored South Pacific Sea Level and Climate Monitoring Project

Figure 4: Region showing net relative sea level trends



Cyclones and other extremes have been compiled in a useful study *The Cyclone history of the Cook Islands* that is an interesting local supplement to regional and international information from other sources[12]. Tropical cyclones mainly affect the Cook Islands between November and April, with occasional events occurring in October or May. In the 41-year period between 1969 and 2010, 47 tropical cyclones passed within 400 km of Rarotonga, an average of just over one cyclone per season. The number of cyclones varies widely from year to year, with none in some seasons but up to six in others. Over the period 1969 to 2010, cyclones occurred more frequently in the Cook Islands during El Niño conditions (even weak ones) compared with neutral ENSO or La Niña conditions[13].

The ENSO weather pattern has changed its behaviour noticeably since 1976, with more El Niños, fewer La Niñas, and the two biggest El Niños on record (1982–83 and 1997–98) and the longest El Niño on record. Statistically, these changes are unusual, and some researchers have speculated that they could be connected to global warming.

More detailed analysis of the climate variables of the Cook Islands can be found in the *Module 3: The Cook Islands Climate – Variation and Change, 2009* report by the National Institute of Water and Atmospheric Research Ltd (NIWA). It has been noted that there are still information gaps for forecasting for many of the Pa Enua, and there have also been problems with the reliability of the automated weather stations.[14] This has largely been due to communication problems between the automated stations and the Meteorological head office in Rarotonga. The connection has been based on 'dial-up' technology but is set to be upgraded to broadband connections allowing information to be collated at the Rarotonga met office in real time.[15]

PROJECTIONS AND SCENARIOS

Understanding Climate variability and projected future changes is vital for managing climate change risk and understanding the vulnerability, impacts and adaptation options to different sectors, systems and groups across the Cook Islands. As exactly what the future holds is unknown, the IPCC developed a series of plausible scenarios based on a set of assumptions about future population changes, economic development and technological advances. Through the INC a COOKCLIM (SIMCLIM) model was developed and provided a basis for further integrated modelling of changes and impacts over the course of the 2NC. More is now known about the nature and direction of trends.

NIWA examined a range of scenarios to the year 2100, and selected a subset of 12 models that validated best for the climate of the South Pacific region to date. These were mainly for the middle of the road global emissions scenarios termed by the IPCC as A1B scenarios (global population peaking mid-century and declining thereafter, very rapid economic growth, and rapid introduction of new and more efficient technologies). They did also briefly look at more moderate (B1) and more extreme (A1) scenarios. The Cook Islands scenarios produced

12 de Scally F, Wood G, Maguire L, Fournier-Beck M, Silcocks D, ***A History of Tropical Cyclones and their impacts in the Cook Islands***, 2006, Cook Islands Meteorological Service, Nikao, Rarotonga.

13 Ibid

14 Stenhouse R, Elrick C. and Bond T (2008), p24

15 Consultation, Meteorological Service, 21 June 2010.

benefited from use of localised datasets in conjunction with the global model outputs.

The recently published report by the Pacific Climate Change Science Project (PCCSP) has evaluated 24 models from around the world and selected a subset of 18 of them to develop climate projections for the Cook Islands. Initial PCCSP findings generally align with that of NIWA.

The individual scenarios that follow summarise the NIWA findings. Since individual models give different results, the projections are presented as a range of values.

TEMPERATURE SCENARIOS

Table 5 shows the projected temperature change for the Southern Pacific.

Table 5: Projected increases in temperature (°C) for the Southern Pacific relative to 1961-1990.

Year	2010–2030	2040–2069	2070–2099
Temperature Change	0.45-0.82	0.8-1.79	0.99-3.11

The NIWA study published in 2009 assessed climate models under the different emission scenarios which returned an increase between 1.7 – 3.5 deg C for Tongareva (Penrhyn) and 1.4-3.1 deg C for Rarotonga.[16] Warming would therefore potentially be larger for the Northern group relative to the Southern group. More hot days and warm nights are expected overall, particularly in the Southern group.

RAINFALL SCENARIOS

Average annual, dry season and wet season rainfall across the Cook Islands is likely to increase over this century. NIWA projections for rainfall in the Southern group pointed towards an increase in precipitation especially during the wet season. However the model for Tongareva (Penrhyn) was uncertain with the median value close to a "no change" scenario. Particularly for the Southern Cooks average rainfall during the wet season is likely to increase over this century mainly due to the expected intensification of the South Pacific Convergence Zone. This is the findings of the recently published report by the Pacific Climate Change Science Programme (PCCSP). However, the model results are not consistent. Model projections show extreme rainfall days are likely to occur more often and be more intense. Under a high emissions scenario by 2090 a rainfall event that currently occurs once every 20 years will occur once every four years in the Northern Group and every five years in the Southern Group. Droughts are projected to increase by 2030, before declining throughout the rest of this century.

16 Baldi M, Mullan B, Salinger J, Hosking D, ***Module 3: The Cook Islands Climate – Variation and Change***, 2009, NIWA Client Report: AKL2009-032, Chapter 5 page 49.

SEA LEVEL RISE

With increased global warming, the rate of sea level rise is likely to accelerate. Observed data show that, globally, the rate of sea level rise has increased from 1.6mm/yr in the period 1961–2003 to 3.1mm/yr in the period 1993–2003. Since 1960, ocean thermal expansion and the melting of glaciers and ice caps are the largest contributors to sea level rise. As there is still much to learn about sea level, particularly how large ice sheets such as Antarctica and Greenland contribute to sea-level rise, scientists warn larger rises than currently predicted could be possible. Table 6 shows the projections by PCCSP based on the three emission scenarios. This means that sea level rise is currently tracking at or near the upper limit of the IPCC projections.

Temperature rise and sea level rise over the past 120 years; suggest a sea level rise of at least a metre by 2100. This is of great concern to the Cook Islands, where most habitation is less than a few metres above sea level. The sea-level rise combined with natural year-to-year changes will increase the impact of storm surges and coastal flooding.

Table 6: Sea-level rise projections for the Cook Islands for three emissions scenarios and three time periods.

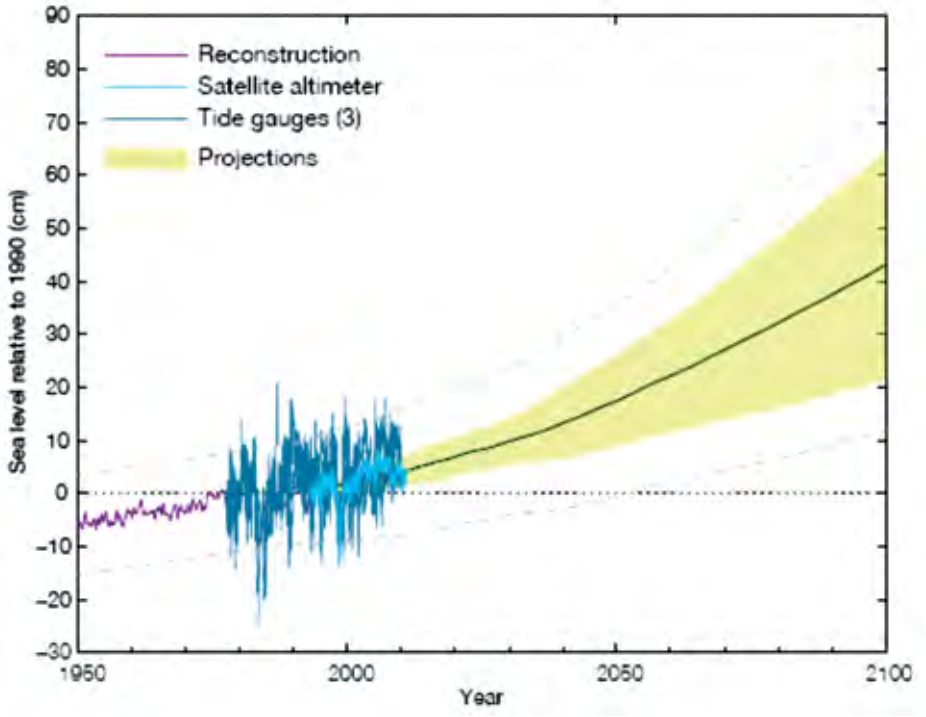
Values represent 90% of the range of the models.

	2030 (cm)	2055 (cm)	2090 (cm)
Low emissions scenario	5–15	10–26	17–45
Medium emissions scenario	5–15	10–30	19–56
High emissions scenario	4–15	10–29	19–58

The variation in sea level as well as projected changes can be seen in Figure 5[17] which includes the tide gauge record since 1977 and the satellite data since 1993 and shows that sea level is projected to continue to rise for the Cook Islands. The projections for the A1B (medium) emissions scenario (representing 90% of the range of models) are shown by the shaded green region from 1990 to 2100. The dashed lines are an estimate of 90% of the range of natural year to-year variability in sea level.

17 Findings by the Pacific Climate Change Science Programme (PCCSP)

Figure 5: Observed and projected relative sea-level change near the Cook Islands.



EXTREME EVENTS, FLOODS, DROUGHTS, TROPICAL CYCLONES STORM SURGE

There is growing evidence from a range of studies that the early impacts of climate change will result from an increase in the frequency, intensity and duration of extreme events such as tropical cyclones, floods, droughts and storm surges. Wind intensities could increase between 5-10% by 2050 and precipitation peaks could increase up to 25%.[18]

The scenarios for the Cook Islands show there is increasing risks from weather related and climate related hazards. The likelihood of occurrence (LO) in one year and the return periods (RP) expressed in years for observed (Table 7) and projected daily for Rarotonga shown in Table 8. Basically more extreme rainfall days are likely to occur more often.

Table 7: Return Periods (RP) (yr) and Likelihood of Occurrence (LO) in One Year for Daily Rainfall in Rarotonga[19]

Rainfall (mm) (at least)	Present (1970–2003)		2025		2050		2100	
	RP (years)	LO (years)	RP (years)	LO (years)	RP (years)	LO (years)	RP (years)	LO (years)
100	1	0.78	1	.81	1	0.83	1	0.87
150	3	0.34	3	.38	2	0.44	2	0.56
200	7	0.14	6	.16	5	0.20	3	0.31
250	18	0.06	13	.08	10	0.10	6	0.17
300	38	0.03	26	.04	19	0.05	11	0.09
350	76	0.01	47	.02	35	0.03	19	0.05
400	141	0.01	81	.01	59	0.02	31	0.03
450	248	0	130	.01	95	0.01	50	0.02
500	417	0	201	0	148	0.01	78	0.01

18 IPCC AR4, p788

19 Hay et al, 2005

Table 8: Return Periods (RP) (yr) and Likelihood of Occurrence (LO) in One Year, For Hourly Rainfall in Rarotonga[20]

Rainfall (mm) (at least)	Present		2025		2050		2100	
	RP (years)	LO (years)	RP (years)	LO (years)	RP (years)	LO (years)	RP (years)	LO (years)
25	1	0.93	1	0.92	1	0.93	1	0.93
50	3	0.29	3	0.36	3	0.39	2	0.45
75	18	0.05	12	0.08	8	0.12	6	0.18
100	91	0.01	57	0.02	25	0.04	13	0.08
125	384	0	246	0	67	0.01	25	0.04
150	N/A	N/A	980	0	159	0.01	46	0.02

Table 9: Return Periods for Tropical Cyclones[21]

Cyclone Category	Wind Speed (km/h)	Return Period (years)
1	≥119-153	5
2	≥154-177	8
3	≥178–209	21
4	≥210–249	294

On average there are 1.6 cyclones that occur annually in the Southern group. This value is higher in the Northern group whereby the maximum number of cyclones in one season is six. Table 9 shows the return periods for a tropical cyclone of a given category. Scenarios are still somewhat unclear on the effect of climate change on frequency of tropical cyclones, with some suggesting decreases and others showing increases in El Nino type conditions which have been associated with cyclone occurrence in the Cook Islands. However the projections point to a likely increase in the average maximum wind speed and intensity of rainfall of these storms.

Table 10 shows a systematic increase in upper ten percentile heights of open water waves associated with increase in intensity of tropical cyclones occurring in the vicinity of Rarotonga.

Table 10: Open Water Wave Height (Average of Top Ten Percent) Associated with Tropical Cyclones Recently Affecting Rarotonga

Cyclone (Name and Year)	Wave Height (m)
Charles (1978)	11
Sally (1987)	10
Val (1991)	14
Pam (1997)	14
Dovi (2003)	17
Heta (2004)	17
Meena (2005)	17
Nancy (2005)	22
Olaf (2005)	17
Percy (2005)	19

The indicated increases in sea level over the next century are driven by global and regional changes in mean sea level as a consequence of global warming (Table 11).

Over the Cook Islands region there is reasonable consistency in the NIWA analysis of projected increases in the prevailing southeast trade winds, particularly for the Southern group.

OCEAN ACIDIFICATION

Ocean acidification is one threat that needs to be looked at closely. About one quarter of the carbon dioxide emitted from human activities each year is absorbed by the oceans. As the extra carbon dioxide reacts with sea water it causes the ocean to become slightly more acidic. This impacts the growth of corals and organisms that construct their skeletons from carbonate minerals. These species are critical to the balance of tropical reef ecosystems. Data show that since the 18th century the level of ocean acidification has been slowly increasing in the Cook Islands' waters. The ongoing decrease in the pH of the Earth's oceans, caused by their uptake of anthropogenic carbon dioxide from the atmosphere will cause a lot of problems for the Cook Islands who depend on the sea or ocean for the livelihoods of the people and the country as a whole. The impact of increased acidification on the health of reef ecosystems is likely to be compounded by other stressors including coral bleaching, storm damage and fishing pressure.

SCIENCE & UNCERTAINTY

There are further threats affecting the Small Island Developing States like the Cook Islands and that is the uncertainty of the future of the islands and the wider world with regards to the economic, social as well as environmental factors. It is clear from the ranges of the scenarios and the areas of uncertainty stated that global projections made by these models can vary significantly around the world, and as a result actual sea level and local climate change the Cook Islands may experience could differ significantly. Work continues on refining climate projections for the Cook Islands, as well as for the Pacific Islands Region as a whole.

20 Hay et al, 2005

21 Air Worldwide Corporation, 2006

Table 11: Return Periods (yr) for Extreme High Sea Levels, Rarotonga[22]

Sea Level (m)	Present Day		2025		2050		2100	
	RP (years)	LO (years)	RP (years)	LO (years)	RP (years)	LO (years)	RP (years)	LO (years)
2	2	0.51	2	0.59	2	0.65	1	0.75
4	4	0.25	3	0.31	3	0.35	2	0.45
6	10	0.10	8	0.13	7	0.15	5	0.21
8	30	0.03	23	0.04	18	0.05	12	0.08
10	112	0.01	80	0.01	62	0.02	39	0.03
12	524	0	349	0	258	0	149	0.01

Squall moves over Pukapuka lagoon © NES

22 Ibid

Vulnerability & Adaptation

Coral micro-atoll exposed to climate impacts © NES

Coastal erosion,infrastructure at risk and protection efforts © NES

Addressing the vulnerability and increasing community resilience to climate change impacts upon the environmental and social and economic structures of the islands is a critical priority for the Cook Islands.

Although some uncertainties remain about the exact types and magnitude of shifts in climate parameters, such as rainfall, cyclonic events, tides, and storm surge outlined in the climate trends chapter, it is now highly likely that climate change will negatively affect many facets of the lives of Cook Islands people.

Improved understanding of the national and regional situation gained through work undertaken since the INC can enhance the Cook Islands' ability to utilise the precautionary approach in responding to climate change.

The reality is that with climate change, there is little that the Cook Islands as a Small Islands Developing States can do locally to change the magnitude of the problem. However significant adaptation investment is required to address the impacts and reduce vulnerability to the adverse impacts of climate change identified through national and island specific assessments both in and since the INC.

Building adaptive capacity has been identified as a key priority in the Pacific Island Framework for Action on Climate Change (PIFACC) and the National Sustainable Development Plan (NSDP) and the National Environment Strategic Action Framework (NESAF). During the preparation of the SNC, needs and strategies towards this priority have been developed through the Adaptation Technology Needs Assessment, the Mangos in July Institutional Strengthening and Functional Review, the Joint National Action Plan for Disaster Risk Management and Climate Change Adaptation (JNAP DRM CCA), as well as development of projects described in Annex 3 ,

Using a participatory community based approach adaptation measures across vulnerable sectors have already been identified, and increasingly are becoming more mainstreamed both domestically by the Government and Non-Government sectors and also in external development partners' activities in the Cook Islands. However, existing national development priorities and resource constraints have limited wide scale implementation of climate change adaptation to date.

The remainder of this section presents the island specific vulnerability and adaptation assessment methodology and then presents vulnerabilities and impacts findings followed by adaptation options drawn from work undertaken for the 2NC[23] in the following sectoral focal areas:

- Coastal Zones – Infrastructure and Coral Reefs
- Marine Resources and Fisheries.
- Water Supply and Quality.

23 Adaptation Technology Needs Assessment Adaptation 2009 (TNA-A), island specific vulnerability and adaptation assessments, the draft Joint National Action Plan for Disaster Risk Management and Climate Change Adaptation (JNAP DRM CCA), the National Capacity Self Assessment (NCSA) report, the National Environment Strategic Action Framework 2005–2009 (NESAF), the Asian Development Bank Climate Proofing reports and projects, the Food and Agriculture Organisation of the United Nations (FAO) Climate Change and Food Security in Pacific Island Countries report, the Disaster Risk Management National Action Plan 2008 (DRM-NAP).

- Agriculture, Food Security and Diet.
- Biodiversity (Terrestrial and Marine).
- Human Health and Wellbeing.
- Cross-cutting Socio-Economic Considerations

Most of these sectors were captured in the INC, however more focussed assessment in the Cook Islands context and emerging issues have been analysed since then.

VULNERABILITY AND ADAPTATION ASSESSMENT

Muri community group discussion on climate change vulnerabilities © NES

As a part of a comprehensive approach toward understanding and documenting its vulnerabilities to climate change, the Government along with a wide range of relevant and interested stakeholders, has begun to prepare island vulnerability assessments for each of the islands in the country.

The main rationale is to assess to what degree or extent is each island vulnerable to changing climate parameters, e.g. cyclonic events, and in that context what means may be available to increase island resilience and adapt to such changes. This information is used to inform sectoral and national policies and plans, as well as to enhance public understanding of climate change through localised information.

Steps typically taken to do the community vulnerability and adaptation assessments[24] working closely with the Cook Islands Red Cross (CIRC) and a Geographical Information Systems specialist are as follows:

- Identifying sites/islands to be assessed with the endorsement by the National Climate Change Country Team.
- NES organise a contact person from island or community of the selected site.
- The contact person identifies names to NES for potential facilitators to be trained to assist with the overall activity.
- Facilitator training of community members run by NES in collaboration with CIRC – teaching facilitation skills, mapping skills, problem and solution tree analysis, interviewing techniques.
- Conduct community meetings in the different villages lead by the contact facilitators with NES and CIRC support. To identify key risks or vulnerabilities and resources/solutions for those risks.
- Fieldwork visiting risk areas identified by the community from the community meetings.
- Survey of each household to assess asset value, current disaster preparedness & response needs, past disaster experiences and coping strategies, knowledge of surroundings and any observed changes.
- Issues from all village meetings as well as household surveys and GIS mapping of key features of the community including risks areas and resources are collated and ready to be presented back to the island/community.
- Climate Awareness presentations at school.
- Report back to the island/community on everything that was collected. Issues are presented back for the community to identify main concerns and prioritise solutions.
- Literature review of scientific and climate data/reports about the site as well as other relevant reports.
- Data entry and analysis of survey and fieldwork results using expert judgement.

Facilitator training for Red Cross volunteers, Pukapuka V&A Assessment © NES

To complete the vulnerability and adaptation assessments, the literature review and field work findings are combined with the results from the community meetings

24 Assessments were conducted for the village of Ngatangiia on Rarotonga, and the islands of Mauke Pukapuka and Nassau as part of the site specific assessments for the Second National Communication Project. Earlier assessments were also undertaken in Mangaia, Penryhn (Tongareva), and Aitutaki . Relevant work has also been done by stakeholders such as Emergency Management Cook Islands and Te Rito Enua

and surveys and put in a report format as well as being presented back to the communities and other stakeholders.

When considering vulnerability it is important to recall the effects of climate change will not occur in isolation from the effects of ongoing and future economic social and environmental changes. Population health and well-being is also contingent on maintaining a viable and sustainable environment to support development. These elements have been detailed in the National Circumstances Chapter and have also been considered in island specific and sectoral vulnerability and adaptation assessments.

Table 12 summarises potential areas of vulnerability to physical impacts of climate change in terms of four key parameters that are altered by climate change; temperature, rainfall variation, extreme weather events and sea level. Each of these areas of vulnerability are examined in more detail later on in the chapter.

Table 12: Summary of Climate Change Vulnerabilities

	Temperature Rise	Rainfall Variation	Extreme Weather events	Sea Level Rise
Coastal Zones Infrastructure and Coral Reefs	Coral bleaching	Runoff, sedimentation, salinity	Wave damage, erosion	Erosion, increased storm surge
Marine Resources / Fisheries	Pearl Diseases, food chain, migratory and distribution changes	Habitat, salinity	Damage to coastal infrastructure and vessels, stock loss,	Damage to coastal infrastructure, unsuitable growing conditions
Water Supply and Quality	Quantity, demand, quality, vectors	Shortages, blockages, contamination	Water pollution, infrastructure damage	Increased salinity of freshwater table
Agriculture, Food Security and Diet	Prevalence of invasive species, productivity	Drought, flooding, crop diseases	Damage to infrastructure and crops	Increased salinity of low lying growing areas
Biodiversity (Terrestrial & Marine)	Increased prevalence of invasive species, species distribution or migration	Increased prevalence of invasive species	Casualties, habitat, food loss	Degradation of habitat, breeding sites
Human Health and Wellbeing	Emergence of tropical diseases, heat stress, productivity impacts	Favourable mosquito breeding conditions	Injury during and increased disease risk following, stress & social disruption	Impact on coastal infrastructure, housing etc
Cross-cutting Socio-Economic. considerations	Key economic sector losses increasing poverty. Increasing energy demand (cooling). Particularly of concern for already vulnerable groups the disabled, youth, and women	Reduced tourism attractiveness, and economic losses from productive sectors, food insecurity, natural resources for handicrafts etc, lack Lack of insurance cover	Damages to critical infrastructure, relocation of people, pollution, disruption of education and social services, affecting already vulnerable groups like disabled, youth, and women	Loss of land, traditional livelihood and culture, social & gender implications, investment diverted

Wharf in Aitutaki, Cyclone Olaf 2005 © NES

Mangaia Harbour, PACC study site © PACC, MOIP

The coastal zone area is of critical importance to the Cook Islands. Any adverse climate change effect on this zone is likely to have the largest impact on the Cook Islands as a nation as this is the zone where most people live and work. It is also in this zone, where images of unspoilt, clean and white sand beaches and spectacular coastal scenery have been portrayed in overseas magazines to promote the country as a tourist destination and which is proving to be a major draw card for tourists.

COASTAL ZONES VULNERABILITIES AND IMPACTS

The coastal zone and coral reefs are vulnerable to increases in sea surface temperature, sea level rise, possible increases in extreme weather events, as well as emerging threats such as ocean acidification. These threats are further detailed in the Climate Trends chapter. The impacts of these threats will almost certainly include accelerated coastal erosion, saline intrusion into freshwater lenses, and increased flooding from the sea.

The coral reef supports fish populations and shellfish, which are very important in the diet of Cook Islanders. The coral reefs also provide protection of the shoreline from erosion and provide a breeding ground and habitat for marine species. Research efforts, including by the Cook Islands Marine Resources Institutional Strengthening Programme (CIMRIS), have been underway in parts of the Cook Islands since the INC, documenting the current coastal fisheries state, ecosystem services and pressures from coastal infrastructure such as septic run off.

The coral reefs are effected by increases in temperature; most notably this has been documented to lead to 'coral bleaching' as seen in past El Niño events. In these cases surface temperatures frequently exceed the temperature tolerance level of coral species (25°C – 29°C). It is likely that any significant increase in sea surface temperature in the future will result in more frequent and severe episodes of coral bleaching as well as possible disease outbreaks in the pearl culture industry.

Such stressed reef habitats provide opportunities for ciguatera dinoflagellate organisms to colonise the coral surfaces making the reef fish that feed on it poisonous for people and animals. Teina Rongo's PhD research, in press, indicates that between 1994 and 2010 annual incidence of ciguatera poisoning on Rarotonga ranged from 204to 1,058 cases per 10,000 population, per year. He also found correlations between the number of cases of poisoning and i) the positive phase of the Pacific Decadal Oscillation, ii) El Nino years, and periods with frequent disturbances. Coral death and bleaching also threatens marine biodiversity, reduces fish supplies for local communities, and diminish the attractiveness of reefs to tourists.

An 'irritant syndrome' occurred on Rarotonga between November 2003 and May 2004. During this event people on the southern side of the island complained of symptoms such as skin rashes, itchiness, sore throats, running noses, asthma attacks, shortness of breath and conjunctivitis-like symptoms such as redness and burning in the eyes. There was extensive testing and various possible explanations for this event., including suggestions that these symptoms were the result of a toxic dinoflagellate or algal bloom in the lagoon. High numbers of dinoflagellates and algal blooms have been correlated with high nutrient levels in the water that can occur as a result of runoff and poor land use practices, as well as high temperatures

As a consequence of ecological stress on lagoons, the CI Ministry of Marine Resources, with technical assistance from the New Zealand Institute of Water & Atmospheric Research Ltd (NIWA) implemented a water quality monitoring programme of streams and the lagoon to provide baseline data and to evaluate whether potentially toxic algae species were present in the Titikaveka lagoon area. The results of this study for the period December 2004 to April 2005 found that water quality of the streams was highly variable, with potentially toxic levels of ammoniacal nitrogen and the water quality measurements in the lagoon showed that at all sites some water quality parameters were at higher values than recommended for the healthy growth of coral reefs.

Three key wastewater management issues have been identified for the Cook Islands:

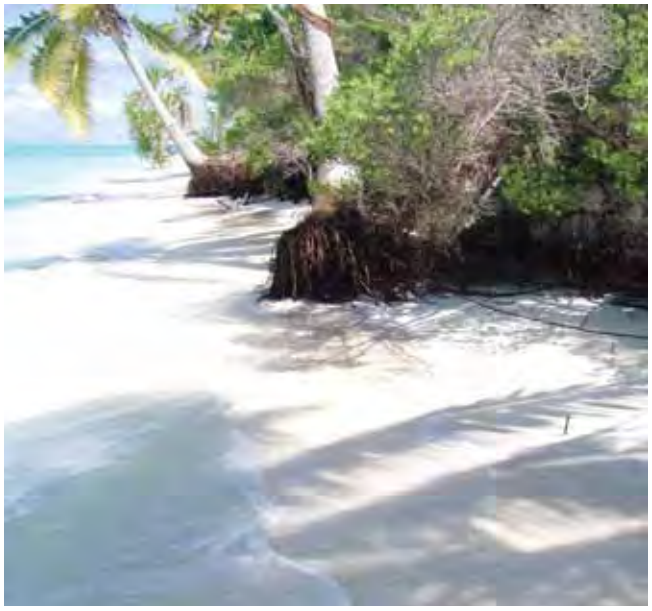
- Groundwater tables in most of the developed areas along the coast are extremely shallow; approximately

1 to 3 m below ground level for more than 60% of the populated areas;

- A significant amount of development has recently occurred within 50 m of the coastline; and
- Rainfall rates can be extremely high during storm periods resulting in saturated soil conditions and high runoff to the lagoon.

Limited work has been carried out tracing lagoon and surface stream contamination to septic tank soak pits, however it is generally accepted that current sanitation practices are substandard and require upgrading especially in the face of scenarios of increased extreme precipitation events[25].

While erosion is intuitively the most common response of island shorelines to sea level rise, it should be recognised that coasts are not passive systems. How they will respond to sea level rise is dependent on a range of factors, a large number of which are likely to be non climate change stresses and disturbances driven by human activities.

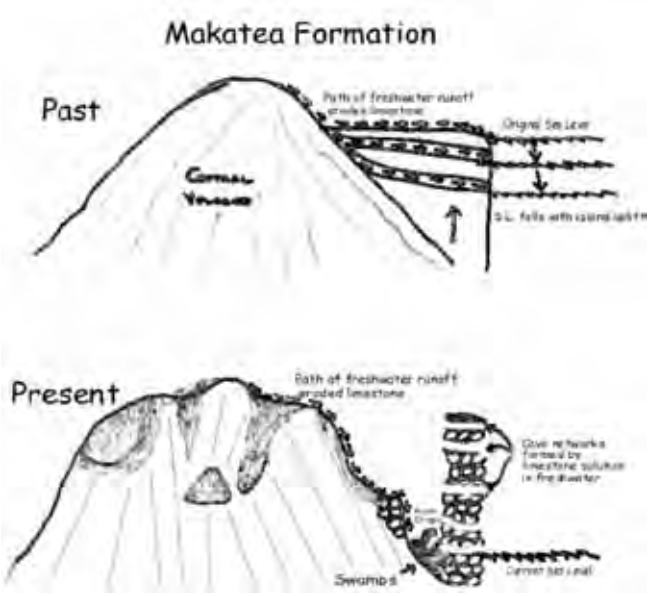


Coastal erosion on Aitutaki © Elizabeth Munro

Coastal erosion is already evident in many areas on Rarotonga and other islands. This can be directly linked to a decline in health of the reef system as well as activities such as removal of coastal vegetation, the blasting of reef channels and poorly constructed sea walls. Lack of an effective water drainage system is also contributing to erosion of land from surface water runoff, as was evidenced by the heavy rains experienced in the Southern group in mid 1999. In some areas of the coastal plain there are low lying areas behind the beach ridge which are prone to flooding from storm surge. In addition, there are areas of intensive infrastructure development with poor water drainage systems that are prone to flooding during rainstorms. These factors, in combination, make coastlines of Rarotonga and other islands increasingly sensitive to variations in sea level, and to storm events.

The shoreline of all the islands of the Cook Islands is very dynamic, and thus places high cost infrastructures such as tourist accommodation, roads and private dwellings that are concentrated and built along the coastal edges at risk. Over the four years to 2010, 31% of new developments on Rarotonga have been concentrated around the foreshore. One of the issues which make regulating such development difficult is the land ownership system in place in the Cook Islands. Land tenure in the Cook Islands is a customary system where many owners connected by family lineages share common ownership of land and outright sale of land, is not possible. Land determination and procedures are a combination of custom and judicial proceedings. On those islands that fall under the Cook Islands Land Court system, there is a procedure to obtain majority consent of all customary landowners in order to create a leasehold. Three of the Cook Islands remain under traditional land tenure – Mangaia and Mitiaro in the southern group and Pukapuka in the northern group. Land on these islands may not be alienated by lease, this means enforcement of the Environment Act 2003 is complex and does not yet apply to all islands but only on five islands including Rarotonga.[26]

The site specific vulnerability and adaptation assessments carried out by NES in partnership with Cook Islands Red Cross found that the different island types result in different coastal vulnerability profiles, however the high makatea islands are not as impervious to sea level rise as might be expected. Despite limestone cliffs separating the agricultural growing areas the sea storm surges and cyclones can still lead to salt-water intrusion into the low-lying swampy areas. Base line salinity levels still need to be established; however it is clear that any sea level increase is going to be an issue for the island of Mangaia and other makatea type islands.[27]



Formation of makatea islands like Mangaia © Anonymous

25 Dakers, A and J Evans, 2007. Wastewater management in Rarotonga: it is not just a matter of a technological fix? On-site 07, Armidale, NSW. 25–27 Sept. 2007. Proceedings: Innovation and Technology for On-site Systems. R.A.Patterson (Edit), Lanfax Laboratories, Armidale.

26 Government of the Cook Islands, Millennium Development Goals – National Report, 2005, p42

27 Carruthers P, and Apera E, Aitutaki ***Climate Change Vulnerability and Adaptation Assessment Report***, CBDAMPIC: Cook Islands, May 2000

The 2006 Asian Development Bank (ADB) Preventative Infrastructure Master Plan highlights the need for a long-term national climate change adaptation strategy and an integrated infrastructure development plan, which incorporates climate change adaptation concepts. Concerns raised since the INC about the exposure of the main commercial district of Avarua, Rarotonga have lead to the Government planning a detailed coastal adaptation needs assessment for this area. Funding from the Government of Australia has been secured to conduct this work in 2011/2012.

CASE STUDY: PACIFIC ADAPTATION TO CLIMATE CHANGE (PACC) COOK ISLANDS PILOT: MANGAIA HARBOUR

In the Cook Islands, the PACC initiative funded by GEF is focused on coastal zone management to increase resilience and reduce vulnerability to the adverse effects of climate change. This work highlights options for addressing concerns about the sustainability of national infrastructure, particularly in the Pa Enua where small communities have been vulnerable to intensifying and more frequent cyclonic weather in recent years. As a first step in the implementation process, a pilot project has been assessed and approved to strengthen the resilience of the Mangaia Harbour to increased levels of risk.

In 2005 Cyclone Meena caused extensive coastal damage to Mangaia, swamping the harbour and reaching inland where destruction and debris affected roads and airport area. The waves overtopped the Mangaia harbour reaching the base of the outer makatea cliff and dumped debris some 100 meters inland from the coast. This affected four and a half kilometres of protective coastline, the road which links the main village of Oneroa to the airport and Ivirua, and also damaged the Mangaia airport.

The initial aim of PACC-CI is to develop an improved understanding of potential coastal hazard areas, the risks, and types different adaptation options that might be suitable in different areas. It is about using evidence (data) on the climate change risks when making adaptation decisions for coastal infrastructure and development planning

As part of the CI-PACC project a geo-spatial survey was conducted that forecasts the climate change impacts on Mangaia in future. The pilot site includes Avarua harbour, the Airport and Oneroa Village where sea surge reached the main road during the 2005 cyclones, despite being some 100 metres from the shoreline.

The PACC team carried out transect (for spot height) and topographical survey of the shoreline of the pilot area (from the foreshore to the Makatea). They also deployed wave sensors in strategic positions: one over the reef, one close to the wave breakers, and one in centre of lagoon and another closer to the shoreline. The sensors collect data on wave dynamics, intensity of waves, currents and data analyzed to develop inundation (flooding) maps. Lagoon depth and over the reef were also recorded and all the data sent to NIWA to be collated and analysed.

This provides the Ministry of Infrastructure and Planning (MOIP) with the information upon which they can base their adaptation options for construction. Once a design has been formed that takes the geo-spatial survey into consideration, MOIP will begin construction in 2012 to ensure that the harbour in Mangaia has a strengthened resilience to the adverse affects of climate change.

PACC team consulting with the Mangaia island community © PACC, MOIP

PACC team conducting survey of lagoon in Mangaia © PACC, MOIP

PACC team, Mangaia Harbour © PACC, MOIP

COASTAL ZONES ADAPTATION

Future development for the Cook Islands especially with regards to infrastructure needs to incorporate "climate proofing" to build for future impacts of climate change. "Climate proofing" as defined for the Cook Islands means identifying risks to a development project, or any other specified natural or human asset, as a consequence of both current and future climate variability and extremes, and ensuring those risks are reduced to acceptable levels through long-lasting and environmentally sound, economically viable and socially acceptable changes implemented at one or more of the following stages in the project cycle: planning, design, construction, operation and decommissioning.[28] This is also known as the 'no regret' option. Building code and EIA procedures should reflect the adaptation options making the development cost-effective.

Climate proofing is not only for the physical infrastructure but also the plans and strategies of the community and up to the national sustainable development. In terms of coastal infrastructure two of the proposed adaptation options for climate change are moving buildings out of at risk zones and improve building standards within the zone itself. However with limited land area for building the first option is not practical, and the second option will require the designing of buildings that are able to with stand the expected risk level identified for the areas concerned. This requires the application of a combination of relevant regulations and building code and will likely require higher initial capital costs. In Rarotonga a number sea walls have been constructed on the shoreline to protect people's properties, and it has been reported that these structures do contribute to further erosion especially on unprotected shorelines adjacent to these sites. Thus any construction of coastal protection barriers should be carried out with input from coastal experts, as the net effect of a protection construction can cause further erosion and deterioration of coastal environment.

Coastal Protected Units (CPUs) have been used successfully to protect coastal properties. These CPUs were designed by a local company Coastal Environmental International Limited (CIEL) and has been used on a number of Cook Islands' government projects, and are well known to be an effective tool for coastal protection activities. The concrete structure basically allows wave energy to enter through levelled compartments which acts on the waves to dissipate its energy thus reducing the wave impact on the shoreline and rebuilding the beach through significant sand regeneration. Coastal Protection Energy Dissipater (COPED) have also been designed by CIELCIEL to diffuse the energy associated with hurricane force waves and to protect coastal zones, an example can be seen at the end of the airport runway in Rarotonga, funding for this project came from the Prime Minister's Office of the Cook Islands Government.

28 Hay et al, 2005

COPED device near the airport on Rarotonga © NES

For any general infrastructure project, it is possible to avoid most of the damage attributable to climate change, and to achieve this in a cost-effective manner. To do this, it is important to apply the appropriate climate change proofing initiatives at the design stage of a project.

The current environmental impact assessment (EIA) procedures which apply to any major development islands that the Environment Act 2003 is administered[29] including coastal development require revamping to include the need for all infrastructure projects to have climate proofing considerations in it, although these are already reflected to some degree. Cost effectiveness can be further enhanced if Climate proofing communities can also be cost effective if planning and regulatory measures take into account both current and future climate-related risks.[30] There is also a need to consider tools for risk management and transfer such as insurance.

The Asian Development Bank examined options for climate proofing the design of the Avatiu Harbour for the newly developed Western Basin in Rarotonga. The ADB CLIMAP project also looked at measures to protect the neighbouring communities of Ruatonga and Avatiu from cyclone damage.[31] Climate proofing the wharf consists of replacing the existing structure with one that is more resistant to wave forces. The new wharf is designed such that it can be raised along with the container yard in the future, should the extent of sea level rise require it.[32] This same harbour is currently undergoing further modification to take larger ships and subsequently will also be included in the PASAP Avarua-Avatiu Coastal Adaptation Needs Assessment.

An additional consideration when looking at the adaptation of coastal zones is the degree of natural or 'autonomous' adaptation which areas such as coral reefs

29 Islands under the Environment Act 2003 include Rarotonga, Aitutaki, Mauke, Mitiaro and Atiu.

30 Asian Development Bank, Climate Proofing: A Risk Based Approach to Adaptation: Summary for Policy and Decision Makers, 2005, p4

31 Asian Development Bank, Climate Change ADB Programs: Strengthening Mitigation and Adaptation in Asia and the Pacific, 2008, p24

32 ADB (2005), p7

may undergo. This is the system's natural adaptive response to changes in climate or even human activities. For example some corals have been shown to adapt to higher sea surface and air temperatures by hosting more temperature tolerant symbiotic algae. They can also grow upwards to respond to increases in sea level, provided there is space and they are not constrained by human activities.[33] Under ocean acidification models contained in the Bureau of Meteorology, Government of Australia reports released 2011. it is said after 50yrs the corals in the area with aragonite will still be there while others in the pacific have gone. There are parts of the Northern Cook Islands with aragonite deposits.

COASTAL ZONE, CORAL REEFS AND COASTAL INFRASTRUCTURE FUTURE ADAPTATION PROJECTS AND PROGRAMS

- Enforce the guidelines and building codes for the construction and operation of residential, tourism and industrial structures in the coastal area that incorporate climate change projections as to sea level rise, storm surge and cyclones.
- Where necessary, develop land use planning around the location of new buildings regulate all new investments in infrastructure, housing construction and agriculture outside hazard zones to minimise vulnerability, reduce repair costs and decrease disruption to economic activities. Involving the landowners in such planning exercises will endear them to the plans thus ensuring their long term success.[34] [35]
- GIS mapping and identification of areas which are vulnerable to flooding and storm surges along the lines of the 'Ridge to Reef' program on Mangaia and previous site specific assessment work in Rarotonga, Aitutaki, Mangaia, Mauke, Pukapuka, and Penrhyn (Tongareva) to be carried out throughout the Cook Islands.
- Develop a strategy for disaster response which can be based on GIS mapping of vulnerable areas and information on occupancy of buildings and the needs of residence.[36]
- Preparations and development of project proposals for funding for the design and construction of appropriate coastal protection systems from flooding and storm sea-surge damages e.g. for Avatiu and Avarua townships.[37]
- Promote coral replanting activities with the Ministry of Marine Resources
- Test preparedness of energy supply companies and other disaster response agencies to respond to a disaster events through regular drills based on worst case scenarios.
- Develop appropriate communications strategies to raise awareness regarding poor land management as a cause of soil degradation and erosion affecting the coastal zone including coral reefs.

33 Tompkins, E, Nicholson-Cole, S, Hurlston, A, Boyd, E, Hodge, G, Clarke, J, Gray, G, Trotz, N, Varlack, L, '***Surviving Climate Change in Small Islands: A guidebook***,' Tyndall Centre for Climate Change Research, School of Environmental Sciences, University of East Anglia, October 2005

34 FAO (2008), p225

35 Integration of Climate Change adaptation into national, NGO, civil society and private sector policies, programmes, and initiatives using appropriate tools, (for example use of EIAs, cost benefit analysis, vulnerability assessments) is listed as Climate Change Goal 2.1.1 in the Cook Island's NCSA, p31

36 Consultation – Emergency Response Management Team, 18 June 2010.

37 Government of the Cook Islands, ***National Environment Strategic Action Framework 2005–2009 (NESAF)***, Prepared by: Tuaere Tangianau, Upoko Solutions Ltd, December 2009, p44

Sundried tuna fillets, Rakahanga © MMR

Marine life – a source of food for Cook Islanders © Sabine Janneck

Cook Islanders have always relied on the sea as a major source of food. The marine resources sector is one of the nation's major exploitable natural resources. The Ministry of Marine Resources perceives marine life such as fish, crustacea and molluscs to be threatened by the long-term effects of climate change, in particular its impact on sea surface temperature, ocean circulation, acidification and sea level rise.

MARINE RESOURCES VULNERABILITIES AND IMPACTS

Continued increases in sea surface temperature lead to changes in the distribution and availability of fish stocks. ENSO events which have seen changes to sea surface temperature and salinity have lead to tuna changing their migration and distribution patterns. Though little has been documented from the local perspective, anticipated changes in sea surface temperatures lead to global changes in wind and ocean circulation patterns. The distribution and availability of nutrients for local migratory and non-migratory fish stocks are related to these patterns. When pelagic fish such as tuna and wahoo migrate by the island of Aitutaki, for example, the migration was once understood by fishermen based on the time of the year and the temperature of the water; however this traditional knowledge is becoming less valid as the oceanic climate shifts.[38] In addition, phytoplankton growth also affected by sea surface temperatures could result in disruption to the food webs in the open ocean. Recent changes in El Niño patterns have significantly affected Pacific tuna catch volumes, resulting in substantial reductions in seasonal tuna catches for many Pacific Island Countries.[39]

Since the 1980s, ciguatera outbreaks have been problematic in the Cook Islands and poisoning events appear to be linked to climate oscillations[40] .

The Cook Islands claims 2 million square kilometres of Exclusive Economic Zone (EEZ). The effect of changes to fish migration and distribution patterns can therefore have a huge impact on the resources available to Cook Islanders, with consequential economic and food security impacts. However shifts in migratory patterns towards the East may benefit the Cook Islands,[41] at least as long as the fisheries do not succumb to other pressures including disruptions in the food chain and overfishing.

There is no known immediate or long term vulnerability of pelagic fisheries due to sea level rise. However sea level rise which leads to coastal erosion will have an impact on marine organisms particularly the permanently attached sessile species. Also of concern is the impact rising sea levels would have on the fisheries infrastructure, docks and mariners, which are vulnerable. Extreme weather events such as cyclones can also damage fisheries infrastructure. This could be from fishing vessels smashing onto each other at berth and alongside the wharf, and the hatchery required for spawning purposes will be vulnerable from flying objects and fallen trees. Related to this is the need to increase supply of fresh fish to Rarotonga. A shortage of supply is already a common occurrence, which is troublesome to locals in terms of food security with fish being a key source of protein, and disappointing to tourists who have expectations of fresh seafood.[42]

38 Asian Development Bank, Climate Change Adaptation Program for the Pacific (CLIMAP), Cook Islands Climate Profile, Draft, February 2004, p12

39 Food and Agriculture Organisation of the United Nations (FAO), ***Climate Change and Food Security in Pacific Island Countries***, Rome, 2008, p203

40 Rongo and van Woesik, in press

41 Bell JD, Johnson JE and Hobday AJ (2011) ***Vulnerability of Tropical Pacific Fisheries and Aquaculture to Climate Change***. Secretariat of the Pacific Community, Noumea, New Caledonia.

42 FAO (2008), p199

LINKS BETWEEN HUMAN ACTIVITIES, CLIMATE VULNERABILITY AND NATURAL DISASTERS – THE RISE AND FALL OF THE PEARL INDUSTRY

Cook Islands Black Pearl
© Cook Islands Pearl Authority

Pearl farming has been one of the main export earners for the Cook Islands since the first black pearl oysters were farmed in the Manihiki Lagoon back in the 1980's. The industry grew steadily over the years and by 2000 there were about 80 to 85 farms in Manihiki, farming over 2 million oysters, with several farms in Rakahanga and Tongareva (Penrhyn). The three atolls form the production base for the industry, with around 90 to 95 per cent of production coming from Manihiki. The value of pearl exports also increased over the years and by 2000, pearl exports peaked earning a total of $18.4 million, making the industry one of the major contributors to GDP.

In late November 2000, the industry suffered a major setback with the outbreak of the Vibrio harvey bacterial disease, which devastated the main pearl producing farms in Manihiki atoll. A combination of climatic conditions, overstocking and inappropriate farm husbandry pushed the lagoon beyond its maximum sustainable capacity, leaving the naturally occurring bacteria to thrive. In addition, world market prices for black pearls tumbled in the same year, placing further pressure on an industry already in turmoil. Since then the industry has experienced a decline in production and plummeting pearl prices, which were further compounded by rising fuel and transportation costs, and loss of investor confidence, with farmers running loan debts, and some farmers leaving the industry.

Water temperature is one of the critical factors affecting pearl farming since water temperature affects oyster food dynamics, which in turn affect pearl oyster growth and hence pearl quality. Higher water temperatures are also likely to lead to greater incidence of disease amongst the pearl oysters. Increases in surface temperature are likely to have a negative effect on pearl farming.

The pearl industry is also vulnerable to extreme weather events, cyclone 'Martin' in 1997 damaged about 95% of the pearl industries land based infrastructure on Manihiki. The cyclone induced flooding also lead to increased pollution from land run off resulting in poor water quality – again impacting negatively on the pearl farmers.

The social and economic impact of this disaster has been severe. In the last six years, the value of Cook Islands pearl exports have been declining, dropping from an all time high of $18.4 million in 2000 to $1.6 million in 2005. Government has taken a number of initiatives to assist the industry – such as the development of a Manihiki Lagoon Management Plan and a Code of Conduct for pearl farmers, and in partnership with NZAID is investing significantly in marketing and management measures. Many of the impacts of climate change in terms of sea surface temperature increase and increased incidence of cyclones are going to require further adaptation strategies as the industry continues to struggle to recover to former levels of production and export value.

(Drawn from Situation and Outlook for Cook Islands Marine Resources 2006 and WWF Climate Change & Pearl Industry Brochure).

MARINE RESOURCES ADAPTATION

There is a large knowledge gap in terms of the impact of climate change on migratory fish throughout the Pacific. While it may be possible for Cook Islanders to adapt to changes in migratory patterns it will be necessary to first establish what (if any) the impacts of climate change will be on migratory fish species. Work in this area is currently underway with the regional agency SPC.

The implementation of monitoring and management plans for at risk species should be a priority. Currently the Ministry of Marine Resources is implementing a management plan for bonefish around the island of Aitutaki, as well as the pearl farm management and monitoring efforts. These include research and early detection activities[43] including monitoring lagoons for changes in temperature, salinity, turbidity and quality, as well as investigating the impacts of climate change on organisms that oysters feed on as limited data exists at this stage. This will detect periods of unsuitable lagoon conditions early, therefore will help to manage and reduce impacts on oysters and farmers.

The implementation of traditional marine social institutions, as exemplified in the *Ra'ui* in Rarotonga, is an effective conservation management tool and has been responsible for improving coral reef health and gives time for lagoon fish, molluscs and so forth to regenerate and having a healthy coastal system from the shore to the reef. The Ra'ui system is a community initiative whereby parts of the coast are protected through traditional ownership and management. This approach could become increasingly important in adapting to climate change as it also has positive impacts on biodiversity and tourism.[44]

Similarly sustainable commercial fishing practices are needed to allow fisheries already under multiple pressures to cope with the additional burden of climate change, along with climate proofing of the industry as a key productive sector.

43 Consultation, Ministry of Marine Resources, 23 June 2010

44 Stenhouse R, Elrick C. and Bond T (2008), p21

MARINE RESOURCES AND FISHERIES FUTURE ADAPTATION PROJECTS AND PROGRAMS

- Research programs into the effects of climate change on migratory fish throughout the pacific. This is currently being carried out by SPC. The results will need to inform future policy decisions around resource management within the EEZ.
- Continue to build monitoring projects for different fish species – such as commercial and recreational fisheries target species, reef health indicator species, and from this develop and implement management plans.
- Implement management plans and guidelines for the aquaculture sector to ensure they are not adding to lagoon pollution.
- Global monitoring program to identify the sources of pollution by persistent toxic substances so that action plans may be developed to eliminate or reduce the emissions from such sources.
- Increase the cool storage facilities on all islands bearing in mind the need for energy efficiency and avoiding pollution. The provision of adequate cooling facilities for the storage of fish catches and other commodities on the Pa Enua while awaiting shipment to the markets on Rarotonga.[45] While the cool store facilities on Rarotonga allow demand from tourists for seafood to be met. processing plants couldcould also be beneficial to allow exports of seafood to encourage sustainable harvesting.
- Implementation of sustainable fishing effort schemes, environmentally-friendly fishing operations, and diversified sources of fish for canneries.
- Pan-Pacific tuna management is required including immediate conservation management measures for big-eye tuna
- Best Practices to be applied including energy efficiency programmes for industrial tuna fleets and climate-proofing associated infrastructure, with safety at sea and gender-sensitive fish processing operations.
- Development of alternative economic industries related to marine resources, eco-tourism is one such suggestion, this could include the development of dive and snorkel attractions involving giant clams, fish and coral. [46] Once an economic value is assigned to resources in this way incentives exist to ensure their long term survival.

WATER RESOURCES

Flowing stream water, a sector that is vulnerable to climate change © NES

Rainwater catchment, Mauke © NES

Lack of water resources are often cited as the most crucial vulnerability of Pacific Islands to climate change. Measures to reduce water demand and promote water conservation are also especially important on small islands, it is also worth looking for new possible sources of water and working to fix infrastructure where deterioration has resulted in water leakage and wastage. According to the NIWA report, average precipitation as well as return periods of intense rainfall

45 FAO (2008), p229

46 Consultation, Ministry of Marine Resources, 23 June 2010

events is expected to increase for the Southern Cook Islands and there is less certainty about changes for the Northern Cook Islands. At the same time droughts may also increase for parts of the Cook Islands depending on the influence of climate change on cyclical oscillation patterns such as the Pacific Decadal Oscillation. While more is known now than when the INC was prepared, uncertainties remain.

WATER RESOURCES VULNERABILITIES AND IMPACTS

Water in the Cook Islands is currently sourced from stream catchments and individual roof catchment systems, underground bore holes and caves and from community water tanks. As a result the Cook Islands, in particular the Pa Enua remains highly dependent on rainfall. The collection of water from rainfall is at present not fully exploited, and thus not many houses have catchment facilities or storage tanks.[47] For this reason, the Cook Islands are highly vulnerable to changing weather patterns in particular drought.

The impact of climate change on water supply in the Cook Islands includes variability in rainfall and periodic droughts which can contribute to the lack of rain as available water in catchments. At the same time there are non-climatic factors such as an increasing population which can raise demand for safe drinking water, as well as the risk of water contamination through improper management of sewage and lack of proper waste disposal systems.

During El Nino periods the Southern group often experience lower rainfall levels, while higher rainfall is experienced in the Northern group. During La Nina, however, the North becomes more susceptible to dry periods, with rainfall becoming more plentiful in the Southern islands. The wet and dry cycles associated with ENSO episodes can have serious impacts on water supply and island economies. For instance the strong La Niña of 1998 to 2000 was responsible for acute water shortages in many islands in the Pacific Oceans. Such shortages have flow on effects right through the economy, and partial shut downs of the tourism industry is necessary in extreme cases.[48]

The water shortages during droughts can be further exacerbated by the lack of adequate infrastructure such as reservoirs and water distribution networks in most islands. In addition to this there is an increasing demand for water resources driven by increased tourist numbers. Related to the increasing tourist numbers are the sewage disposal issues particularly prevalent on the main islands of Aitutaki and Rarotonga. The problem here is that sewage can contaminate fresh water sources as well as lagoons and other food sources. While most households have septic tanks, such systems are not suitable for larger hotels. With the tourism industry still expanding, the need for construction of improved sewerage systems and sewerage treatment plants has become critical. On the atoll islands, there is concern that the advocated use of pour flush and pit toilets is causing pollution of the shallow water table, leading to high incidence of gastro-intestinal disease in the population.[49]

Periods of heavy rainfall can also cause problems to the water supply. Heavy downpours often cause flooding in the inland streams, which causes debris to be washed downstream and disturbs sediment at the bottom of the streams. During such periods of heavy rainfall it is not uncommon for households to find that their water turns a 'muddy brown' colour and incidences of gastric illnesses become more common, as the quality of water is compromised due to water pollution from soil erosion, herbicide and pesticide runoff and livestock waste.

Related to these problems during heavy rainfall are more general issues of watershed management. It is estimated that Rarotonga, the largest of the Cook Islands by area and population, could potentially avoid costs of NZ$7.4 million per year, or $2,900 per household per year, if watershed pollution across the entire island was prevented.[50] The most significant cost impacts are through lost tourism income, bottled water purchases and healthcare costs from illnesses related to water quality.

Salt water intrusion is another water-related vulnerability. On some smaller atoll islands there is concern that groundwater lenses may shrink or even disappear with a 45cm increase in sea levels,[51] this has also been identified as a potential problem on Aitutaki.[52]

The existence of freshwater lenses is absolutely critical for both sustaining human habitation and ecosystem maintenance on atoll islands. Yet the freshwater lenses are very vulnerable to extreme weather events such as storm surge. A storm surge is a temporary rise in sea level that often accompanies tropical cyclones. A study of the effects of a storm surge following the category 5, Cyclone Percy that hit Pukapuka in 2005 showed how fresh food supplies on the island were wiped out by saltwater incursion into the taro swamps, while many rainwater tanks lost their roof catchments and the few freshwater wells in existence were polluted by seawater, with consequent risks to public health. Coconuts could not be used as an emergency measure as most had been torn from trees and lay rotting on the ground. The combined effect of these vulnerabilities left the island with no fresh water source until aid arrived. The study tracked the recovery of the freshwater lens on the Island and found it took 11 months to recover.[53]

47 Stenhouse R, Elrick C. and Bond T (2008), p15

48 IPCC Fourth Assessment Report, Chapter 16

49 Asian Development Bank, Climate Change Adaptation Program for the Pacific (CLIMAP), Cook Islands Climate Profile, Draft, February 2004, p10

50 Hajkowicz SA, Okotai P. 2005. An Economic Valuation of Watershed Management in Rarotonga, the Cook Islands. CSIRO Sustainable Ecosystems, Brisbane, Australia

51 McMichael et al (2002), p103

52 Carruthers P, and Apera E, Aitutaki ***Climate Change Vulnerability and Adaptation Assessment Report***, CBDAMPIC: Cook Islands, May 2000.

53 Terry, James & Falkland, Anthony, '***Responses of atoll freshwater lenses to storm-surge overwash in the Northern Cook Islands***,' Hydrogeology Journal, Published Online: Journal 27 November 2009, p4

Although community access to safe drinking water improved after 1991 in the Pa Enua, there is still disparity between Rarotonga and the Pa Enua in access to quality source of water. About 35% of population in the Northern Group islands carry or cart water to their houses from bore wells or public water tanks.[54]

WATER RESOURCES ADAPTATION

On the island of Rarotonga the Water Works Division under the MOIP is responsible for the maintenance of water intakes and the safeguarding of water catchment areas. The Ministry of Health is also involved in the Water Sector, regarding drinking water quality, as is the Ministry of Marine Resources and the National Environment Service, who carry out water quality testing every month.

Climate change adaptation measures are already being planned and in some cases implemented in the water sector. At a policy level the National Water Policy, drafted by the Planning and Policy Division of the Prime Minister's Office in 2008, includes consideration of extreme events.[55] The Water and Sanitation Unit is currently developing a Water Safety Plan, and participating in regional programmes such as Water Demand Management, as part of institutional strengthening.[56]

The Ministry of Infrastructure Planning and the Planning and Policy Division of the Office of the Prime Minister have conducted a stakeholder driven 'Integrated Water Resource Management' approach (IWRM) during 2008. It is hoped that this approach will lead to greater co-ordination among Island Administrations and the relevant Government Departments to bring about sustainable management of water catchment areas on all islands.

Through the Pacific Water Safety Plan Programme a joint initiative of the SOPAC and the WHO a collection of government agencies will be implementing a Water Safety Plan with the aim to minimise contamination of water sources, prevent or remove contamination during storage and distribution.[57]

CASE STUDY: ADAPTATION OF WATER RESOURCES ON AITUTAKI – CIDA CBDAMPIC PILOT PROJECT (2002–2005)

Capacity Building for Development of Adaptation Measures in Pacific Island Countries (CIDA CBDAMPIC) project was to improve the ability of Pacific Islanders to understand and cope with effects of climate change and sea level rise.

V&A studies conducted on Aitutaki found access to drinking water was the main concern for the people. Increasing climate variability has already led to shifting rainfall patterns which in turn is affecting recharge of ground water. In addition salt-water intrusion into water galleries as a result of anticipated climate change impacts and sea level rise is seen to be inevitable.

In consultations on adaptation measures household water tanks were identified as the priority recommended solution to address the problem of drinking water in Aitutaki.

Household water tanks allowed for a focus on rainwater collection. In addition the CBDAMPIC team worked on groundwater data collection, demand management and water quality improvements as complementary measures of the pilot project.

Water tanks and related equipment were facilitated for households in need of improved drinking water catchment, storage and quality. This was done by way of a 50% subsidy to qualifying households.

The data on the water supply and storage systems can now be used to model scenarios of the impacts of climate variability and change on water resources, while local planning and policies can better reflect the water situation on the island and demand management measures can be put in place. The data and lessons learnt in the pilot were applied to the recovery exercise following cyclone Pat devastating Aitutaki in February 2010. A similar participatory approach is also being used for the Northern Water Project funded through NZAID.

CIDA CBDAMPIC, Pilot Project Implementation Document, April 2004.

Water tanks purchased for the CBDAMPIC project © NES

54 Stenhouse R, Elrick C. and Bond T (2008), p15

55 Stenhouse R, Elrick C. and Bond T (2008), p16

56 Stenhouse R, Elrick C. and Bond T (2008), p16

57 Government of the Cook Islands, Water Safety Plan Programme: Draft National Plan, August 2009

WATER RESOURCES FUTURE ADAPTATION PROJECTS AND PROGRAMS

- Introduce and enforce building requirements for water tanks and rainwater collection systems for all new buildings.
- Put programs in place to increase the number of household water tanks and ensure water tank maintenance.
- The CI IWP Economic Valuation Report into Watershed management makes the following key recommendations:[58]
- Use of alternative policy instruments (such as tax subsidies, incentive payments, competitive tendering for watershed improvement, awareness schemes) for achieving required improvements in watershed management. The instruments used must suit the Cook Island's requirements.[59]. :
- Assessment and implementation of on-ground watershed management actions. These include improved septic tank systems, fencing of riparian areas to restrict livestock access, improved or restricted fertiliser and pesticide application practices, installing storm water filtering devices and improved building practices to prevent erosion during construction.
- Regular water quality testing and publication of results.
- Implementation of further filtration technology.[60]
- Replanting of trees for soil stabilization around water catchments areas and hills.
- Watershed management, including the proposal by traditional leaders to protect the cloud forest of Rarotonga in partnership with landowners. Develop a conservation area in the centre of Rarotonga in partnership with landowners, encompassing permitted activities and a moratorium on development at higher altitudes to protect watersheds , as proposed by the Koutu Nui traditional leaders forum.
- Continuing studies into underground water resources, monitoring salt water intrusion and looking for additional sources.

AGRICULTURE, FOOD SECURITY AND DIET

Staple crop, wetland Taro (*Colocasia esculenta*) © NES

A drip irrigation system on Rarotonga © NES

The INC identified an abundance of fish and good soil, and no major difficulties with availability of food in the Cook Islands, with the exception of some atolls where there have been shortages. However the agricultural sector is highly vulnerable to climate change and will be negatively influenced by cyclones (which cause crop and tree damage), floods (which destroys vegetables and cause root crops to rot, and waterlog soils), droughts (which reduce or stop crop growth) as well as temperature increases (which can affect crop growth and heat stress on animals) and sea level rise (which

58 Hajkowicz SA, Okotai P. 2005. ***An Economic Valuation of Watershed Management in Rarotonga, the Cook Islands***. CSIRO Sustainable Ecosystems, Brisbane, Australia

59 Hajkowicz SA, Okotai P. 2005. ***An Economic Valuation of Watershed Management in Rarotonga, the Cook Islands***. CSIRO Sustainable Ecosystems, Brisbane, Australia

60 Govt. CI (2009), Water Safety Plan Programme, Goal 15, p15

contributes to salination of water lens's and storm surge damage).61 Development (on good agriculture land due to land ownership system) and social-economic factors have reduced food productivity.

AGRICULTURE VULNERABILITIES AND IMPACTS

Variations in rainfall patterns can have a significant effect on the yield and the life of agricultural crops and in particular the main export crops of the Cook Islands, pawpaw and taro. Agriculture in the Cook Islands has suffered frequently from the effects of droughts while farmers have also observed changes in the timing of harvesting. Many attribute this to changes in the climate, and in particular reductions in rainfall.[62]

These are the areas in which highly valued root crops are grown, increased salinity levels in this land means crops will not grow. Moreover, a reduction in the size of the island, resulting from land loss accompanying sea level rise, is likely to reduce the thickness of the freshwater lens on atolls by as much as 29%. This can have a drastic effect on taro plantations.

Sea level rise can also threaten agriculture in the Cook Islands due to increased flooding and coastal erosion; this already creates major problems to agricultural activities particularly for atoll islands in the Northern Cook Islands, reducing the already limited land available on these islands. Storm surges have a greater impact on atoll islands as a result of rising sea levels for example, cyclone Percy in 2005 destroyed entire taro plantation areas on Pukapuka. They were completely inundated by salt water as the result of a storm surge. It took three years before taro could again be reintroduced to the island.[63]

Increases in air temperature and other climatic changes can also lead to increased incidence of pests and disease which are likely to threaten agriculture. These climatic changes can also cause suitable temperature for pests ton increase abundantly. An example of this is the potato white fly which has become a concern in the Cook Islands most likely as a result of periods of wetter conditions.[64]

Issues such as reduced food security, a less nutritional diet and an increased reliance on imported foodstuffs tend to be associated with lifestyle diseases.[65]

AGRICULTURE ADAPTATION

The Cook Islands are already engaged in the 'Sustainable Agriculture Development in the Pacific' program which will assist agricultural adaptation to climate change. The Ministry of Agriculture also conducts research into finding new varieties of fruit and vegetables and diseases resistant varieties which will grow in the Pacific. Traditional methods of crop rotation and composting using banana mulch are also being encouraged as adaptation methods.

Over the years people have already adapted to extreme weather events by planting low lying crops, not planting close to streams or the ocean and not planting crops that must be planted or fruit during the cyclone season.

Adaptive farming practices and biological agriculture have been actively encouraged by the Ministry of Agriculture over recent years. Practices such as mulching help improve water retention in soils, while drip irrigation systems which are now widespread on Rarotonga help to both to control weeds and conserve water.[66]

Hydroponic agriculture is also used in the Pa Enua to supply fresh fruits and vegetables to islands with poor soils. However other traditional methods are also being used to ensure food security on the Pa Enua. A project which aims to encourage the growing of bananas on Atoll Islands in the Northern Cook Islands as a way of overcoming the high current global food prices and improving local village community's food security is currently in the planning stages. The project is to be funded by the FAO and conducted by the Ministry of Agriculture, sees the adoption of a traditional planting technique which allows bananas and other fruit trees and crops to be grown on sandy atoll islands through environmentally stable soil building and management techniques. The project also uses disease resistant varieties of banana. The project began April 2010 and is due to be completed by February 2012.[67]

The Ministry of Agriculture and FAO are currently implementing a project to map soil suitability for specific agricultural crops in the Southern group. These maps will enable growers to identify which crops are suitable to grow on their pieces of land and would not require as much additional effort e.g. labour and fertilizer, to flourish. These maps will be distributed for use in the Southern group however climate change impacts such as salt water intrusion/soil salinisation, will affect the validity of these maps.

61 McMichael A, Woodruff R, Whetton P, Hennessy K, Nicholls N, Hales S, Woodward A, Kjellstrom T, '***Human Health and Climate in Oceania – A Risk Assessment***' www.health.gov.au/pubhlth/strateg/envhlth/climate/ 2002

62 FAO (2008), p209

63 FAO (2008), p209

64 FAO (2008), p209

65 Country Survey on Health and Climate Change

66 Consultation – Ministry of Agriculture, 21 June 2010.

67 FAO Technical Cooperation Programme, 'Assistance to Small Scale Atoll farmers in the cultivation of disease free bananas for food security in the Northern Cook Islands,' 2010

AGRICULTURE, FOOD SECURITY AND DIET FUTURE ADAPTATION PROJECTS AND PROGRAMS

- Continue involvement with SPC programs to conduct regional research into developing species of crops which are resistant to changing climates and more suited to withstand higher levels of salinity. Also encourage the use of the SPC gene bank to aid in recovery of agriculture following extreme weather events.
- Continue to encourage household agriculture for food security in Pa Enua. This is an aim of the National Sustainable Development Plan "the government will continue to concentrate on developing niche markets for viable crops and commodities for domestic use, import substitution, and/or export, as well as strengthen biosecurity policies and control structures". The development of such a market will be crucial to reinvigorating the agriculture sector in the Cook Islands.[68]
- Encourage investment by the private sector in the processing of fruit crops into other marketable commodities such as juice and jams that have longer shelf-life and are easier and lighter to transport.[69]
- Resilience to droughts may be supported by improvements in existing rain fed farming systems like improved water-harvesting systems and irrigation. This is currently being explored in a project being coordinated by MOIP looking at drought proofing Ruaau and Arorangi areas by drilling bore holes to explore possible water sources during droughts.[70]
- Market and economic adaptations such as investigating grain future markets, the role of food price subsidies, cash transfers and school feeding schemes.
- Improve research and understanding of subsistence root crops. There is currently limited understanding of the productivity, growth requirements and pathogens of the Cook Islands main subsistence crops.[71]
- Promote to growers, especially commercial growers, the concepts of biological agriculture, the incorporation of sustainable agricultural practises and the planting of crops based on soil suitability and local conditions, in order to minimize greenhouse gas emissions from the degradation of land by agriculture.
- Remediation of known contaminated sites and improved regulations for life-cycle management of imported products that become hazardous waste at end-of-life, including government procurement policy to purchase "green" products with extended producer responsibility, and re-export of hazardous waste under the Basel Convention for environmentally sound disposal.

BIODIVERSITY (TERRESTRIAL & MARINE)

Polynesian chestnut *(Inocarpus fagifer)* I'i
© Gerald McCormack

Mangaia Kingfisher (*Todiramphus rufficollaris*)
Tanga'eo © Gerald McCormack

The Cook Islands still retain a number of unique endemic and rare flora and fauna. National biodiversity has come under significant pressure in terms of economic development initiatives, such as growth in the tourism sector and increased demand on water and environmental services. With increased pressure also from a changing and variable climate, biodiversity will become more vulnerable and suffer higher mortalities.

68 Government of the Cook Islands, National Sustainable Development Plan (NSDP): Living the Cook Islands Vision – A 2020 Challenge (2007- 2010), January 2006.

69 FAO (2008), p182

70 Consultation, MOIP, 21 June 2010

71 FAO (2008), p224

BIODIVERSITY VULNERABILITIES AND IMPACTS

Suwarrow atoll in the Northern group and Takutea Island in the Southern group has two of the most vulnerable bird colonies in the Cook Islands. No comprehensive study exists to assess the potential impact of climate change on the ecology of bird colonies, although references have been made in two surveys undertaken by R. Jones in Suwarrow from 2000–2007.

One of the major concerns in terms of biodiversity is the risk of invasive species which may become established in areas not previously known, or there population have grown to a level where eradication or even management is either impossible or well beyond our means. Invasive plant species become more of a problem as a result of differing forms of deforestation both by human activities and naturally, because they can colonise areas quickly, such as the balloon vine (*Cardiospermum grandis*) which have rapidly dispersed and established themselves on forest margins or clearings. Indigenous species colonise the same areas but at a slower rate, or sometimes are overwhelmed by the introduced plants.

Fire could potentially be an impact under climate change, when the Cook Islands had periods of low rainfall in 2011 areas of the island were burnt from fire, and most of Maunga Pu in Aitutaki, was burnt as a result of dry conditions and little available water. There was also a major fire in Mitiaro.

Although we do not have reports on hand species (including birds, turtles, and others) migration could be affected by climate change.

BIODIVERISITY ADAPTATION

The National Biodiversity Strategy Action Plan (NBSAP) programme has conducted a data collation project on invasive species on the islands of Rarotonga, Mitiaro, Mauke, Atiu and Aitutaki, as well as completed reports on Protected Areas, Traditional Herbal Medicine (*vairakau maori*) and a report on the atoll of Suwarrow as well as the baseline survey Manuae reef and a Manuae resource management plan.

The Natural Heritage Trust has been recording and integrating scientific and traditional knowledge on the Cook Islands flora and fauna into an impressive database recording of 3,700 species.

BIODIVERSITY (TERRESTRIAL AND MARINE) FUTURE ADAPTATION PROJECTS AND PROGRAMS

- Analysis and research building on the Natural Heritage Trust inventory to allow modelling of climate change effects on populations over time.
- Endangered Species Management: Develop surveys and plans for the conservation of rare native animals and plants,[72] including the transfer of some species among islands, such as the Kakerori which was transferred from Rarotonga to Atiu.
- Invasive Species Management:
  - Develop a programme involving all islands to survey invasive species in natural ecosystems and in the agro-ecosystem
  - Develop a community-based programme to eradicate those invasive weeds and animal pests that are not yet widespread on particular islands.
  - Develop national programmes to assist with the control of the more serious invasive weeds and animal pests in both natural and man-modified ecosystems.
- In close consultation, prepare Community Based Protected Area Plans and Strategies in order to ensure local level involvement and decision making of biodiversity resource use and conservation.

HUMAN HEALTH

On a general level the concern in relation to human health is that a changing climate can provide an environment that is more suitable for some diseases, including those borne by mosquitoes and those which require higher temperatures to survive. In the past there has been a strong link between the incidence of ENSO events and dengue fever outbreaks in the South Pacific island states.[73] In addition, extreme weather events present an increased risk of physical injury and death to the population.

HUMAN HEALTH VULNERABILITIES AND IMPACTS

High temperatures put vulnerable groups such as young children and older people at risk of heat stroke and death. Heat stress to humans as well as plants result in a loss in productivity. The incidence of bacterial and fungal skin infections can also be expected to increase.

Higher temperatures and precipitation associated with climate change are likely to lead to an increase in the incidence of water borne disease across a wider spectrum of society as water sources become polluted following flooding. It has been suggested the negative impact of climate change on freshwater quality and quantity is the most critical threat to Pacific Island health and welfare.[74]

72 Govt. CI (2009) NESAF, p22

73 McMichael et al (2002)

74 McMichael et al (2002)

Local doctors are also aware that climate changes could lead to certain tropical diseases re-emerging as threats. The El Niño phenomenon has raised awareness in the Cook Island's community of the potential effect of extreme weather variability on health and disease transmissions. El Niño has been linked to cyclic outbreaks of transmission of dengue fever, malaria, cholera and of other emerging infectious diseases as well as vector-borne diseases. There is also inconclusive information on the cause of algal blooms in the lagoons.

There is also growing concern about the adverse effects of climate change on human health in remote islands due to potential changes in disease vectors such as mosquitoes, water-quality, and the ability to respond to climate related ills like heat stress, seasonal influenza and respiratory infections.

HUMAN HEALTH ADAPTATION

Regardless of the outcomes of the climate models, this sector must have no-regret measures in place. Improved early warning systems for extreme weather events such as cyclones, floods and droughts may reduce vulnerability to future risks associated with climate variability and change. The Technology Needs Assessment for Adaptation (TNA – A) report points out that there are already a number of actions in place which will assist the health sector adapt to the effects of climate change. The 2004 Public Health Act for example contains regulations for sewage treatment to reduce nutrient flow from septic tanks into groundwater supplies or lagoons. One of the major problems facing such initiatives is a lack of funding for enforcement, and for upgrading facilities to meet the regulations. Currently for example it is too expensive to send Ministry of Health compliance officers to the Pa Enua to conduct building inspections.

The TNA Adaptation report also identified information gaps in terms of recent information on lifestyle disease, vector borne disease and water borne disease in relation to climate change. It also suggested that monitoring of mosquito density and dengue fever outbreaks (while present) was limited due to resource constraints. However the 'Tutaka Notice' program conducted by the Ministry of Health in partnership with NES and Police is an example of a current adaptation program aimed at reducing mosquito breeding sites and ensuring septic tanks are working correctly.

Public Health Department is surveying a total of 100 properties, most residential, as part of the CIMRIS study funded by New Zealand Aid Programme to help government subsidise the cost of rebuilding and upgrading old septic tanks to comply with new regulations. Preliminary results have found around 90 per cent of the septic systems in a recent survey of the first 50 random properties from Tupapa to Vaimaanga are not working properly.[75] The systems are either broken, leaking or just not working properly. With the increase in rainfall expected with climate change, sewerage from these septic tanks can easily be washed downstream into the lagoon and even into the underground water supply[76].

75 Cook Islands News, (30.10.2010) "Septic systems fail inspection".

76 Dakkers A, and Evans J, 2007

As one of the most critical threats to human health in the Cook Islands relates to freshwater quality and quantity many of the adaptation measures discussed above in relation to water are also relevant here.

HUMAN HEALTH FUTURE ADAPTATION PROJECTS AND PROGRAMS

- Education programs on household water treatment options (filtration, boiling water) for times when water quality is low (as determined by regular testing). Provide training for food storage and processing techniques to improve food security, livelihood of family household isolated from the availability of food products.[77]
- In partnership with Ministry of Agriculture, continue promoting locally grown produce – production and consumption78 (please refer to Agriculture table)
- Ongoing monitoring of vectors to be done quarterly especially if vectors become resistant by all means.
- Continue the testing of the quality of the drinking water using WHO standards quarterly.
- Notifiable conditions are checked regularly on a weekly basis and action will be and is taken to manage any outbreaks.
- School inspections especially after heavy rain and flooding to monitor the school septic tanks. There is bound to be an overflow of sewerage. Increase in rain due future climate change may also increase flooding.
- School heath survey of all students at all levels done every 3 years looking at all health related aspects of the children and if the change in climate might have an influence on children's health.

Healthy and happy Cook Islands children © NES

77 Govt. CI (2009) NCSA, p34

78 Consultation with Public Health – Karen Tairea, Tata Vaeau, Fran Mc Grath – Nov 3rd 2010

CROSS CUTTING SOCIO ECONOMIC CONSIDERATIONS

There are a number of direct and indirect potential adverse effects related to temperature rise, rainfall variation, extreme weather events, and sea level rise that may not be captured within a purely sectoral analysis of climate change vulnerability and adaptation. These are highlighted in Table 12 and elaborated below. These issues and sometimes possible solutions or adaptation options for them were touched on in various fora and the assessments conducted through the 2NC project, however more in depth consideration will need to be given to the cross cutting socio-economic aspects in future.

Overall development of the Cook Islands also determines how climate change will impact the country and its communities. Linkages between climate change and development are increasingly recognised as resulting from anthropogenic greenhouse gas emissions driven by development patterns characterised by economic growth, technology, population and governance. These socio-economic development patterns, in turn, determine vulnerability to climate change and the human capacity for greenhouse gas mitigation and for adaptation to climate change. The impacts of climate change on human and natural systems in turn influence development patterns.[79]

The economy of the Cook Islands is characterised by a very large number of imports and proportionally a very small number of exports. Tourism is the major industry of the Cook Islands with the current annual average of 100,000 visitors. The pearl industry of the Northern Group was the second major industry increasing since between 1985[80]–2008[81], however it has been superseded by the financial services industry, and may soon be replaced as the key productive sector by fisheries.

Holistic consideration of how land and economic losses, food and water insecurity, investment traditional livelihood and culture, social & gender implications, across all sectors as a result of climate change would affect the viability of the country and what overall adaptation there may be has yet to be undertaken.

CROSS CUTTING VULNERABILITIES AND IMPACTS

Experience from a number of Pacific island countries and elsewhere show that women and their families and communities are undergoing increasing hardships in their daily lives as a result of climate change impacts on agriculture, land availability, water resources, fishing, and other sectors. Climate change and associated natural disasters, such as floods, droughts, cyclones and storms, affect women differently from men, and often more severely. This is largely because men and women are bound by distinct roles and responsibilities that give rise to differences in both vulnerability and the ability to cope with these consequences of climate change, including disasters. As a result, vulnerable groups such as women are likely to be faced with problems such as food insecurity, loss of livelihood, hardships due to environmental degradation that lead to displacement

Recognising the physical impacts will have in increased vulnerability on a gender basis is an important consideration. Women of the Pa Enua rely on natural resources to either supplement or as the main source of income for their households. e.g. the maire[82] in Mauke, Mitiaro and Mangaia, the Rito (young coconut fronds used in handcrafts) of the Northern group and the pupu (shells[83]). There is little research on the impacts of climate change to these natural resources. Women of Mangaia have reported a decrease in the number of pupu (in the peak season – anecdotal evidence) which leads to a reduction in the amount of necklace eis they sell which affects their income level. The diseases that affect coconut fronds (which also have an impact on food security) will also reduce the amount of handicrafts that can assist in basic economic needs of households. The maire export business in Mauke provides the main source of income for female headed households and also the economy of Mauke – any negative changes that impact on the growth and supply of this plant will only provide the impetus for outmigration to seek economic opportunities either on Rarotonga and overseas.

Mangaia mama with ei pupu
© Elizabeth Munro

Possible gender differentiated impacts on household food security relate to the different roles women and men play in the daily livelihood of their families and their use of natural resources and provisions of food for the family.

COMMUNITY WELLBEING

Key climate related hazards affecting the Cook Islands are cyclones, storm surges, floods and droughts. The Cook Islands lies within the "cyclone belt" and their vulnerability to cyclones was emphasised in 2005 when the country was hit by five consecutive cyclones

79 Hay et al, 2005

80 Rongo, Teariki and Rongo, Julia, Cook Islands National Report: United Nations Convention to Combat Desertification (land Degradation), Island Friends Ltd environmental consultants, p 37

81 Rongo, Teariki and Rongo, Julia, Cook Islands National Report: United Nations Convention to Combat Desertification (land Degradation), Island Friends Ltd environmental consultants, p 37

82 Alixia shrub Leaves and bark made into fragrant garlands. Exported from Ma'uke to Hawai'I since the mid-1980s (McCormack & Kunzle 1995).

83 Locally endangered land snail collected after rain on the makatea islands to make shell necklaces

in just four weeks causing damage estimated at NZ$20 million. Prior to this cyclone Sally extensively damaged Rarotonga in January 1997 and in November 1997 cyclone Martin destroyed about 90 percent of the houses and killed 19 people on Manihiki atoll. Cyclone Martin furthermore, caused people to leave the island and move to the main islands Rarotonga and some families also migrated to New Zealand. In 2010 Cyclone Pat caused significant damage to 75 percent of homes on Aitutaki, over a year later during the next cyclone season some residents were still in tents or had migrated due to a longer than expected aid-supported rebuilding process. Extended droughts have also led to pressures on families Such events also result in disruptions to basic services including water, sanitation, and electricity as well as schooling, healthcare, sporting and cultural events, and other aspects of community well being.

Relocation within the country or beyond as a result of climate extremes or in the longer term with loss of food and water security, and livelihoods has implications in terms of urbanisation, land availability, ownership and maintenance of important sites and graves, as well as other aspects of culture and traditional knowledge which are often place specific.

There are also health risks from burning of waste, and air pollution from vehicles which also contribute to green house gas emissions, so are not a climate change impact, but addressing them benefits both the climate and human health.

TOURISM

Current tourism development on main islands, Rarotonga, and Aitutaki, has focused upon infrastructure and services in coastal margins which would be significantly impacted by increased storm surge and cyclonic events.

The Cook Islands natural environment provides the foundation for the long term economic and social wellbeing of the nation As the Cook Islands key industry, tourism is reliant upon the attractive natural environment of the islands. The Cook Islands Tourism Corporation has a national drive towards environmental sustainability by ensuring the tourism industry grows in an environmentally sustainable manner. Tourism is at risk from climatic fluctuations in the short term and from climate change over longer timeframes. Climate related impacts upon tourism services, such as water, energy, the marine environment, as well as Cook Island culture, has not been previously quantified. The 2005 Cook Island Tourism Master Plan emphasised the need to integrate environment with tourism development and laid out a framework for tourism development in the Cook Islands in this regard. However, a change in weather and climate conditions would negatively impact upon the development framework without careful consideration.

ENERGY DEMAND

In the Cook Islands especially on the main island of Rarotonga where majority of cooling systems are found becomes dependent on these cooling systems especially

CASE STUDY: MURI – SAME BUT DIFFERENT

A project about the environmental history of Muri Lagoon, Rarotonga, with an outlook to present and future climatic changes.

Based on historical photographies and interviews with local residents, this project documented environmental changes in Muri Lagoon. By incorporating findings of geoscientific and historical research, consultancy reports and recent climate projections an exhibition was on display in Ngatangiia Meeting House.

The main changes coming to the fore in narratives about past and present activities (such as fishing, sailing, swimming, diving, horse racing and picnicking) were beach erosion, reduced water quality and less diversity of the flora and fauna of the lagoon.

Present activities including a large scale upgrading of the sewage system and an awareness program focusing on the use of phosphate-free detergent were important markers for the local residents' awareness of the local human impact on the health of the lagoon.

The primary climatic changes noticed were related to practices on land, above all planting and harvesting of fruit. It is a generally observed phenomenon that the fruit seasons have changed, and that various seasonal weather patterns are more difficult to predict. Higher intensity of cyclones and rising sea level is mainly considered to be a major problem for smaller atolls. Occasional high swells overtopping the reef are mainly considered to be a result of a natural variation, rather than an example of a rising sea.

Muri Beach back in History © Cecilie Rubow

Exposed tree roots at Muri beach © Cecilie Rubow

in the months of November to April where maximum temperature can exceed 39 degrees Celsius every day. The demand for air conditioning and fans to be turned on during this time increases and therefore in turn causes energy consumption to increase. The expected increase in temperature over the coming years, the demand for cooling will keep increasing. Unless renewable energy technologies can be deployed quickly this will result in an increased individual and private sector cost burden for imported fossil fuels and associated infrastructure that is currently vulnerable to climate change impacts.

Potential increased cost of oil and petroleum based products from mitigation measures or as a result of climate impacts on transport and associated infrastructure could have a large economic impact on health costs, increasing the cost of health services, transport, certain products especially pharmaceuticals, vector control sprays as well as fertilizers for nutritious food production.

CROSS CUTTING ADAPTATION

DISASTER RISK MANAGEMENT

Emergency Management Cook Islands (EMCI) is responsible for coordinating the Cook Island's response to disasters (DM) as well as promoting disaster risk reduction activities (DRR). DRR activities include, inter alia, mainstreaming DRR into national planning, public awareness campaigns, documentation of traditional knowledge systems and general preparedness activities. Tsunami evacuation routes have recently been signposted and an early warning system has been put in place. This compliments the Frontline Emergency Response System (FERN) which was developed in 2010.

Following a comprehensive consultation process, a DRM National Action Plan was compiled and endorsed by Cabinet in 2008. In June 2010, a High-Level decision was taken to amend the DRM NAP to include Climate Change Adaptation. The development of one National Action Plan to cater for both DRM and CCA is now in its final stages. This plan is officially titled the CI Joint National Action Plan for DRM & CCA (CI JNAP DRM CCA). It is however commonly referred to as the JNAP – Joint National Action Plan.

The JNAP is essentially a strategic roadmap describing how Cook Islands will respond to the challenges posed by natural and technological hazards, including climate change. Many of the Adaptation initiatives proposed here are taken up and included in the JNAP. The current iteration of the 5 year plan includes four strategic areas (governance; monitoring; disaster risk management; and risk reduction and climate change), **seven strategies**, and **twenty nine** actions. The actions have been further broken down into 128 indicative sub-actions.

INTEGRATING GENDER PERSPECTIVES INTO DECISION MAKING

Gender perspectives on climate change with regards to agriculture, fisheries, food and water security and livelihoods, need to be considered in the design of programme proposals and activities. Understanding how division of labour and differences in the social and economic status of men and women, affect their vulnerability to climate change improves actions taken to reduce this vulnerability and any unintended gender biases in measures to increase community resilience

Improving the capacity of women to contribute to climate change adaptation strategies is necessary as directed in the National Gender policy. This requires conducting studies to understand the differential vulnerability of women and men towards climate change impacts and how they respectively respond to climate stresses; ensure an equitable participation of women and men in climate change adaptation programs, especially at the community level in the Pa Enua; provide information and build the capacity of women to be prepared and respond to natural disasters and climate change impacts; ensure gender perspective and women human rights are properly integrated in climate change strategies and that funding mechanisms favor gender responsive initiatives.

All members of the communities, including vulnerable, disadvantaged and minority groups will benefit from awareness raising and training activities, through participatory consultation processes engaging community governing and social institutions, such as village councils, church, youth, and women's groups. Internationally recognised principles of gender equity can be applied, through the use of gender analysis tools during implementation of programmes and individual activities.

The Disaster Awareness campaign at the Cook Islands Constitution float parade 2011
© Joseph Brider

FUTURE ADAPTATION PROJECTS AND PROGRAMS TAKING INTO ACCOUNT SOCIO-ECONOMIC CONSIDERATIONS

To enable adaptation options to be implemented the following actions have been identified as being of high priority through the JNAP:

- Incorporate climate change adaptation and disaster risk management into sectoral/community plans and develop local level action plans.
- Identification of coastal areas vulnerable to storm surge and flooding using climate and sea surge modeling.
- Establishment of sustainable financing mechanisms for DRM/CCA including risk insurance.
- Completion of Cyclone Emergency Shelters on all Islands.
- Development of a National Strategy for Long-term Water Security for all islands.
- Refinement of Disaster Management Operational Procedures for the Pa Enua and building capacity of Island Administrations.
- Completion of Disaster Management Plans by relevant National Ministries and Agencies.
- Climate change strategies at the national and local levels to be gender responsive, i.e., addressing differential needs women and men may have; build on their respective knowledge and skills to develop their capacity and reduce their vulnerability.
- Establish guidelines and standards for the construction (i.e. building codes) and operation of residential, tourism and industrial structures in the coastal area that incorporate climate change projections (e.g. sea level rise).
- Land use planning, location of new buildings and building codes should incorporate design, construction and building technologies related to climate change, extreme events and future conditions, and develop inspection guidelines and regulatory enforcement systems with appropriate capacity building and training in implementation, to support preventative planning at the development stage
- Assess energy demands, storage facilities and capacity in the Pa Enua to cater for sufficient reserves in times of disaster and recommend appropriate strategies including alternative back up options

Greenhouse Gas Emissions Inventory

Rarotonga Electrical Authority © NES

Motor vehicles in Avarua town, Rarotonga © NES

A key commitment under the UNFCCC is for the Cook Islands to prepare an inventory of Greenhouse Gas (GHG) emissions. The Cook Islands' inventory is prepared in line with the 2006 IPCC Guidelines84 elements of the inventory are prepared using the 1996 Revised IPCC Guidelines for National Greenhouse Gas Inventories. In addition, some elements are based on the EMEP/CORINAIR Emission Inventory Guidebook. The reason for making use of these additional guidelines is that the 2006 IPCC Guidelines do not provide detailed methods for all gases and encourage countries to refer to these additional guidelines instead. The Cook Islands used the Tier 1 methods are applied, utilising national data and international default emission factors. A comprehensive methodologies report was produced during the undertaking of the second greenhouse gas inventory.85 The Cook Islands published its first GHG Inventory in 1999, which covered emissions for 1994. The second inventory covers the period 2000–2006, as well as a revision of the estimates from the first inventory.

The Second National Greenhouse Gas inventory focused on four sectors (see figure 6 below) in the collection of activity data for calculating GHG emissions from each sector. The sectors identified include:

- Energy.
- Industrial processes and product use.
- Agriculture, forestry and other land use.
- Waste.

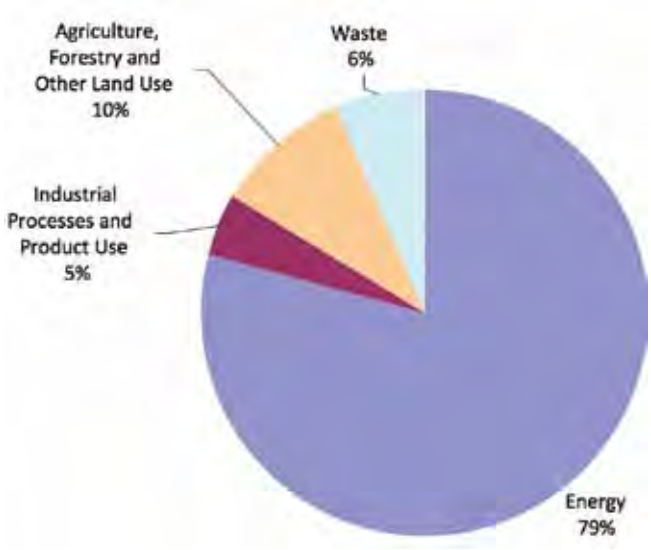


Figure 6: National GHG emissions by sector (2006)

GREENHOUSE GASES

The INC set a baseline for data collated in the first Greenhouse Gas Inventory in 1994. As part of the second GHG inventory the results from the first inventory were revised for two key reasons and these are set out in Table 13. Firstly, there was a need to align the results from the first inventory with the reporting structure provided by the 2006 IPCC Guidelines. The first inventory was prepared using the Revised 1996 IPCC Guidelines, which has a slightly different reporting framework. Secondly, with the benefit of hindsight a number of small errors were identified in the first inventory and needed to be corrected. Reviewing and amending inventory results is an inherent part of the GHG inventory cycle. The 2NC provides an up to date and accurate set of data and information across the sectors.

84 Hosking K, McGoldrick W. ***Second National Greenhouse Gas Inventory, Final Report***, 2006 National Environment Service.

85 McGoldrick W, Second National Greenhouse Gas Inventory, Methodologies, 2006 National Environment Service.

Table 13: Summary of revisions made to results from first GHG inventory

IPCC Category (as reported in the first Inventory)	Revisions Made
Energy	Fuel use data from the first inventory was used to re-calculate emissions using the methodologies provided by the 2006 IPCC Guidelines.
Industrial processes	None (emissions from this category were not reported in the first inventory)
Agriculture	Incorporated into the agriculture, forestry and other land use sector. Livestock methane emissions recalculated using 2006 IPCC guidelines. Nitrous oxide emissions associated with manure management included. Nitrous oxide emissions from the addition of nitrogen to soils were included as an additional source of emissions
Land use change and forestry	Incorporated into agriculture, forestry and other land use category.
Waste	Emission estimates for solid waste management were revised based on new approach, detailed in the methodologies document. Estimates of emissions from open burning included Nitrous oxide emissions from wastewater disposal were corrected, using new emission factors (the first inventory had misplaced the decimal place in the emissions factor, causing the result to be out by a factor of 10).

GASES ASSESSED

The second national GHG inventory covers emissions of the following gases:

- Carbon dioxide (CO_2).
- Methane (CH_4).
- Nitrous oxide (N_2O).
- Carbon Monoxide (CO).
- Oxides of nitrogen (NOx).
- Non-methane volatile organic compounds (NMVOCs).
- Sulphur dioxide (SO_2).
- Hydrofluorocarbon gases (HFCs).

It is important to note that the inventory also includes an estimate of removals of carbon dioxide from the atmosphere by forests and croplands. These are reported in Table 14.

Table 14: Cook Islands National GHG Emissions (2006)

Greenhouse gas source and sink categories Key: NA = not applicable, NE = not estimated, NO = not occurring	CO2 Emissions Gg	CO2 Removals Gg	CH4 (Gg)	N2O (Gg)	CO (Gg)	NOX (Gg)	NMVOC (Gg)	SO2 (Gg)
Total National Emissions and Removals	55.18	-166.97	0.33	0.0160	1.65	0.32	0.33	0.0742
1 ENERGY	54.45		0.0078	0.0015	1.65	0.32	0.31	0.0740
1A Fuel Combustion Activities	54.45	-	0.0078	0.0015	1.65	0.32	0.31	0.0740
1A1 Energy Industries (electricity generation)	23.54		0.0010	0.0002	0.0048	0.0635	0.0016	0.0440
1A2 Manufacturing Industries and Construction	-		-	-	-	-	-	-
1A3 Transport (subtotal)	28.86	-	0.0068	0.0013	1.64	0.26	0.31	0.03
1A3a Civil Aviation (Domestic Aviation)	5.35		0.0000	0.0001	0.0075	0.0225	0.0037	0.0017
1A3b Road Transport	22.74		0.0067	0.0011	1.62	0.22	0.31	0.0267
1A3c Waterborne Navigation (Domestic Shipping)	0.77		0.0001	0.0000	0.0103	0.0155	0.0021	0.0014
1A4 Other Sectors (subtotal)	2.06	-	0.0000	0.0000	0.0007	0.0033	0.0002	0.0003
1A4 a Commercial/Institutional	0.67		0.0000	0.0000	0.0002	0.0011	0.0001	NA
1A4 b Residential	1.38		0.0000	0.0000	0.0004	0.0022	0.0001	0.0003
1A4 c Agriculture/ Forestry/ Fishing/ Fish Farms	NE		NE	NE	NE	NE	NE	NE
1A5 Non-Specified	NO		NO	NO	NO	NO	NO	NO
1B Fugitive Emissions from Fuels	NO		NO	NO	NO	NO	NO	NO
1C Carbon Dioxide Transport and Storage	NO				NO	NO	NO	NO
2 INDUSTRIAL PROCESSES AND PRODUCT USE	0.59		NE	NE	NE	NE	0.0113	NE
2A Mineral Industry	NO		NO	NO	NO	NO	NO	NO
2B Chemical Industry	NO		NO	NO	NO	NO	NO	NO
2C Metal Industry	NO		NO	NO	NO	NO	NO	NO
2D Non-Energy Products from Fuels and Solvent Use	0.59		NA	NA	NA	NA	0.0113	NA
2D1 Lubricant Use	0.59				NE	NE	NE	NE
2D2 Paraffin Wax Use	NE		NE	NE	NE	NE	NE	NE
2D3 Solvent Use	NA		NA	NA	NA	NA	0.0113	NA
2D4 Other (please specify)	NO		NO	NO	NO	NO	NO	NO
2E Electronics Industry	NO		NO	NO	NO	NO	NO	NO
2F Product Uses as Substitutes for Ozone Depleting substances	NA		NA	NA	NA	NA	NA	NA
2G Other Product Manufacture and Use								
2H Other (please specify)								
3 AGRICULTURE, FORESTRY AND OTHER LAND USE	0.00425	-166.97	0.17	0.01118	NE	NE	NE	NE
3A Livestock	0		0.17	0.00034	NE	NE	NE	NE
3A1 Enteric Fermentation			0.0681					
3A2 Manure Management			0.09962	0.0003				
3B Land	0.0000	-166.97	NE	NE	NE	NE	NE	NE
3B1 Forest Land	NE	-165.28	NE	NE	NE	NE	NE	NE
3B2 Cropland		-1.69	NE	NE	NE	NE	NE	NE
3B3 Grassland	NE	NE	NE	NE	NE	NE	NE	NE

3B4 Wetlands	NE	NE	NE	NE	NE	NE	NE	NE
3B5 Settlements	NE	NE	NE	NE	NE	NE	NE	NE
3B6 Other Land	NE	NE	NE	NE	NE	NE	NE	NE
3C Aggregate Sources and Non-CO2 Emissions Sources on Land	0.00425		NE	0.01084	NE	NE	NE	NE
3C1 Biomass Burning	NE		NE	NE	NE	NE	NE	NE
3C2 Liming	NE							
3C3 Urea Application	0.004250							
3C4 Direct N2O Emissions from Managed Soils				0.00852				
3C5 Indirect N2O Emissions from Managed Soils				0.0023				
3C6 Indirect N2O Emissions from Manure Management				NE				
3C7 Rice Cultivations			NO				NO	
3C8 Other (please specify)	NO		NO	NO	NO	NO	NO	NO
3D Other	NO		NO	NO	NO	NO	NO	NO
4 WASTE	0.1383	0.0000	0.1516	0.0033	0.0002	0.0003	0.0000	0.0002
4A Solid Waste Disposal	NA		0.02123	0.0000	0.0000	0.0000	0.0000	0.0000
4A1 Managed Waste Disposal Sites	NA		0.02123		NE		NE	
4A2 Unmanaged Waste Disposal Sites	NA		NE	NE	NE	NE	NE	NE
4A3 Uncategorised Waste Disposal Sites	NA		NE	NE	NE	NE	NE	NE
4B Biological Treatment of Solid Waste	NA		NE	NE	NE	NE	NE	NE
4C Incineration and Open Burning of Waste	0.14		0.0017	0.0000	0.0002	0.0003	0.0000	0.000162
4C1 Waste Incineration	0.13		0.000009	0.000009	0.0002	0.00026	NE	0.000162
4C2 Open Burning of Waste	0.01		0.00174	0.0000	NE	NE	NE	NE
4D Wastewater Treatment and Discharge	NA		0.13	0.0033	0.0000	0.0000	0.0000	0.0000
4D1 Domestic Wastewater Treatment and Discharge	NA		0.1286	0.0033	NE	NE	NE	NE
4D2 Industrial Wastewater Treatment and Discharge	NA		NE	NE	NE	NE	NE	NE
4E Other (please specify)	NO		NO	NO	NO	NO	NO	NO
5 OTHER	NE		NE	NE	NE	NE	NE	NE
Memo items (not included in national totals)								
International Bunkers (subtotal)								
International Aviation (International Bunkers)	17.87		0.0001	0.0005	0.0250	0.0750	0.0125	0.0000
International Water-borne Transport (International Bunkers)	0.0719		0.0000	0.0000	0.0010	0.0015	0.0002	0.0001
Multilateral Operations	NO		NO	NO	NO	NO	NO	NO

Between 1994 and 2006 Cook Islands total emissions increased by approximately 61% from 43,150 t Co2 e to 69,574 t Co2 e in 2006. Overall, the Cook Islands are not a large contributor of GHGs with removals making the Cook Islands a net carbon sink. The Cook Islands emissions have increased by 34% from the first inventory.[86]

86 Ibid p.9

Table 15: Trends in emissions (tonnes CO2-e, 1994–2006)

	1994	2000	2006	% Change (1994–2006)
Energy	31,537	39,925	55,075	75%
Industrial Processes and Product Use	n/a	510	3,149	-
Agriculture, Forestry and Other Land Use	7,508	6,930	6,991	-7%
Waste	4,105	4,197	4,359	6%
Total	43,150	51,562	69,574	61%

PER CAPITA EMISSIONS

The most recent statistics per capita show the Cook Islands to have 3.6t CO2 e compared to 2.3 t CO2-e in 1994 representing a 56% increase per capita, although this remains lower than the approximately 11 t CO2-e averages for developed countries. However some of this increase can be attributed to increased numbers of tourists and energy demand by reflected in the increase in number of beds between 1994 and 2006, and further increases to 2011.

EMISSIONS INTENSITY OF THE ECONOMY

An important indicator is the change in the emissions intensity of the national economy. In order to compare the emissions intensity of the Cook Islands economy with other countries it is necessary to convert GDP figures to US dollars. Using an historic currency NZ$-US$ exchange rate the emissions intensity of the Cook Islands economy in 2006 was approximately 0.53 t CO2-e per US$1,000. In 2006 the emissions intensity of the Australian economy was approximately 0.94 t CO2-e per US$1,000, while New Zealand recorded an intensity of 0.86 t CO2-e per US$1,000.[87]

DESCRIPTIVE SUMMARY

The sources for emissions are separated in to four main categories as shown below in Table 16.

Table 16: Sources of emissions covered in the second national inventory

Sector	Activity	Description
Energy	Electricity generation	Emissions from the use of diesel for electricity generation.
	Transport	Emissions from the use of all fuel for transport purposes (includes land, sea and air transport).
	Commercial/institutional energy use	Emissions from the use of LPG fuel in commercial and institutional building (does not include emissions from electricity).
	Residential energy use	Emissions from the use of kerosene and LPG fuels by households (does not include emissions from electricity).
Industrial Processes and Product Use	Lubricant use	Emissions of CO2 from the use of lubricants in vehicles (excluding 2-stroke, which is covered under the energy sector)
	Solvent use	Emissions of non-methane volatile organic compounds (NMVOCs) from the use of solvents, including in paints.
	Products used as substitutes for ozone depleting substances	Emissions of HFC gases from air conditioning and refrigeration units.
Agriculture, Forestry and other Land Use	Livestock farming	Emissions of methane and nitrous oxide from enteric fermentation and manure management.
	Forest lands	Emissions and removals of carbon dioxide from managed forests.
	Croplands	Emissions and removals of carbon dioxide on croplands.
	Urea application	Emissions of carbon dioxide from the use of urea on farms.
	N2O emissions from managed soils	Direct and indirect emissions of nitrous oxide from the use nitrogen-based fertilisers and other substances on farms.
Waste	Solid waste disposal	Emissions of methane from the breakdown organic material in waste disposal sites.
	Incineration and open burning	Emissions of various gases from the incineration and open burning of solid waste.
	Wastewater treatment and disposal	Methane emissions from the breakdown of sewage and other wastewater.

87 Hosking K, McGoldrick W. ***Second National Greenhouse Gas Inventory, Final Report***, 2006 National Environment Service.

Table 17: Total emissions and removal by sector (2006)

Sector	Emissions (t CO2-e)	Removals (t CO2)
Energy	55,075	-
Industrial Processes and Product Use	3,149	-
Agriculture, Forestry and Other Land Use	6,991	-166,912
Waste	4,359	-
Total	69,574	-166,912

The two largest sectors that dominate the activity data are electricity generation and road transport. The reliance on imported fuels and demand in these sectors has intensified since the first inventory was completed due to an overall positive economic growth and an increased tourism visitor numbers. Figure 7: Breakdown in national emissions by activity (2006) shows that more than 95% of the Cook Islands total emissions are the result of just nine activities. Electricity generation and road transportation make the biggest contributions to national emissions with each accounting for around 33% of the national total.

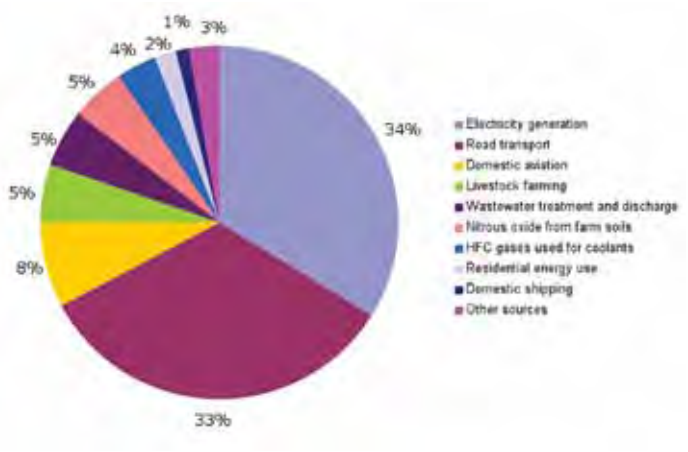


Figure 7: Breakdown in national emissions by activity (2006)

Emissions by Gas

Carbon dioxide is the most significant GHG being released in the Cook Islands, methane, nitrous oxide and HFC gases make smaller contributions. Figure 8 shows that while carbon dioxide emissions occur predominantly in the energy sector, methane and nitrous oxide emissions are the result of waste management and agriculture. Emissions of HFC gases were only recorded in the industrial processes and product use sector.

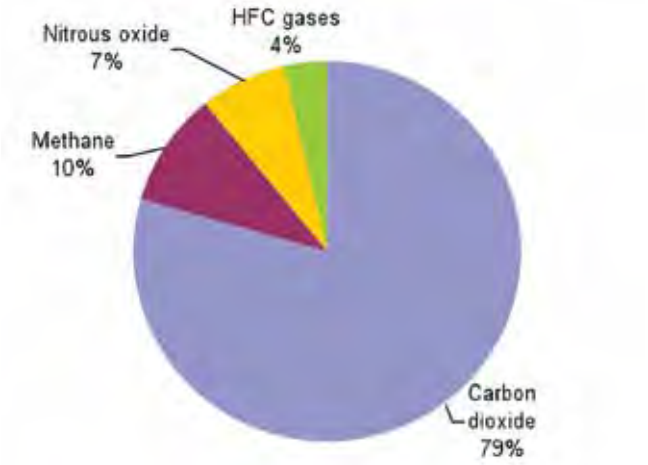


Figure 8: Emissions by gas – % contribution to total CO2-e emissions (2006)

ENERGY EMISSIONS

The energy sector consists of power generation, road transport, domestic shipping, and domestic aviation, other use of energy including commercial & institutional, and residential.

The key source analysis[88] outlines the key sources of GHG emissions from the energy sector. In summary, this includes emissions from fuel combustion associated with the following activities:

- Electricity generation;
- Manufacturing industries and construction;
- Domestic aviation;
- Domestic shipping;
- Road transportation;
- Commercial and institutional energy use;
- Residential energy use;
- Stationary energy use associated with agriculture, forestry and fishing;
- Off-road vehicles;
- Fuel used for fishing boats; and
- International aviation and shipping bunkers (excluded from national totals).

However not all of these activities have sufficient data available to estimate emissions. The key sectors in the INC identified the Cook Islands heavy dependence on imported fuel. This dependency has not changed and accounts for 79% of total national emissions for the energy sector.

Electricity generation is reliant on diesel powered generators. Since 2000, there has been an increase in installed capacity of diesel generators and therefore a marked change in emissions since the INC. Emissions from electricity generation amount to 23,620 t CO2-e representing 34% of national emissions. Table 18 provides more detail of emissions of the energy sector since the first inventory.

88 McGoldrick W, Second National Greenhouse Gas Inventory, Methodologies, 2006 National Environment Service.

Table 18: Summary of energy sector emissions (t CO2-e, 1994–20)

	1994	2000	2006	% Change since 1994	% change since 2000
Electricity generation	14,280	15,828	23,620	65%	49%
Domestic aviation	3,360	4,340	5,402	61%	24%
Road transport	13,726	16,752	23,222	69%	39%
Domestic shipping	0	1,506	774	-	-49%
Commercial and institutional energy use	0	504	672	-	33%
Residential energy use	171	996	1,385	712%	39%
Total	31,537	39,925	55,075	75%	38%

ROAD TRANSPORT

Road Transport is the second largest source of GHG emissions. The bulk of these emissions are from gasoline. Emissions from road transport are 22,737 t CO2-e representing 33% of national emissions. The increase in transport emissions is due to the large number of vehicles now in use mainly on the island of Rarotonga but also shipped to the Pa Enua for use by residents and Government.

There are no restrictions on the importation of vehicles regarding their levels of emissions. Figure 9 shows the road transport emission by fuel from 2000 to 2006.

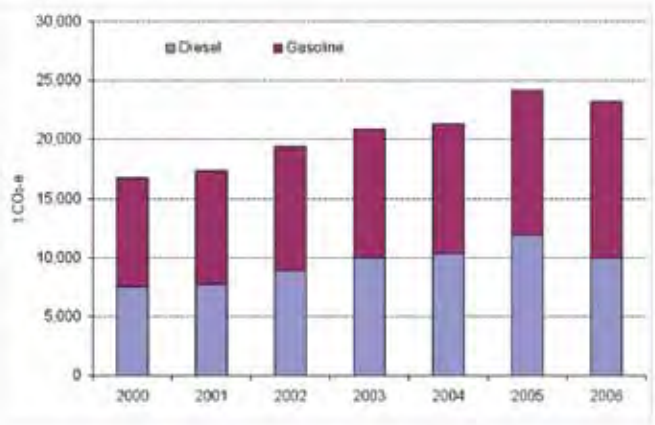


Figure 9: Road transport emissions, by fuel (2000–2006)

INDUSTRIAL PROCESSES AND PRODUCT USE

Emissions in the industrial processes sector are small and account for 4% of the national total. Table 19 shows the amount of tonnes emitted and by which gas in this sector.

Table 19: Emissions from industrial processes and product use (2006)

Source	Gas Emitted (tonnes)					Tonnes CO2-e
	CO2	HFC-134	HFC-32	HFC-125	HFC-143	
Lubricant Use	586	-	-	-	-	586
Refrigeration and Air Conditioning	-	0.43	0.05	0.32	0.28	2,563
TOTAL	586	0.43	0.05	0.32	0.28	3,149

AGRICULTURAL EMISSIONS

Emissions from agriculture, forestry and other land use accounted for about 10% of the national total in 2006 and it includes methane emissions from livestock farming, carbon dioxide emissions from urea use and nitrous oxide emissions from the addition of nitrogen to soils from by livestock. This sector also includes removals of carbon dioxide in forests and on croplands, which are summarised in detail in Table 20.

Table 20: Emissions from agriculture, forestry and other land use

Source	Gas (tonnes)			Tonnes CO2-e
	Carbon dioxide	Methane	Nitrous oxide	
Livestock Farming				
Enteric fermentation	-	68	-	1,430
Manure management	-	100	0.34	2,196
Urea use	4	-	-	4
Nitrogen from livestock			11	3,361
TOTAL	4	168	11	8,482

As of 2006, emissions from livestock farming were 7% lower than in 1994.[89] Some areas of Rarotonga are particularly prone to high nutrient levels in the lagoon due to farming.[90]

89 Hosking K, McGoldrick W. ***Second National Greenhouse Gas Inventory, Final Report***, 2006 National Environment Service.

90 Consultation with MOIP, 20 June 2010

FORESTRY & OTHER LAND USE

There was no latest data or inventory available to assess Greenhouse Gas on forest cover although GIS mapping could provide the latest data for forest cover and was not available for assessment in the second inventory. However an assumption has been made that there has been no change to overall forested land.

The next Greenhouse Gas Inventory should require GIS mapping to provide the latest data for forest cover as no data was available for assessment in the second inventory. The assumption has been made that there has been no change to overall forested land.

WASTE AND WASTE MANAGEMENT

Septage pond, Rarotonga Waste Facility © NES

Rarotonga Waste Facility, Arorangi © NES

Waste Management in the Cook Islands is managed primarily by the Ministry of Infrastructure and Planning (MOIP). Landfills on the islands of Rarotonga and Aitutaki have been established to handle the growing amount of waste on these two main islands. An established collection system and recycling centre on both the islands now provide alternative options to dumping of waste in the landfills, thus extending their operational life by some years.

Over the past decade on Rarotonga, household waste has been disposed of in a newly established lined landfill. While relatively small, the landfill is situated in a former quarry and has an expected lifetime of 25 years if biomass and robust recycling programs are excluded from the waste stream.

Additionally liquid waste, particularly, sewerage has been problematic for many years. With increased tourism and land development this issue is exacerbated to the point where disposal has created localised severe environmental impact. Some larger scale accommodation resorts have implemented their own liquid waste processing systems seeking to mitigate seepage into the lagoon environment.

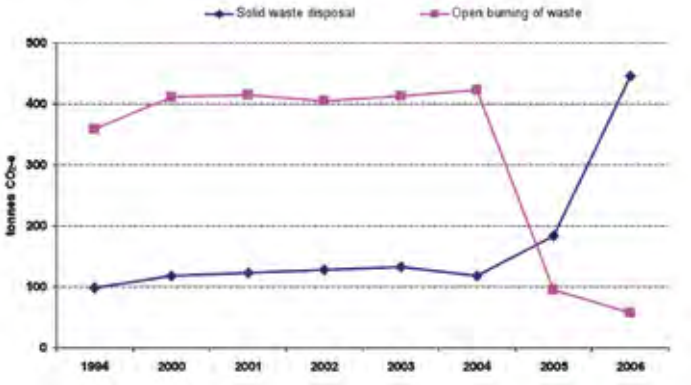
On the Pa Enua, household waste is disposed by a combination of burning and disposal in open dumping areas.

SOLID WASTE

The dramatic increase in methane emissions since the first inventory from landfill is a result of increased volume of waste going to the Rarotonga landfill rather than backyard disposal and burning. Figure 5 shows a graphic representation of this. It is estimated that GHG emissions are approximately 4,359 t CO2-e which accounts for 5% of total emissions. The data for these emissions covers Rarotonga and Aitutaki only.

The landfill which opened in 2005 on Rarotonga is set to reach capacity prior to the life expectancy of 25 years. Open burning of green waste has declined thereby offsetting some of the emissions but a projected increase in tourism will place additional pressure on the landfill and add further to methane emissions. The disposal of waste in the Pa Enua continues to be in pits or on vacant land. This practice is not ideal and contributes to the degradation of the surrounding environment.

Figure 10: Trend emissions from solid waste disposal, compared with emissions from open burning of waste (t CO2-e, 1994–2006)



WASTE WATER

Solid waste disposal and waste water management are sectors which require specific mention. The National Strategic Development Plan set out this sector as a key policy target as part of a long term strategy (Te Kaveinga Nui, 2006).

The projected growth in these two sectors can have serious and long term impacts on the lagoon and surrounding environment. The implementation and enforcement of new regulations regarding septic systems by the Ministry of Health is a positive step towards preventing further degradation of the lagoon. Identifying and testing septic systems suitable to local conditions as well as funding and support to communities for the retrospective upgrading of existing systems to comply with the new regulations will be essential steps in this process. A number of new tourism accommodation resorts have set up good quality treatment systems in line with the growing concerns over lagoon health and safety caused by contamination.

PROJECTIONS

The latest GHG inventory revealed an increase in emissions from the energy and transport sectors which provide the bulk of GHG emissions. This trend is set to increase through higher vehicle registrations, increased electricity generation and growing visitor numbers on the islands.

Greenhouse Gas emissions in the industrial processes and product use sector are also projected to show strong growth under a business as usual scenario. However the projected growth rate is lower than has been observed in recent years. This is because it is expected that the use of HFC gases for air conditioning and refrigeration will begin to plateau as the phase out of ozone depleting substances is completed.

These projections are based on the assumption that emissions continue to grow in line with broad socio-economic trends and that no efforts are made to constrain the growth of emissions. The Cook Islands government has demonstrated it is committed to monitoring national greenhouse gas emissions. Given budgetary constraints this can only be done over time with ongoing technical and financial support from the international community. Projected growth in the tourism industry will lead to greater demand on electricity generation, water and sewerage. Current resources do not allow for such growth and are constrained by the lack of an infrastructure plan with full budget support from Government, therefore the next GHG inventory can be expected to show increased emissions. However with the new government target of 50% renewable energy by 2015 along with other mitigation strategies it is hoped a reversal of such trends will occur.

Total waste sector emissions are projected to grow by 29% by 2030. This aggregate growth rate for the sector conceals the fact that emissions from solid waste disposal and waste incineration are expected to show significant increases (143% and 107% respectively).

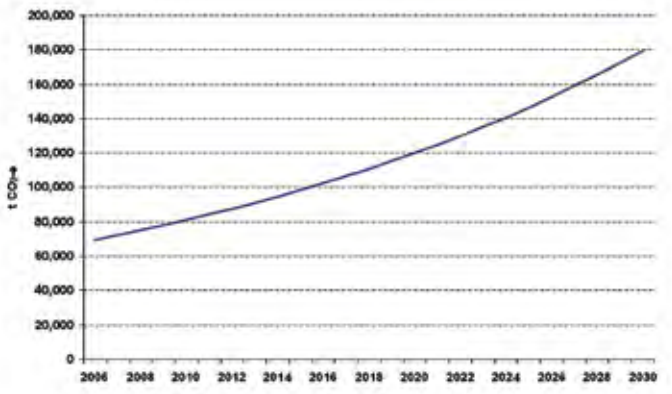
Emissions from wastewater management are projected to increase by only 14%, while emissions from open burning are projected to decline by 68%.[91]

Management of the landfill is suffering due to insufficient funds to operate to the standards prescribed in the landfill Operations Manual, and the landfill is fast approaching its volume capacity. An alternate landfill site has not yet been identified due to the lack of available land and funds for development so actions to prolong the life of the existing landfill must be taken immediately. The landfill is also in need of maintenance investment for improved waste management, such as liner repairs and leachate disposal.

PROJECTED BUSINESS AS USUAL EMISSIONS: 2010–2030.

Based on the assumptions outlined above it is projected that the Cook Islands' total national emissions will rise to 179,627 t CO_2-e from the year 2010 to 2030. This represents a 158% increase above 2006 levels. This growth trajectory is illustrated in Figure 11Figure 11: Projected national business as usual emissions (t CO2-e, 2006–2030).

Figure 11: Projected national business as usual emissions (t CO2-e, 2006–2030)



The Cook Islands continued reliance on imported fossil fuels contributes to the majority of GHG emissions. Electricity generation and transportation account for 75% of overall emissions. Since the Initial National Communication (INC), the Cook Islands dependency on fossil fuels has increased in line with growth in the commercial sector, particularly tourism. While an interdepartmental Committee on Renewable Energy has been established and a Renewable Energy Plan has been prepared, few practical activities and policies to facilitate renewable energy system development for promoting renewable energy have yet been implemented.

91 ibid

Mitigation Measures

Awareness poster about climate change mitigation © NES

Solar panels at Te Aponga Uira, Rarotonga

The Cook Islands, like many other Small Island Developing States, has a large number of pressing priorities and concerns that have to be addressed under capacity constraints and high opportunity costs of investment. This means that any mitigation effort must focus on measures that not only reduce emissions but also have other positive development impacts or potential win-win attributes.

To achieve this aim, sectors have been ranked according to the following criteria:

- the quantitative contribution to GHGs;
- the potential positive impacts of mitigation measures;
- benefits from reducing local pollution through GHG mitigation measures;[92]
- benefits of increasing resilience.

Work in the area of mitigation has advanced significantly since INC. The Cook Islands first National Energy Policy was enacted in 2003, this has since become more ambitious in the 2009 National Renewable Energy Policy and 2011 Renewable Energy Chart of work to transform the sector.

The Government policy has proposed that to achieve the emissions reduction and energy self sufficiency strategic objectives, specific policies, measures and actions will be needed in six complementary areas:

- Harnessing renewable energy.
- Clean and green transportation.
- Being energy smart.
- Having the right infrastructure.
- Awareness that prompts change.
- Building our capacity.

In implementing these policies Government is encouraging public-private partnerships including use of the GEF Small Grants Programme for projects that provide community and environmental benefits. The successful implementation of these initiatives is dependent on the financial support of Government both through mainstreaming of climate policy into current policies but also backed by support and assistance from international community.

ENERGY SECTOR

The main sector area where the Cook Islands can reduce GHG emissions lies in the energy sector. Through moving away from reliance on imported diesel fuel (both for electricity and transport) and switching towards renewable energy as a part substitution. Investing in energy efficiency and renewable energy has the near term potential to reduce GHG emissions by close to 20% from current levels.

It is estimated that 2MW of renewable energy replacing 2MW of diesel on Rarotonga would reduce 10,005 t CO2-e per year.[93] This would provide the additional benefit of increasing security of energy supply and reducing dependence on imported fossil fuels. This is consistent with the long-term objective of the Cook Islands Government of self-sufficiency of energy resources.

The Cook Islands heavy reliance on imported diesel for electricity generation and petroleum for transport makes it particularly susceptible to fluctuations in global oil prices. The price of a litre of diesel in the Cook Islands in 2010 can be upwards of NZ$3.50, with flow on effects for electricity prices. High prices and fluctuations have a destabilising effect on businesses and households, limiting growth, particularly in the most isolated and vulnerable areas.

92 Zieroth G, Mitigation Analysis and Technology Needs Assessment-Mitigation, May 2009, p. 5

93 Hosking K, McGoldrick W. ***Second National Greenhouse Gas Inventory, Final Report***, 2006 National Environment Service.

ENERGY

Electricity is supplied to most inhabited islands in the Cook Islands. Electric generators are all diesel powered with the fuel being imported. Photovoltaic systems have been introduced to Rarotonga, Mitiaro, Pukapuka, Nassau and Palmerston and the Government of the Cook Islands is seeking to promote the wider use of solar and other alternative energy sources in an effort to reduce the dependence on imported fuel. In 2007 the Government of the Cook Islands formed a National Energy Committee (NEC) to focus on Renewable Energy Issues and investigate means of progressing forward towards sustainable energy. In the same year Te Kaveinga Nui NSDP from the Prime Minister's Office was published in relation to the Pacific Plan. The document addressed many different issues, but specifically set targets for Renewable Energy under "GOAL 5", a "Strong Infrastructure Base".

The general principles within this goal include:

- Rationalise the management of the energy sector by developing and implementing Cook Islands Energy Strategic Plan for all islands.
- Develop the Cook Islands Energy Strategic Plan consistent with strategies outlined in the Pacific Islands Framework for Regional Action on Climate Change, Climate Variability and Sea level Rise, 2006–2015, and, the Pacific Regional Energy Policy.
- Implement priorities related to energy in the Preventive Infrastructure Master Plan.
- Decreasing energy consumption by 20% per capita by increasing efficiency in energy use through the adoption of new technologies and energy conservation practices by 2012.
- Reducing the reliance on high GHG based fossil fuel by identifying and adopting technically feasible and financial viable alternative energy sources.
- Improve generation capacity, fuel supply, storage capacities and security.

Since publication of Te Kaveinga Nui, the world petroleum market and bio-fuel markets have been volatile. The Cook Islands remains vulnerable to external shocks in the global markets, thus it is important for the Cook Islands to seek appropriate renewable energy technologies to reduce the nation's reliance on fossil fuels.

ENERGY EFFICIENCY

The Sustainable Energy Action Plan stems from the Te Kaveinga Nui report which specifically sets targets for alternative energy. The plan seeks to implement priorities related to energy in the Preventative Infrastructure Master Plan.

These priorities are to be developed with other key documents e.g. the Pacific Regional Energy Policy to reduce the reliance on high GHG based fossil fuel systems by identifying and adopting technically feasible and financial viable alternative energy sources. One example that has been implemented is the Net Metering Scheme.[94]

Another initiative is the ADB Compact Fluorescent Light (CFL) project seeking to reduce emissions from long life lighting sources, as well as a four year energy efficiency programme to be implemented in four countries (Cook Islands, Samoa, Tonga, Vanuatu) starting 2011.

Through the 2NC, Energy Audits were undertaken and Energy Efficiency Guidelines were prepared including several policy recommendations for Government promotion of energy efficiency and to encourage adoption of best practice in energy efficiency by all stakeholders.

94 Government of the Cook Islands (2009) National Sustainable Energy Action Plan p.8

Figure 12: Energy Efficiency Guideline

Policy Options
Departments should each have an employee charged with maintaining the department's energy use at as efficient level as possible. Include energy efficiency as an audit criteria for government departments, SOEs and Crown Entities, so that achieving an acceptable level of energy efficiency is a measurable output. Goals should be set to achieve certain energy efficiency targets in each department, measurably, and with a deadline. Departmental asset management should include a clear, and quantified 'total cost of ownership', so that energy use – and particularly wasteful use – is factored into decisions to upgrade or replace equipment. Energy Dept should be resourced to enable it to provide appropriate and timely advice to other departments on the efficiency of their existing – or proposed – energy consumption. Energy use of departments should be analysed with a similar scrutiny to that accorded to financial accounts, to ensure that there is a proper accounting for use, and that use is appropriate to the departmental output achieved.
Equipment Procurement
Government should adopt a policy of only purchasing equipment compliant with the relevant NZ/AS standard, regardless of whether such a standard has been legislated in the Cook Islands. CRT computer monitors should be replaced with LCD monitors wherever possible to improve energy efficiency directly (reduced electricity) and indirectly (reduced air conditioning heat load) Electronic devices should be specified regarding their "standby" energy consumption – e.g. the 1 watt standard – to reduce parasitic loads. Computer networks should be designed with optimal energy efficiency regarding 'sleep' mode, monitor type, power supply efficiency, UPS design etc. Printers, copiers and fax machines should also be set to power down, or 'sleep' when not in active use. Air conditioning should be specified to be compliant to the NZ Minimum Energy Performance Standard. Verification from air conditioning suppliers should be held on file to demonstrate that units are appropriately sized, and meet the relevant regulations.

Lighting	
Existing installations: A policy of reducing the use of incandescent lamps, and replacement with energy efficient alternatives, should be instituted as a matter of priority. Tubular fluorescent fittings should be fitted with appropriate reflectors, and be mounted at heights appropriate to the area being lit. Security lighting should be controlled by accurate daylight sensors, and should be fitted with lamps of the minimum wattage necessary to provide the required illumination. Halogen down lights should be replaced wherever possible with LED lamps and the appropriate LED driver unit.	New Installations: New lighting should be specified to be compliant with the NZ MEPS. Fluorescent fittings should have electronic – rather than wire-wound – ballasts, with a facility for automatic dimming to compensate for varying ambient light levels. Consideration should be given to occupancy sensors fitted in intermittently occupied rooms, to ensure lights switch off when the room is vacated.

Buildings	
Existing Buildings: Buildings should be checked by competent engineers to ensure that adequate shading prevents the entry of excessive solar gain, while maintaining the required level of ambient light. Where blinds have been installed inside, consideration should be given to replacement with external shading, to prevent interception of solar heat inside the building envelop. Wherever possible, buildings should be insulated against solar gain, in particular in the roof cavity, to improve occupant comfort and to reduce air conditioning load. Insulation should be fitted directly below the roofing material, and not above the ceiling lining (if there is an attic) to reduce heat build-up in the attic space. Air conditioned spaces should be checked for air tightness, and any louver windows should be of the type the close tightly. Wherever possible, and 'air-lock' type entrances should be encouraged into air conditioned spaces to reduce heat gain. Door closers and air curtains should be fitted where appropriate to ensure minimum infiltration of hot external air into air conditioned spaces	New Buildings: Any new designs should have as part of their design brief a requirement for maximum energy efficiency. The use of maximum natural light, while reducing solar gain, should be an absolute requirement for all new buildings. Air conditioning requirements should be an intrinsic part of the initial design concept, with a full understanding of where the heat sources come from, and how they can be dealt with in the most efficient manner. Fresh air introduction systems should be fitted with NZ/AS compliant air-to-air heat exchangers to allow air exchange while pre-cooling incoming air. All new equipment should be specified to include a maintenance contract which will guarantee the performance of the equipment within design parameters over the useful life of the plant. Electrical controls should ensure that equipment reverts to the lowest energy consumption state that is appropriate as a matter of default; lights go off in unoccupied rooms, stairwell and storeroom lights turn off by timer or occupancy sensor, water heating operates on a one-shot basis, air conditioning centrally switches off outside working hours etc. External lighting, street and car-park lighting, should be high efficiency LED type where appropriate, accurately controlled via daylight sensing. Buildings should include a means of monitoring energy consumption – either through an accessible tariff meter or by a dedicated energy meter, to allow occupant self-audit of their consumption on a regular basis.

Figure 13: Energy Efficiency Guidelines for Private and Domestic Sector

Use of CFL lamps / LED lamps.
Use of inverter, R410a air conditioning compressors.
Use of shading – outside – of windows of air conditioned spaces to reduce solar gain.
Door closers and air curtains to prevent air infiltration for air conditioned spaces.
Insulation to be fitted in roof cavity to insulate against solar gain.
Minimum 600mm roof overhang over windows to reduce solar gain.
Use of 'one-shot' relays for hot water boost.
Use of gas instead of electric for water heating boost.
Resetting of water-heating thermostats to actually required temperature (45C)
Use of solar tubes to use natural light for dark interior areas.
Natural cooling via ventilation, shading via trees, shrubs.
Window design to allow maximum cross ventilation – louvers vs. awning windows.
Replacement of CRT computer monitors with LCD monitors.
Elimination of water leakage – control pumping costs, hot water loss increases water heating cost.
Adjustment of water pump pressure switches to reduce pressure, and therefore pump loading.
Adjustment of air-conditioning and refrigeration thermostats to efficient levels.

RENEWABLE ENERGY

The Government has adopted a policy of converting the electricity needs of 50% of its islands to renewable energy by 2015 and 100% by 2020. Until this was put in place a lack of identified targets for renewable energy and the limited integration of renewable energy in to National Energy policies were factors preventing an effective strategy to mitigate ongoing emissions.[95]

In 2007 the National Energy Committee was established by government to provide policy guidance and measures towards energy mitigation. The Rarotonga Power Board (Te Aponga Uira) contributes 1 cent out of the existing tariff to promote renewable energy in Rarotonga. This initiative was developed by TAU.[96]

A further initiative since the INC has been the implementation of Net Metering in November 2009[97] [98]. In the first year of the programme nine households (three wind and six solar) took up the scheme. The start up cost for the average house is prohibitive at NZ$30,000 to adopt a full system. The majority of households who have chosen alternative energy have opted for smaller solar systems which can be expanded on in the future.[99] This gradual approach may also allow for TAU to adjust its grid to the fluctuations and storage issues associated with net-metering.

There is a need to strengthen and increase the capacity within the Energy Division to plan and monitor the implementation of renewable energy technologies and the impact of economic incentives. The 2010 national budget has no specific allocation for further studies for renewable energy projects.[100]

While much more work is required, through a partnership approach and following the Cook Islands Renewable Energy Chart the summary table below provides some indicative and preliminary information on the types and costs of the renewable energy systems under consideration.

95 Consultation with Energy 21 June 2010

96 Consultation with TAU, 18 June 2010

97 Government of the Cook Islands (2009) National Sustainable Energy Action Plan

98 Government of the Cook Islands (2009) National Sustainable Energy Action Plan

99 Consultation with TAU, 18 June 2010

100 Consultation with Energy, 21 June 2010

Table 21: Cook Islands Renewable Energy Chart

Island	Total households	Population	Expected Energy Demand (KWH)		Proposed Technology	Estimated Cost (NZ$M)
			2015	2020		
Northern Group						
Rakahanga	24	140	64,379	78,327	Solar PV with diesel backup	1.10
Pukapuka	97	507	20,923	25,456	Solar PV with diesel backup	2.40
Nassau	32	121	TBC	TBC	Solar PV with diesel backup	0.35
Suwarrow	1	2	TBC	TBC	Solar PV with diesel backup	0.04
Manihiki	97	366	TBC	TBC	Solar PV with diesel backup	2.50
Tongareva (Penrhyn)	66	255	79,017	96,136	Solar PV with diesel backup	2.50
Southern Group						
Palmerston	18	60	28,439	34,601	Solar PV with diesel backup	0.35
Mitiaro	145	219	62,330	75,834	Solar PV with diesel backup	1.50
Mangaia	177	640	578,990	704,430	Wind, solar PV, biomass, with diesel backup	3.50
Atiu	158	570	455,515	554,203	Solar PV, biomass with diesel backup	3.20
Mauke	106	391	288,002	350,404	Solar PV with diesel backup	4.00
Aitutaki	535	2235	3,064,353	3,186,927	Solar PV with diesel backup	8.00
Rarotonga	3,009	13,890	TBC	TBC	Solar PV, wind, waste to energy, grid storage and bio diesel backup	200.00
Total						229.44

SOLAR ENERGY

The Cook Islands has abundant solar radiation, and while projected climate trends might reduce this slightly, solar electricity – photovoltaic or 'PV' is an attractive option. Solar thermal systems are widespread, about 80% of households already use solar water heating partly as a result of a tax rebate incentive that was provided in the early nineties. Solar PV options have been limited by initial capital costs and compatibility with grid system loading as compared to other options. However as technological advances have been made solar PV systems have significantly reduced in cost and the Rarotonga electricity supplier Te Aponga Uira is pursuing solutions to the storage and grid compatibility issues. There is now a net-metering policy which effectively could result in a return on investment over 10 years. Opportunities in the Pa Enua could yield better results given the smaller economies of scale

An example of this is on the island of Pukapuka where a project was implemented in the early 90's facilitated by the South Pacific Institute for Renewable Energy (S.P.I.R.E.), an engineering and research and development organisation, and G.I.E. Solar, a non-profit company specialising in solar energy implementation.

Solar panels at a home in Pukapuka © Renewable Energy Development Division, OPM

The project was funded through loans from the French Central Bank for Economic Cooperation, and the Bank of Indosuez. PV units on Pukapuka continue to provide electricity today although the system is no longer fully intact. In 2005, many of the panels were damaged by cyclone requiring repairs as well as ongoing maintenance being needed to return this project back to optimum performance. A lack of funding has prevented this from occurring.[101]

WIND ENERGY

Wind energy assessments have been done on Rarotonga and some of the Pa Enua. Initial assessments on Rarotonga identified a number of sites with mixed results. A preferential site in the village of Matavera on Rarotonga is planned to deliver 1MW.

A privately owned wind generator © Renewable Energy Development Division, OPM

Outside of Rarotonga, assessments for wind energy resources have been completed for the island of Aitutaki; is ongoing for the past two years on Mitiaro and; three months on Atiu. An assessment was due to start on the island of Mauke at the end of 2010. The results from the installation that was established on Mangaia lead to reservations from the Aitutaki Council for a proposal for a wind installation.[102] The results were not encouraging enough to convince the Aitutaki Council to see this as a viable option in the meantime. A number of issues regarding the stability, integration of the power generated and the replacement of parts proved problematic in Mangaia and was an issue on Aitutaki.

The maximum load TAU in Rarotonga can handle at present is 2 MW. The estimate for the installation of turbines is high by international standards but the production cost for electricity is much lower than current production. Wind energy is the least cost mitigation option but there are several barriers to implementation which include the availability of suitable land sites and the impact to the environment as well as stability integration.

Exploiting the total potential of embedded generation and the potential for utility scale wind would require additional dispatchable storage capacity and sophisticated system controls. TAU will undergo shortly a two year phase out of the existing powerhouse to a new fully automated powerhouse with a maximum feed in of

101 Consultation with Energy Commission, 21 June 2010

102 Zieroth G, Mitigation Analysis and Technology Needs Assessment-Mitigation, May 2009 p.32

20% from renewable energy.[103]

OTHER ENERGY ALTERNATIVES

The Cook Islands has taken a cautious approach to other forms of alternative energy involving technologies that may not be so well proven in a tropical SIDS context. There had been approval of a possible Solar-Hydrogen proposal to be undertaken through ICHET- UNIDO-GEF support however this is currently on hold. There are also opportunities to investigate biomass and organic and other waste as possible renewable energy sources although Non-Government Organisations have expressed some concerns about potential pollution and environmental sustainability of these approaches. The development of legislation for standards regarding vehicle importation based upon emissions would facilitate additional mitigation action.

WASTE MANAGEMENT

The endorsement of a National Waste strategy with special consideration of emissions reductions options as a national priority needs to be undertaken. This needs consideration of reduction of waste and packaging at source or before import. Pa Enua do not generally have any landfill or managed waste systems and given the emissions reductions achievable in the waste sector by switching from open burning to appropriate landfills this needs to be promoted.

As there are issues with the availability of land on Rarotonga or Aitutaki it would be prudent to identify an alternate landfill site or disposal mechanism to the current Arorangi landfill in Rarotonga within the next five years, including consideration of the incorporation of methane capture to energy from waste. There are a couple of private individuals successfully using of waste cooking oil to run diesel trucks.

The current collection system for solid waste for the landfill is inadequate. Certain recyclables such as aluminium cans, plastic bottles and glass are also collected with the domestic collection and go to the Rarotonga Recycling Centre. Currently the value for recyclables is low but the government is seeking alternatives to improving the recovery of recyclables and other waste so that it does not go to the landfill taking up much needed space. The collection system requires greater efficiency; this can be best achieved by tendering the management of the landfill and collection of waste to the private sector with a five year sustainable business plan. Recommendations such as the addition of 'free' recycle bins to all households to encourage the recycling of as much waste as possible will lead to a greater reduction in loads to the landfill as well as prolong the life of the landfill. A GEF Small Grants Programme community project is currently piloting this idea within their community of Ruaau.

INDUSTRIAL

The Cook Islands Industrial Sector has changed little since the INC, as the Cook Islands is a Service oriented economy rather than industrial one. The industrial and product use sector is very small, mainly small breweries and construction; has very little growth prospects and is a low level contributor to GHG emissions. Since the 2006 GHG Inventory there has been the development of a small outrigger canoe construction industry which does use some solvents and glues which contain GHGs. Several new proposals to manufacture plastic rainwater tanks and kayaks would involve an increase in emissions from this sector that would need to be incorporated into inventories. How much of those emissions could be mitigated is yet undetermined.

It is important the Cook Islands adopt technologies that are proven, particularly in the region, with similar climatic conditions and readily available parts and expertise for maintenance. Such technologies can be demonstrated and then be promoted by and disseminated through the private sector i.e. GHG mitigation needs to achieve lower carbon growth and be supportive of national development priorities and local business opportunities.

An effective mitigation strategy needs to address a number of institutional barriers. There is a need for some policy changes in order to improve the enabling framework for renewable energy and energy efficiency investments and for improved management of municipal and agricultural wastes. In the energy sector, institutional arrangements keep changing but an adequately resourced regulatory body that could set and enforce rules, regulations and performance standards promoting efficiency and the development of indigenous resources is yet to be established.[104]

MITIGATION TECHNOLOGY NEEDS ASSESSMENT

In 2009 the Cook Islands conducted an assessment on the mitigation needs and technology options that the country could potentially utilise to help reduce its greenhouse gas emissions.

Like other developing countries Cook Islands have a large number of pressing priorities and concerns that have to be addressed under capacities constraints and high opportunity costs of investment. This means that any mitigation effort must focus on measures that not only reduce emissions but also have other, positive development impacts. GHG mitigation needs to achieve lower carbon growth and be supportive of national development priorities and local business opportunities.

Supply side technologies that are considered high impact in Cook Islands include: utility scale wind energy, small scale embedded wind, utility scale solar PV (hybrid) and embedded solar PV. All technologies have been successfully implemented in the Pacific and it is safe to assume that well designed and transparently procured projects have a very high chance to succeed in the Cook Islands.

103 Consultation with TAU, 18 June 2010

104 Zieroth G, Mitigation Analysis and Technology Needs Assessment-Mitigation, May 2009 p.32

Wind resource assessments based on long term wind data measurements at 30 meters above ground in Rarotonga, Mangaia and Aitutaki indicate that larger wind turbines could be operated at a capacity factors[105] between 23% and 27%. Given limited available space for wind installations and the load characteristics of the power grid of the national power utility Te Aponga, the maximum wind capacity to be integrated into the power system of the main island of Rarotonga is presently estimated to be 2 Megawatts. Full development of this potential would already necessitate the use of dispatchable storage unit (battery or flywheel) in order to prevent network stability problems and voltage flicker as minimum loads of the Te Aponga system approaches 2 MW in the cold season. Other limitation for utility scale wind includes steep terrain that does not allow cost effective and environmentally friendly construction of wind turbine platforms and access roads on the hilly ridges in Rarotonga. A second option using larger 1,000 kW turbines on two flat sites on the Southeast cost of Rarotonga has not yet been investigated in detail, fowever, for these alternatives noise pollution and landowner consent will be critical issues. What remains as the most realistic option for utility scale wind projects on Rarotonga is the use of smaller, (up to 100 kW) and quieter wind turbines up to a combined installed capacity of 1,000 kW.

Probably the most promising option for renewable energy use in Cook Islands is embedded generation using wind and solar PV generators. This concept is strongly supported by the National Alternative Energy Committee and is suitable for the larger electricity systems of Rarotonga, Aitutaki, and perhaps others in the Southern Group. A 'Sustainable Energy Action Plan' under preparation by the Alternative Energy Committee presents details on such a program. While solar PV can be employed at any location that allows the panels to receive direct sunlight, small-scale wind is only viable at easterly sites that are exposed to the prevailing winds without too much disturbance by surface roughness. A small wind generator (2 – 5 kW) installed at 10 meters hub height and exposed to easterly winds generates a net average of 5 kWh per day per kW installed. At an average household consumption of 250 – 300 kWh per month a 2 kW unit produces on average enough electricity to supply all electricity needs, provided the turbine is grid connected and able to feed surplus into the system while drawing electricity during periods of low wind speeds and/or high demand. At present tariff levels, wind would be a financially attractive no-regret mitigation investment. Grid connected solar systems on Rarotonga and Aitutaki would generate on average a net output of 2.9 kWh per day and kW installed. An average household would need to install 3 kW to generate its monthly electricity needs, requiring a panel area of approximately 24 m^2. A high quality solar system with a 20 years' lifetime would cost $16,000 per kW resulting in generation cost of approximately $2.00 per kWh if commercially financed. Clearly, for solar to be attractive there would have to be a subsidy in addition to the net metering concept. The potential for embedded solar generation on Rarotonga is approximately 550 kW and would generate approximately 600,000 kWh per annum. For Aitutaki, the solar potential is estimated at 120 kW.

In the Pa Enua, solar diesel hybrid systems (and possibly wind diesel hybrid systems) could reduce fuel consumption to 30% of the current levels, enhance security of supply and reduce environmental hazards of dealing with diesel fuel. The total potential for such system is estimated at 350 kW. The systems would have to retain at least one of the existing diesel generators as back up. This configuration would also allow to operate the diesel (when necessary) in a load range that resulted in better efficiency (specific fuel consumption). The total potential for hybrid systems is estimated to be 350 kW, mainly for the Northern group. The hybrid systems would replace 325,000 kWh diesel generated electricity per annum at generation cost of $ 2.20 per kWh. Although this is high, average generation cost based on diesel are currently estimated to be in the vicinity of $ 2.50 per kWh (*ADB Draft Preparing the Infrastructure Development Project TA 7022-COO, August 2008*). Thus hybrid systems for outer islands could be considered as a no-regret options that in the long term produce a positive return on investment and would thus have very low or even negative mitigation cost similar to wind technologies.

Four demand side technologies are considered high impact in Cook Islands: Decrease in household and commercial electricity use (lights, appliances, and air conditioning), reduction of fuel use in the transport sector, fuel switching to LPG for cooking and water heating and energy efficient building designs. Here households can make a major contribution by refraining from using electricity for cooking and hot water production. The quantitative aspects and impacts of these measures are more difficult to assess than those of supply side measures, nevertheless there is sufficient information to at least provide good indication of the performance that can be expected of the interventions.

SECTOR PRIORITIES

In ranking sector priorities, three criteria have been used.

1. The quantitative contribution to GHG.
2. The potential positive impacts of mitigation measures.
3. Benefits from reducing local pollution through GHG mitigation measures.

Accordingly, energy is the clear leader but there is merit in mitigating emissions from waste and agriculture as the former offers no-regret options that would produce significant co-benefits. In the agricultural sector, reducing effluent pollution from animal husbandry – especially piggeries – would have significant environmental benefits by reducing controlled nutrient intake into lagoons. The same is true for improvements in the management of sewerage. The focal sector is clearly energy which produces more than 80% of the countries GHG emissions. At the same time, sustainable development of the energy

105 A capacity factor is the proportion of energy actually produced to the energy theoretically produced if the unit was operated at full capacity 100% of the time.

sector must ensure increased access to electricity in order to achieve the Millennium Development Goals.

Reduction of fossil fuel use makes sense for a number of reasons. The Cook Islands relies very heavily on imported fuels for commercial energy needs including 100% of transport and electricity generation (the chief uses), and a majority of household use including cooking, transport, refrigeration, and lighting i.e. the vulnerability of the economy towards shocks and volatility in international energy markets can be significantly reduced through energy conservation and use of indigenous renewable energy resources.

Under the mitigation studies conducted for the 2NC, it assumed that with key policies in place a mitigation scenario could targeted that erodes growth in emissions every year by 0.5%. Under such a scenario GHG emissions would slightly increase until 2014 after which emissions start to drop off until they reach a level of 50 Gg CO2 e in 2026 i.e the scenario would result in a net reduction of GHG emissions compared to the 2006 levels. Obviously, for this to materialise the Cook Islands has to accelerate use of available technologies now and adopt new technologies once they have proven to work in similar contexts.

The above scenario would be a considerable achievement putting the Cook Islands in a good position in the international community. This scenario considers funding constraints and assumes that a small and vulnerable economy such as the Cook Islands has to be mindful of costs imposed by mitigation measures. It also takes into consideration that change requires public awareness building, education and consensus building processes that are known to take considerable time in Pacific societies.

Higher mitigation of emissions in line with the Government's more recently stated targets could be achieved through significant technological development and external funding for mitigation measures of all types.

Mangaia wind turbine © Renewable Energy Development Division, OPM

Other Relevant Information

School presentation about climate change © NES

Renewable energy technology, Rarotonga © NES

In addressing climate change it is important to have enhanced research and systematic observations, technology development and transfer, as well as education, training and public awareness. More information on the Cook Islands work and needs in these areas is elaborated below.

1. Steps taken to integrate climate change into relevant social economic and environmental policies

As mentioned in the National Circumstances chapter, there is currently no specific climate change policy for the Cook Islands but this is being developed in the next few months. However climate change related aspects have been integrated somewhat into relevant policies such as environment and renewable energy policies. "Te Kaveinga Nui" is the key planning document, the National Sustainable Development Plan (NSDP) 2007–2010, NSDP 2011–2015, and 2015–2020. The objective of the NSDP is 'to build a sustainable future that meets our economic management, environment integrity, social stability, and our Cook Islands Maori culture, and the needs of our future generations.' All sector and government agencies must align plans to the NSDP strategies as these are the nation's priorities. While none of the current Strategic Goals explicitly reference climate change several goals have particular relevance.

2. Activities related to research and transfer of technology to adapt to and mitigate climate change

Through the SNC technology needs assessments (TNA) were undertaken for mitigation and adaptation respectively. Through this work it became apparent that the definition of technology under the UNFCCC was extremely broad, and that further work is required to elaborate the technology needs identified into implementable concepts in the local context, particularly for the adaptation technologies identified. These TNA highlighted that it is essential for the Cook Islands to focus on proven and environmentally sound technologies that offer the potential for no-regret investments by public and private sector sponsors. To date there has been no formal transfer of technology on adaptation or technology transfer for mitigation.

Mitigation Technology

A number of stakeholders have expressed interest in looking at developing projects in the Cook Islands utilising the Clean Development Mechanism (CDM) under the Kyoto Protocol as a way of facilitating technology transfer. Two of the issues around CDM projects to date have been scale and location issues. Opportunities for emission reductions in the Cook Islands are small on the global scale and the Cook Islands location makes tapping into European carbon markets difficult. However with the introduction of an Emissions Trading Scheme in New Zealand, interest in developing CDM projects in the Pacific is growing. There is a national awareness that technology transfer be undertaken with due regard to environmental integrity and locally appropriateness.

Potential for technology transfer to occur through the Clean Development Mechanism (CDM) or other support exists in several areas identified through the Mitigation Technology Needs Assessment, including:

- Waste Management and Renewable Energy.
- Wind.
- Solar.
- Biomass.
- Waste to energy.

Options exist mainly in the energy sector, but there are also interesting options in agriculture and waste management. In addition there are some interesting no-regret measures under consideration in the waste

management area which include reduction of the incoming waste stream (banning of plastic bags and packaging) and the recycling/reuse of organic wastes. These have been detailed in the mitigation chapter of this 2NC report.

Adaptation Technology

The National Environment Service in collaboration with Coastal Zone Management Pty Limited in 2008 carried out a Technology Needs Assessment for Adaptation (TNA-A). The assessment indicated priority sectors such as Health, Water, Agriculture and the Coast, priority technologies for each, barriers to technology implementation and means of overcoming such barriers. The report[106] is based on desktop literature review, stakeholder interviews and a workshop held in October 2008 in Rarotonga, Cook Islands.

Many of the highly ranked technologies require short-term time frames for implementation, and were from the Coastal or Health sectors. Highly ranked technologies included both soft and hard technologies, and included on-ground projects, training/education programmes, policy reform, and development of strategies or guidelines, resource assessments or monitoring projects and enforcement. The outputs of the TNA-A are captured in more detail within the vulnerability and adaptation and the constraints and gaps chapters of this report.

3. Climate change research and systematic observations

RESEARCH AND SYSTEMATIC OBSERVATIONS

There are a number of research programmes that are being undertaken in the Cook Islands. These have been established in the areas of Agriculture, Marine Resources and Meteorological Services. Due to the Public Health laboratory being unavailable at times for environmental monitoring, Ministry of Infrastructure Planning-Water Works Division, and Ministry of Marine Resources have both established laboratories of their own. The sharing of information between agencies requires elaboration of data sharing protocols which have been made in some cases. However there remain challenges in terms of having the range of qualified personnel, testing equipment and standard operating procedures in place, therefore there have been proposals for combined laboratory for all non-health testing.

A number of graduate and doctoral researchers have been undertaking relevant work. Such research requires a research approval permit from the National Research Approval Committee and copies are provided to the Cook Islands Government Libraries. An effort is made to ensure external researchers engage with a local counterpart for capacity building. There is also a lot of research and observations work being undertaken regionally that covers the Cook Islands. Where this work is facilitated through the CROP agencies the Cook Islands has access to it, and the role of the regional and international organisations in maintaining databases has been vital. However on occasion there have been challenges with intellectual property rights and the Government of the Cook Islands has had to purchase the analysis of and models developed with the raw data it provided.

While the programs have been working well it has been noted there is currently 'very limited resources to support research and systematic observation.'[107] One new area which would benefit from increased attention is the impact of climate change on people's migratory patterns within the Cook Islands, in particular the effect this is already having on the main Island of Rarotonga.

AGRICULTURE RESEARCH

The agricultural research station has provided the foundation for the success of the agriculture sector in the past. It conducted research on increasing productivity and nutritional value, locally appropriate biological pest controls, soil and water management, and identifying crops resilient to current and anticipated climate conditions. The loss of the station on Rarotonga due to budget constraints and land availability is hampering efforts to once again make agriculture a sustainable contributor to the Cook Island's economy. Plans for the re-establishment of the research station on Mauke or another Pa Enua need to be realised to enable further research. The Ministry of Agriculture is working with farmers to test new varieties in the field. The Cook Islands also contribute to the repository of seeds and plant tissues that are held in the SPC Gene Bank in Fiji, so that these may be re-introduced to the country in the event of a disease or disaster affecting key species.

Hydroponic lettuce
© NES

MARINE RESEARCH

The Ministry of Marine Resources has several research arrangements with international organisations like the Flinders University of South Australia and University of Hawaii which maintain an array of tide monitoring gauges in the Cook Islands. Coral coring surveys have been conducted for climate change with assistance from the University of Hawaii, Tropical Ocean Global Atmosphere Station and the University of Edinburgh. MMR also work with SPC to conduct research into the migratory patterns of fish species with the Cook Islands EEZ. MMR is also has a basic laboratory for water quality testing which is conducted in collaboration with NES and MoH.

106 TNA Adaptation

107 Govt. CI (2009) NCSA, p74

Meteorological Service Current Systematic and Observational Networks

The Cook Islands Meteorological Service is working continuously to provide the most recent climate data not only for the national climate database but also to support the work of regional and international organisations like the World Meteorological Organisation (WMO).

The Cook Islands, as a member of the WMO, has participated in a number of regional initiatives related to observational networks, such as, the Global Climate Observation System (GCOS). As a participating member the Cook Islands is provided and has access to a wide range of atmospheric research and monitoring program information covering the South Pacific region.

There are six automatic weather stations (AWS) located on the islands of Aitutaki, Manihiki, Mangaia, Mauke, Pukapuka and Tongareva (Penrhyn). Synoptic three hourly weather reports are interrogated from a platform on each of these islands through a modem in the main office in Rarotonga as well as an upper air station situated in Rarotonga. Rarotonga operates one flight a day consisting of a wind-finding and radio-sonde. Wind-finding detects the wind speed and direction at different altitudes while the radio-sonde detects the temperature, humidity and atmospheric pressure at different altitudes.

With funding from AusAID, the South Pacific Sea Level and Climate Monitoring Project (SPSLCMP) has been installing SEAFRAME stations throughout the Pacific since 1992. A SEAFRAME station was installed at Avarua Harbour (Rarotonga) in 1994. The SEAFRAME gauges record sea level, air and water temperature, atmospheric pressure, wind speed and direction. The SPSLCMP was a response to concerns raised by the Pacific Forum leaders over the potential impacts of an enhanced greenhouse effect on climate and sea levels in the Pacific region.

Data from this observational network will contribute to the global models that are implemented by the IPCC and other research organisations as well as meeting the needs and demands of the Cook Islands community. These provide the Cook Islands Meteorological Service with the daily weather readings and information for organisations like WMO who are carrying out readings to assess climate patterns globally.

Meteorological Services of the Cook Islands are responsible for collating climate data. They are required to monitor climate change and sea level rise and to implement their programme successfully the following information gaps and specific capacity building needs have been identified:

- Information Gaps and Specific Capacity Building Needs.
- Early storm surge warnings.
- Early cyclone warnings.
- Identification of mechanisms for cost effective transfer of data.
- Problems with automatic weather stations malfunctioning.
- Training and equipment – stronger cyclone resistant AWS's .
- Data transfer systems – broadband connection with AWS's to provide information in real time.

4. Information on education, training and public awareness

EDUCATION, TRAINING AND PUBLIC AWARENESS

Since the INC there have been a number of initiatives to promote public awareness and education around climate change. The Cook Islands UNFCCC Article 6 focal point is the Education and Awareness Division of the National Environment Service (NES) and work is ongoing to carry out general awareness about climate change. The 2NC project in collaboration with NES, community groups and other relevant stakeholders supports various education, training and awareness activities. Some of these over the duration of the project included the following:

- Presentations to schools both secondary and primary about climate change.
- Presentations to the Cook Islands Christian Church council meetings and theological college about the 2NC Project as well as general awareness about climate change.
- Supported the adaptation and translation of the 'Climate Change in the Pacific 'booklet produced by WWF South Pacific into Cook Islands Maori using local examples and actions.
- Supported printing copies of 'A history of tropical cyclones and their impacts in the Cook Islands' by Fes A. de Scally et al.
- Held community meetings as part of the Vulnerability and Adaptation assessment to create further awareness about the 2NC project and climate change as a whole.
- 'Youth and Climate Change' themed International Youth Day' (August 2008)initiative coordinated with the Youth and Sports Division of the Ministry of Internal Affairs, involved a range of Government and Non Government Organisations and youth groups.108 The main objectives for the event were to:
- Provide global and local climate change information to young people, promote youth activities to get involved in environment activities, and to let young people express the environment related issues to their leaders including through postcard messages to the Prime Minister. These messages were also displayed at the Pacific Island Forum in Niue.
- Promoted and created awareness about the Year of Climate change 2009.

108 Youth & Sports Division Ministry of Internal Affairs, ***International Youth Day 2008, Youth & Climate Change: Time for Action***, Final Report, 2008

- Held a secondary schools speech competition and the winner of the competition became the youth representative to the Conference of Parties in Copenhagen, Denmark; Environment Week theme of Climate change.
- Promoted the annual Earth Hour initiative and having a Cook Islands wide campaign about saving electricity and cutting down green house gas emissions by one simple step of turning all non-essential electrical appliances off.
- Held radio talk backs on the issues of climate change

It will be necessary to continue these efforts and expand the education programs to the Pa Enua.

FORMAL EDUCATION

There is advancement in this area with sustainable environment issues, including climate change, now in the process of incorporation into the National Curriculum Framework. In 2010, a forum for children to learn about sustainable environment proved successful; climate change was one of the main topics. It is hoped this forum will be held biannually pending on funds to do so.

For future populations to understand and make intelligent, informed views on the implications of climate change and sea level rise these topics must be incorporated into the curricula of primary and secondary schools. However it should be noted that many environmental issues are also taught as part of the Social Studies, Science and Maori curriculums[109] supplemented by presentations by organisations such as NES and Cook Islands Red Cross Society.

Both undergraduate and post-graduate courses that are relevant to climate change are increasingly being offered by the University of the South Pacific Extension centre on Rarotonga, and some scholarships are available to conduct research in the areas of climate change adaptation and mitigation.

INFORMAL EDUCATION

The INC identified informal education activities as being the most effective method of sharing and creating interest in climate change issues. The use of audiovisual productions and print materials was identified as two of the most important tools for public dissemination of climate change information.[110]

The NESAF report considers it vital that education and awareness programmes that utilise local cultures and traditions to enable Cook Islanders to understand and adapt to climate change.[111] Along similar lines, there exists a collection of videos on climate change in the Pacific which includes a film called 'Kia Vai Te'ate'amamao' about the traditional climate forecasting knowledge from the people of Aitutaki and also a series of short clips on water resources. The films demonstrate the collaborative effort by various agencies on the implementation of one of the aims of NESAF, namely education and awareness programmes.

The Emergency Risk Management team have also produced advertisements which screen on the Cook Islands television station advising people on being prepared for cyclones as well as traditional climate forecasting film from the island of Atiu.

The Natural Heritage Project's database recording of 3,700 species which is relevant to issues of biodiversity and climate change has been updated and made accessible to schools and the general public.[112] It was launched at the NES in May 2010.

Another initiative is the joint project by the Ministry of Marine Resources, Ministry of Health, and NES to monitor the lagoon and stream health on Rarotonga and issue a 'Report Card' for the public. The annual National Environment Week celebrations and Lagoon Day expo have been used as leverage to raise awareness of lagoon health and encourage best practices to improve land and lagoon management, building resilience amongst communities.

The Cook Island's Red Cross conducted a "Preparedness for Climate Change Programme" which has focused on the Pa Enua and includes the creation of a plan of activities to prepare for and reduce risks of climate change to be implemented in the Cook Islands. As part of this preparedness plan, the CIRC is preparing a video to document traditional methods of food preservation which could help people store food during times of disasters and extreme climatic events.

The NES has built a comprehensive communications strategy on environment related issues over the years and produced materials (audiovisual and print) and organised visibility activities (e.g. debates, string-band competitions, displays, cultural performances and story-writing) on climate change. 2009 was the International Year of Climate Change and NES worked closely with climate change stakeholders and regional partners (SPREP, SOPAC, and WWF) on climate change related communications. Climate change still remains a strong topic within other environment campaigns on biodiversity, water, wetlands and marine environment for the Cook Islands.

There have also been many workshops in the region and at the international level targeted at youth over the past few years Cook Islands youth have attended including the Pacific Youth Environmental Leaders Forum (2008), Pacific Youth Environment Network Forum (2009), IUCN World Conservation Congress (Barcelona, 2008) for which Cook

109 Rongo, Teariki and Rongo, Julia, Cook Islands National Report: United Nations Convention to Combat Desertification (land Degradation), Island Friends Ltd environmental consultants, p60

110 Government of the Cook Islands, ***Initial National Communications under the UNFCCC***, Revised Edition, March, 2000, p39

111 Govt. CI (2009) NESAF, p43

112 Government of the Cook Islands, ***National Environment Strategic Action Framework 2005–2009 (NESAF)***, Prepared by: Tuaere Tangianau, Upoko Solutions Ltd, December 2009, p21

Islands and Pacific Youth were represented and 350.org Pasifika Climate Leadership Workshop (2010), all which have had a strong climate change focus. NES and 2NC also included a youth representative as part of the Cook Islands delegation to COP15 and COP16. Youth delegates were selected through National Climate Change Speech, Essay and Film competitions.

There have many opportunities for Cook Islands media and government education officers to improve their understanding and therefore reporting skills on climate change, coordinated by NES and regional organisations such as WWF and SPREP and it is fair to say the media have improved their capacity and their reporting to the community on climate change in the Cook Islands, status within the global climate change challenge and environmental issues as a whole.

Overall, it is necessary to continue these efforts and further training and professional development initiatives are necessary to build the capacity of all institutions and individuals working within them. There are courses on offer from organisations such as the University of the South Pacific that can be taken advantage of.

In many cases too there still remains a need to expand the education programs to the Pa Enua and deliver these in Maori.

Therefore a renewed focus is required to achieve some of the initiatives identified in the INC that remain to be implemented such as:[113]

- To promote the conservation of water, sound waste management, coping in disaster situations, and sustainable development practices on all islands and to preserve or revive traditional conservation practices which support education on climate change.
- To foster a spirit of consultation and public co-operation through better use of the media so that necessary changes to conserve and protect the environment and human life, particularly during times of disaster, are led by public acceptance.
- To assist in the development and review of curriculum materials in environmental education, including climate change and disaster management, for the national education system and community-based education.
- To train workers in a variety of sectors – media, government, and community groups on effectively informing publics of climate change and related environmental areas.
- To raise awareness of political leaders so that they become effective communicators of climate change and related environmental issues, and to provide the same aims and supplementary materials for climate change and media workers at national level.
- To facilitate production of materials and education aids that would support the above aims.

113 Govt. CI (2000) INC, p39

The National Capacity Self Assessment report for the Cook Islands explicitly sets out a goal for "Integrated education and awareness programmes for climate change."

The report goes on to make the following recommendations:[114]

- Develop a systematic approach to environment education awareness including regular specific climate change communications strategies and measures for different levels, including NGOs and community groups.
- Strengthen partnership roles in strategy design and implementation. E.g. Live & Learn, the Green Maze, and interactive programmes such as Sandwatch, Schools of the Pacific of Rainfall Climate Experiment SPaRCE, Te Kaveinga Ora.
- Incorporate climate change into the formal education curriculum and provide resource materials and professional development to support teachers with this subject area.
- Produce media and education packages featuring local climate change relevant information in a simplified bilingual format.
- Utilize 'information brokers' who are able to undertake the translation of scientific and technical information into simplified clear format/language.
- Encourage schools to take part in environment monitoring e.g. beach, climate, water and assist NGOs and Government Departments.
- Undertake training for planners, developers and decision makers on how to incorporate climate change and disaster management considerations into infrastructure and development.

5. Information on capacity-building at the national regional and sub regional levels

The Cook Islands completed its National Capacity Self Assessment Project in 2008 and the output reports of the exercise highlights the national priorities and needs for capacity building and development to address global environment issues, in particular, climate change, biodiversity, and desertification/land degradation.

The University of the South Pacific is now offering climate change courses as well as scholarships through the Cook Islands extension centre in Rarotonga. This is to encourage Cook Islands to take courses.

6. Efforts to promote information sharing

The role of the National Climate Change Country Team is further enhanced as a mode for information sharing of climate change information amongst the different sectors and what is happening at the community level.

114 Government of the Cook Islands, National Capacity Self Assessment (NCSA) Capacity Development and Final Report, May 2009, p40

Constraints and Gaps

Nikaupara community discussing solutions for coral bleaching; a comprehensive assessment for all islands is a gap to be addressed © NES

Raised home, policy/enforcement © NES

The constraints and gaps for the Cook Islands in addressing climate change have been identified in national policy reports such as the NCSA, NAP, NESAF and through consultations with stakeholders. It should be noted that many of the initial policies and in some cases legislation for adapting and mitigating the effects of climate change are all ready in place, such as the Environment Act 2003. A number of specific gaps or constraints have been identified as:

- Comprehensive early warning and risk information availability for all islands.
- Risk transfer and insurance
- Capacity Building for Nationally Appropriate Mitigation Actions.
- Sustainable institutional arrangements for climate change including meteorological services, disaster risk management, green house gas emission mitigation, and international negotiations.
- Greater integration of climate change in all planning and implementation.
- Enforcement of policy and regulations.
- Technology Transfer Barriers
- Land issues.
- Access to funding/budget constraints.
- UNFCCC National Communications Reporting obligations.

COMPREHENSIVE EARLY WARNING AND RISK INFORMATION AVAILABILITY FOR ALL ISLANDS

This 2NC has developed the vulnerability and adaptation assessment chapter around various reports and projects conducted over the last 10 years since the INC. To date, site specific assessments have been conducted for Aitutaki, Mangaia, Tongareva (Penrhyn), Mangaia, Pukapuka, and the village of Ngatangiia on Rarotonga however more comprehensive vulnerability and adaptation assessments need to be completed for all of the Pa Enua as well as Rarotonga.

In terms of climate forecasting, there are still information gaps especially for many of the Pa Enua. This has been highlighted in the Climate Trends chapter. There are disruptions in satellite communications the automated weather stations that were installed in the Pa Enua following the 1996 economic transition and associated layoff of personnel. Following many decades of manual recording, these disruptions have lead to a discontinuous observation record at Meteorological head office in Rarotonga. Met Service requires support to data rescue, validate and quality control, as well as the ongoing need to maintain, upgrade, and equip all Pa Enua with observational systems.

Connected to vulnerability assessment is the need for more complete Geographical Information Systems (GIS) mapping work to identify vulnerable areas and value community assets. Consultation with both the Emergency Risk Management team and the Ministry of Infrastructure and Planning identified a desire to conduct further GIS work, MOIP for example are currently in the preliminary stages of conducting further analysis of Mangaia Island in the Southern group.

Studies into the vulnerabilities and possible adaptation strategies of people such as children, youth, women, disability and elderly affected by climate change need to be undertaken. This will better allow the impacts of climate change to be taken into consideration within the various social services provided by the Ministry of Internal Affairs.

There are also sectoral gaps for example, identified information gaps and specific capacity building needs for the agriculture and food security area include:

- Lack of information on increases in pests and diseases as a result of climate change.
- Limited of information on shifts in rainfall patterns and periods of drought.
- Agricultural research stations taking into account climate change.
- Education on adaptive farming practices and awareness of climate change issues amongst farmers.
- Availability and local acceptability of adaptive crops

The need for more financial and technical resources to be dedicated to vulnerability and adaptation assessments has also been identified in the NCSA as a gap and capacity need.[115] The NCSA also identifies the need to conduct a National Adaptation Programme of Action (NAPA)-like process to identify vulnerabilities and adaptation priorities. To some degree this is now encapsulated in the JNAP, however further site specific work needs to be developed through to identification of options to address the risk and implementation of adaptation actions.

RISK TRANSFER AND INSURANCE

Private sector insurance for climate related impacts is not available in the Cook Islands. Following climate related events, such as Cyclone Pat in 2010 which damaged 75% of infrastructure on Aitutaki and Cyclone and 2003 floods in Mangaia which devastated livestock and agricultural growing areas, the community and Government is completely reliant on contingency funds and aid[116].

While any homeowner who has a mortgage is required by the bank to take out insurance, this generally only covers fire and earthquakes, as exclusions have been progressively put in place by the private sector insurance companies following Cyclone Sally in 1987 for cyclones, flooding, and storm surge. It may be possible to obtain insurance for climate related impacts from reinsurers, but the cost is prohibitive. This may be in part due to the lack of comprehensive risk data across the Cook Islands, whereupon the premiums are increased to allow cover for the unknown variables. High premiums are also due to the small market and economies of scale.

Some businesses in a position have elected to 'self insure' by putting aside funds in a separate bank account, which enables them to rebuild following extreme events. The Government similarly has allocated a contingency fund mechanism within the annual budget for many years, and recently established a Emergency Response Trust fund which will have an annual allocation from the national budget which can only be accessed in the event a state of emergency is declared. This is overseen by a small board.

However with climate related extreme events set to increase in intensity (cyclones) and frequency (number of extremely wet days, hot days, droughts etcetera) there is a need to further consider risk management and transfer options for not only extreme events but also slow onset events such as loss of agricultural land to coastal erosion from sea level rise.

Because of the economy of scale issues regarding insurance and innovative approaches required with much of the relevant expertise externally based, the Cook Islands has been calling for work on regional risk transfer options and an international mechanism to address loss and damage from the adverse effects of climate change under the UNFCCC process.

NATIONALLY APPROPRIATE MITIGATION ACTIONS CAPACITY BUILDING

An effective greenhouse gas emissions mitigation strategy has to confront a number of institutional barriers. There is a need for some policy changes in order to improve the enabling framework for renewable energy and energy efficiency investments and for improved management of municipal and agricultural wastes.

Policies needed include:

- Inclusiveness of major stakeholders in relevant strategic discussions and implementation committees;
- Definition of role of private sector as provider of technology and of financing services;
- Establishment of regulatory framework and standards for energy technologies and grid assess (net metering and IPP grid assess codes);
- Institutional framework and unambiguous mandate for certification of technologies and technology providers/installers; and creation of independent, external advisory panel for assessment of new technologies to be introduced;
- Minimum efficiency standards for buildings designs, and important equipment such as household appliances, air conditioners, lights and vehicles.

While the need to develop renewable energy has been clearly stated in a host of national policy documents and enjoys widespread public support, few renewable energy projects are currently moving toward implementation.[117] It has proved difficult to put policies in place regarding imports of only energy efficient appliances, as the private

115 Government of the Cook Islands, National Capacity Self Assessment (NCSA) Capacity Development and Final Report, May 2009, p74

116 World Bank, Asian Development Bank and SOPAC, Pacific Catastrophe Risk Assessment and Financing Initiative A joint Initiative Co-funded by The Government of Japan and the Global Facility for Disaster Reduction and Recovery (GFDRR) Progress Brief, May 2011

117 Support for renewable energy projects stated in: Govt. CI (2009) NESAF, p43 ...

sector has often countered that this should be left to consumer choice.

A report by SPREP in 2004 found that "public and private sector capacity limitations in renewable energy expertise and knowledge are barriers to the widespread use of energy efficiency measures in the Cook Islands."[118] An increased capacity and understanding of renewable energy alternatives is needed to prevent the adoption of policies based on 'crisis management' and the continued reliance on fossil fuel energy and technology as a business as usual solution.

From speaking with stakeholders it is clear that many possess a good knowledge of renewable energy solutions and have been actively exploring different options, the difficulty often comes in securing Government funding for the initial feasibility studies and ongoing capacity building, particularly in terms of practical aspects such as installations and their maintenance. Government support also is limited in terms of creating economic incentives to adopt renewable energy technologies. The state-owned electricity supplier Te Aponga Uria does currently allow net-metering of grid connected household solar panels or personal wind generators up to 2KW, and off-grid generation with storage is not limited [119]. Technology constraints on the grid's stability with variable renewable energy inputs have resulted in the limitations to net metering.

Concerns have been expressed by stakeholders (Tourism, Maritime Cook Islands shipping registry, Airport Authority) about proposed measures at the international level to encourage the mitigation of emissions from bunker fuels, given the Cook Islands reliance on both national and international aviation and marine transport. The potential additional cost burden from multi-lateral or uni-lateral measures on the Cook Islands is seen as unfair when costs of adaptation to the impacts of climate change are already too high. Options for redressing these concerns remain to be identified and implemented, through technical and operational measures under the International Maritime Organisation (IMO) and the International Civil Aviation Organisation, as well as any consideration of target setting for the emissions from the international transport sector under the UNFCCC.

SUSTAINABLE INSTITUTIONAL ARRANGMENTS FOR CLIMATE CHANGE COORDINATION

Recommendations and aims of the national reports looked at in the development of this 2NC report emphasized the need to task a national body with oversight of climate change issues. This has also been strongly echoed in the consultations with stakeholders. In 'Key Strategic Actions' the NESAF report suggested that as immediate priorities the current National Climate Change Country Team (NCCCT) and related functions should be institutionalised as part of a wider National Sustainable Development Committee, including all relevant stakeholders, traditional leaders, non-government organisations, and the members of the private sector.

A further immediate priority was the need to have a full time National Climate Change coordinator appointed within this host institution to coordinate and mainstream climate change activities. The National Climate Change Coordinator needs to be enabled to ensure all relevant Ministries and departments are working to complement each other. Already some Ministries are developing their own contacts with donor and regional agencies on climate change activities, although it could be more advantageous to the Cook Islands as a whole if this contact was coordinated.

Both of these recommendations are in the process of implementation, but a key challenge is how to sustain such a body and personnel in a public sector which has hiring caps.[120] Also the new institutional arrangements for climate change means a learning by doing approach is being used and may require further refinement. While a broad stakeholder engagement on a climate change platform is vital, clarification of decision making on different aspects of climate change activities including finance, adaptation, mitigation and related policies remain to be clarified. A further functional review supported by the ADB currently underway may also propose further or alternative institutional arrangements for climate change that will need to be considered.

GREATER INTEGRATION IN ALL PLANNING AND IMPLEMENTATION

Despite efforts to make climate change planning multi-sectoral in the Cook Islands, there remains a gap in the incorporation of climate change issues into the planning activities and strategies of many government agencies and sectoral organisations[121]. This is in part due to other development priorities and conflicting resource demands, as well as limited knowledge of how to actually incorporate climate change considerations[122]. There is a general need to ensure that climate change is an issue for all Ministries and relevant national policies and plans, not just those coordinated by NES as the UNFCCC operational focal point.

Both the NCSA and the NESAF reports also draw attention to the issue.[123]The Cook Islands first NSDP did not make specific mention of addressing climate change as a strategic goal for the Plan treating it as a cross-cutting threat with limited actions detailed. Responding to climate change is more prominent in the current NSDP and NESAF, however means of implementation

118 SPREP (2004), Draft National Report: Pacific Islands Renewable Energy Programme (PIREP), Energy Division, Ministry of Works/SPREP Rarotonga.

119 Govt. CI (2009) NCSA, p74

120 Govt. CI (2009) NESAF, p44

121 It was a common point raised and emphasised in stakeholder consultations.

122 Food and Agriculture Organisation of the United Nations (FAO), ***Climate Change and Food Security in Pacific Island Countries***, Rome, 2008, p224

123 Govt. CI (2009) NCSA, p72 and NESAF, p96

and incentivising changes from business as usual, remain unclear. Unless climate change mitigation and adaptation are further integrated into the planning and budgeting processes of government, they will continue to be addressed in a 'piecemeal fashion as has been in the past'.[124]

It is through the integration of climate change issues with other policies such as disaster preparation, environmental conservation, coastal and land use planning which will lead to long term enhancements in the capacity of the Cook Islands to adapt to climate change. While the JNAP and the Energy Roadmap do provide a guide for this work, the gap between resources required and resources available is significant.

ENFORCEMENT OF POLICY AND REGULATIONS

Another issue which became apparent through consultation with stakeholders was the need to improve the enforcement of those climate change related regulations which are already in place. This idea has also been emphasised in reports such as the NESAF[125]. The lack of an over arching climate change body has meant that weaknesses have developed in the implementation, enforcement, monitoring and management of environmental programmes and regulations. An example would be the enforcement of building codes and standards around the construction of septic tanks, For the Health Inspectors, checking of the constructed septic tanks is not done sometimes because builders do not inform the inspectors of the construction.[126]

The problem of enforcement is apparent across many of the sectors working on climate change related issues and often stems from a lack of financial resources, capacity and understanding as well as the lack of an over arching climate change body to follow up on the implementation of activities.

TECHNOLOGY TRANSFER

Large scale implementation of all technology options required a strengthening of the institutional capacity and the establishment of enabling frameworks for private sector and market led dissemination. Another key barrier noted was the inequitable social conditions amongst the country's islands. Also noted was a lack of policy to enable technology development, and a lack of recognition amongst the public and professionals for the need for technology development. A lack of knowledge of, and respect for, traditional customs and practices was recognised as potentially impeding climate change adaptation and mitigation implementation at the Cook Islands. It was noted that donors do not always have the same agenda as the nation. Ideas from technology needs assessment workshop participants on how to overcome such barriers included landholder and community consultation, education and awareness raising projects and policy and legislation development, reform or clarification. There have also been limitations in the availability of information, technical backstopping and advice or mobilisation of funding relevant to Small Islands Developing States from the UNFCCC and its Expert Group on Technology Transfer.

LAND ISSUES

There are several constraints and gaps related to land issues in the Cook Islands. Barriers to implementation of technology transfer within the technology needs assessments included landowner rights. The Cook Islands' traditional system of family owned lands, with land rights at the landowner level rather than government level, means that land is family governed, it is difficult to apply government laws and there are no land zoning plans. There has been an issue of land availability for the implementation of infrastructure projects such as renewable energy facilities and sewage and waste treatment plants. Indeed the sites of the Rarotonga and Aitutaki Landfill and septage pond took many years to establish.[127] The Ministry of Agriculture research station located at Titikaveka was recently closed as a result of requests by the landowner for a return of the family land on which the station was located.[128] This also serves to highlight the implications for adaptation in response to forced displacement and climate change driven migration

Similarly there are concerns regarding the implementation of zoning regulations around riparian strips and coastal zones. The concept of land zoning in the sense used overseas is simply not applicable to the land tenure system of the Cook Islands.[129] Yet land use and physical planning that look at the possible impacts of climate change and sea level rise are one of the most powerful tools for reducing vulnerability. Planning mechanisms can be used to direct or regulate all new investments in infrastructure, housing construction and agriculture outside vulnerable zones to minimise vulnerability, reduce repair costs and decrease disruption to economic activities.

This constraint can be minimised through overcoming the difficulties of balancing traditional ways with western conservation ideas.

SUSTAINABLE FINANCE / BUDGET CONSTRAINTS

To date most climate change activities undertaken by Government or communities in the Cook Islands have

124 FAO (2008), p228

125 Govt. CI (2009) NESAF, p59

126 Rongo, Teariki and Rongo, Julia, Cook Islands National Report: United Nations Convention to Combat Desertification (land Degradation), Island Friends Ltd environmental consultants, p61-62

127 Rongo, Teariki and Rongo, Julia, Cook Islands National Report: United Nations Convention to Combat Desertification (land Degradation), Island Friends Ltd environmental consultants, p 41

128 FAO (2008), p220

129 Rongo, Teariki and Rongo, Julia, Cook Islands National Report: United Nations Convention to Combat Desertification (land Degradation), Island Friends Ltd environmental consultants, p 57

been donor funded.[130] There is a need and obligations under the UNFCCC to ensure at international and regional levels that new and additional financing of specific climate projects continue. The Government of the Cook Islands is clear that diversion of ODA should not be used for climate change funding initiatives.

At the same time Government recognises that climate change should also be a priority at sector level and individual Ministry levels to ensure an effective and prioritised response to impacts, and to provide efficient coordination across government and communities of financial flows under climate initiatives, as well as highlighting that climate change is not only an environmental issue.

Particularly in relation to mitigation and adaptation projects however, it has been very difficult to identify national resources that could be redirected given the demands of social development needs. Given the Cook Islands limited financial and technical resources, it will be impossible for the government to effectively address the wide range of issues and actions necessary to respond and adapt to climate change. Hence the government aims to strategically address a limited number of clearly identified priorities and actions based on the greatest needs and risks from climate change. Examples are water supply, coastal erosion and renewable energy[131] .

Further constraints relate to accessing multilateral funds through the UNFCCC and GEF or new and additional direct budgetary support for climate change activities. The Ministry of Finance – Aid Management Division have identified several gaps in the ability provide the data to meet the fiduciary requirements to attain National Implementing Entity status under the Kyoto Protocol Adaptation Fund and is seeking support to address these gaps. For this reason the Cook Islands decided to develop a proposal to the Adaptation Fund Board with a Multilateral Implementing Entity UNDP.

There is no dedicated unit for developing project or programme proposals for funding. Climate change activity funding has primarily been sought on an ad-hoc basis by National Environment Service, with the opportunities and support for implementation going to various ministries. This proposal development role may now be taken on by Climate Change Cook Islands within the Office of the Prime Minister.

130 See Chapter 3 for description of agencies operating in the Cook Islands.

131 FAO (2008), p228

REPORT SPECIFIC – ABILITY TO MEET OBLIGATIONS

In the preparation of the 2NC the Cook Islands project management unit in NES experienced challenges in achieving the outcome.

Problem	Solution
Poor quality high cost reports prepared by consultants for various outputs of the 2NC project	Project coordinator drew on the expertise on the climate change country team through one on one consultations with individual sectoral representatives to provide better quality inputs and address gaps in the report prepared by the consultant Withheld payment from consultants and communicated expectations in writing for further work to be done as part of the terms of reference of the consultancy. Payment made available once a satisfactory report submitted.
Delays in disbursement	Government advanced funds to the project on a reimbursement basis. This will not be possible in future due to public expenditure policy changes Coordinated with other national work that does not require financial input.
Insufficient funds for project management component	NES as an agency of Government paid the salary of the Project Coordinator and Technical Advisor for the majority of the project.
Project Coordinators require climate change technical abilities, but such personnel doesn't necessarily include project or financial management/ accountancy skills	Channelled 2NC programme funds through the Aid Management Division of MFEM. Cross checked records. Requested support from NCSP where appropriate.

Conclusion

Sunset View in Rarotonga © NES

Red tailed tropicbird (*Phaethon rubicauda*) Tavake © NES

The Cook Islands faces severe climate impacts and higher vulnerability due to increased climate change and global warming. While scientific and technical research, studies and programs seek to highlight in more specific detail the levels of impacts, vulnerabilities and resilience, many communities, on small isolated low lying atolls and on the higher volcanic islands of the Cook Islands, look to the Government to identify how and where it can address many of these impacts in a socio-economic context.

Since the INC, the Cook Islands has progressed in addressing climate change nationally and also at the community specific level. As a Party to the Kyoto Protocol and to the UNFCCC, the Cook Islands has participated through and accessed multilateral funds provided under the Convention on regional and national climate projects, many of which have been identified in this Communication.

Adaptation remains the priority for the Cook Islands. A 'no-regret' resilience building approach is a benefit for the country as a whole; communities would be strengthened and knowledgeable and make better informed decisions. Nevertheless, the Cook Islands continues to face a high cost and burden for increasing impacts of climate change, and while addressing these impacts are a priority, the Government and individual response is constrained severely through priorities of other key sectors, such as health and education. For its part the Cook Islands Government is moving toward a coordinated approach to addressing climate change through legislative, policy, and sector level activities, that in turn will assist it cope with a changing climate.

The Cook Islands look forward to the third national communication as it will further report on the progress made in addressing the constraints and gaps highlighted in this communication and where appropriate fulfil its obligation and effective implementation of the convention.

Annexes

Pukapuka CICC Church, aftermath of cyclone Percy 2005 © NES | Rockwall in Arorangi © NES | Planting taro – Food Security © NES

Annex 1: Country Description

Country Description and National Circumstance

In the Southern group of the Cook Islands, only Rarotonga is high volcanic, while the rest of the islands are low volcanic surrounded by a raised reef platform or Makatea. The height range for the southern Cook Islands is 5 to 652 meters above mean sea level.

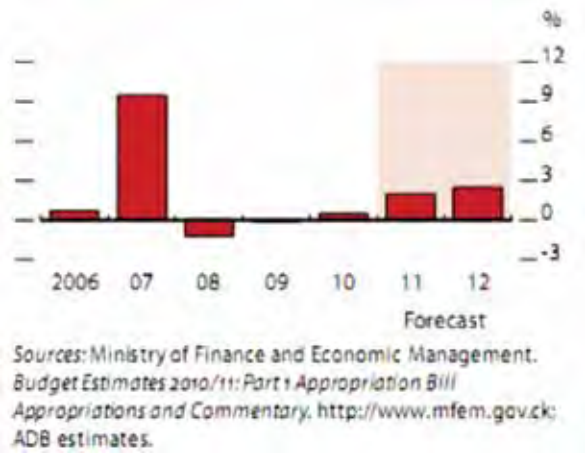
The Northern group of islands, with the exception of Tongareva (Penrhyn) emerge from a large submarine feature known as the Manihiki plateau. These islands are low-lying atolls and a sand cay with a height range of 3 to 9 meters above mean sea level. Tongareva (Penrhyn) is the most remote and largest atoll of the 15 Cook Islands. It is 1365 km north-north-east of Rarotonga, and 9° south of the equator. It sits atop the highest submarine volcano in the Cooks, 4876 m above the ocean floor and comprises a 77 km ring of coral. The lagoon covers 233km^2 of which 62km^2 are covered with pearl-shell making it the largest lagoon in the South Pacific (Carter, 1984). Suwarrow atoll is an uninhabited coral atoll designated as a National Park and has an important seabird breeding colony in the central South Pacific.

The Economy

After two years of contraction, the economy grew by 0.5% in financial year (FY) 2010 (ended 30 June 2010). This was supported by expansion of tourism and fisheries, as well as the start of construction on some donor-financed infrastructure projects. Visitor arrivals and expenditure rose by 2.7% and 2.6%, respectively. Exports of fish (54% of total exports) increased by 15.9%. These performances offset a 10.1% decline in pearl exports caused by a shortage of skilled pearl-seeding technicians.[132]

Growth is projected to increase up to 2.0% in FY2011 (Figure 14), as infrastructure projects, including development of Avatiu port, gain momentum. However tourism is subdued because of reduced consumer spending in New Zealand, the main source of visitors. Growth prospects are more positive for FY2012, on the expectation that tourism will pick up and infrastructure investment will increase. GDP growth is forecast to rise to 2.5% that year.

Figure 14: GDP Growth for Cook Islands



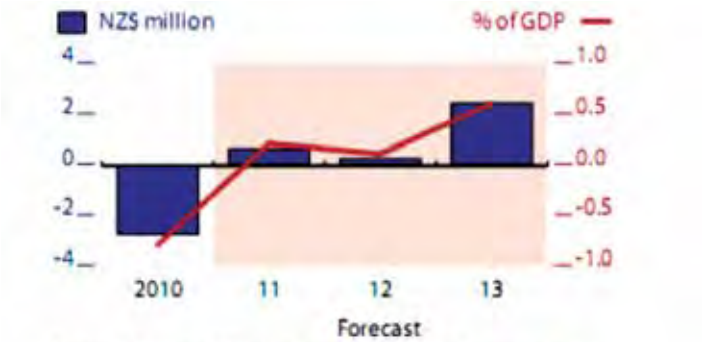
Sources: Ministry of Finance and Economic Management. *Budget Estimates 2010/11: Part 1 Appropriation Bill Appropriations and Commentary*. http://www.mfem.gov.ck; ADB estimates.

Inflation moderated to 3.5% in FY2010, but will likely quicken to average 4.0% in FY2011. Higher prices for imported oil and commodities, coupled with increased construction activity, have pushed up prices for food, housing-related costs (including electricity), and transport.

Merchandise exports fell by 21% in FY2010, lowing largely to the problems with pearl production, while imports rose by 42%. The trade deficit widened and is expected to worsen as import growth driven mainly by materials for projects that donors are financing,

132 Pollard S et al, 2011, Asian Development Outlook 2011 Small Island States Cook Islands

Figure 15: Fiscal Balance for Cook Islands



Source: Ministry of Finance and Economic Management. 2010. *The Cook Islands Half Year Economic and Fiscal Update for the Financial Year 2010/2011*. December. http://www.mfem.gov.ck

Table 22: Gross Domestic Product (GDP) at Current Market Price

Calendar Year	GDP (NZ$'000)	Growth Rate (%)	Mid Year Population	GDP per Capita ($)	Growth Rate per capita (%)
1996	137,002	-3.7	20,000	6,850	-6.6
1997	130,183	-5.0	18,300	7,155	4.5
1998	141,054	8.4	17,400	8,107	13.3
1999	152,760	8.3	16,500	9,258	14.2
2000	177,834	16.4	18,000	9,880	6.7
2001	205,679	15.7	18,200	11,301	14.4
2002	220,550	7.2	18,400	11,986	6.1
2003	246,038	11.6	18,400	13,372	11.6
2004	258,428	5.0	20,300	12,730	-4.8
2005	261,347	1.1	20,200	12,938	1.6
2006	277,649	6.2	20,800	13,349	3.2
2007(r)	274,542	-1.1	21,100	13,073	–2.1
2008(p)	289,329	5.4	21,200	13,648	4.4

Source: Cook Islands Statistics Office

Government revenue exceeded budget estimates by 4.3% in FY2010, a result of better than expected receipts from company tax and one-time revenue from fines for illegal fishing. Expenditure was 9.6% over budget, partly on account of supplementary appropriations to cover cyclone recovery expenses and subsidies for Air New Zealand flights from Rarotonga to Sydney and Los Angeles. Despite this the budget deficit of NZ$2.7million (0. 8% of GDP) narrowed sharply from 11.7% in FY2009.

The FY2011 budget projects an operating surplus of 0.2% of GDP (Figure 3.35.2), but this was framed against an earlier backdrop of a more positive tourism outlook. Consequently, revenue collections will need to be revised down. The government is aiming to trim expenditure by 1.5% relative totoFY2010. Public debt is projected to fall by NZ$30million to NZ$114.8million in FY2011 (equivalent to 34% of GDP), mainly due to movements in exchange rate.

Table 23: Labour market indicators (resident population 15 years and over) – 2001 population census

Indicator	Total	Males	Females
Number of persons employed	5,928	3,386	2,542
Number of persons employed (urban)	4,569	2,501	2,068
Number of persons employed (rural)	1,359	885	474
Number of persons employed – private	3,291	1,798	1,493
Number of persons employed – public	1,452	835	617
Unpaid workers, subsistence workers	82	48	34
Unemployment rate (%)	13.1	11.7	14.8
Labour force participation rate (%)	69.0	76.4	61.4
Employment-population ratio (%)	60.0	67.5	52.3
Gross average annual income from all sources	$12,253	$14,121	$10,328

Source: Cook Islands Statistics Office

Table 24: Inflation rate 2009

	All Group	Food	Housing	Household Operations	Apparel	Transport	Tobacco and Alcohol	Misc
Mar	8.54	8.79	8.02	7.01	-0.64	11.28	16.24	2.76
Jun	10.23	11.40	7.96	7.83	-0.75	12.76	21.80	3.65

Source: Cook Islands Statistics Office

Table 25: Merchandise Trade – Balance of Trade

Period YEAR	Balance of Trade		Exports		Imports	
	($'000)	% change	F.O.B.	% change	C.I.F.	% change
2004	-103,607	–2.7	10,771	–26.2	114,378	-5.5
2005	-107,838	4.1	7,417	-31.1	115,255	0.8
2006	-148,156	37.4	5,420	–26.9	153,576	33.2
2007	-137,694	-7.1	7,052	30.1	144,746te	-5.7
2008(e)	–207,067	50.4	5,895	-16.4	212,962	47.1

Source: Cook Islands Statistics Office

Tourism Sector

More recently the Cook Islands Government and the private sector, including representation from the Cook Islands Chamber of Commerce, have moved toward outer island tourism development promotion along with associated infrastructure services. A number of Southern group islands, such as Atiu, Mauke, Mangaia and Mitiaro, already cater for an increasing tourism industry and have suitable accommodation facilities available. In the Northern group currently only Manihiki and Tongareva (Penrhyn) have tourism capacity although on atolls such as these, pressure for scant water resources, and energy needs are only just being met. Thus with an increased growth in visitor numbers, the pressure will only get worse.

Agricultural Sector

The tourism sector is an important market outlet for locally grown produce. In addition some agricultural produce is exported to New Zealand. Agriculture contributes about 18% of the country's GDP in 2009. The Ministry of Agriculture has an ongoing research programme focused on finding new varieties of fruit and vegetables that will grow in the Cook Islands, along with promotion of sustainable farming particularly in the Northern Group of the Cook Islands. The Ministry of Agriculture is currently initiating projects to revive the citrus, banana and pineapple-growing industries in the Pa Enua.

MARINE RESOURCES SECTOR

About 271 tonnes of fish worth an estimated $NZ 2.5 million (gross) were caught in southern waters in 2002, but with the help of a sharp increase in the number of fishing boats based in the Cook Islands, the same total was caught in the first 6 months of 2003. Cook Islands boats caught about 846 tonnes of tuna in the north worth about $3.1 million (gross) last year and by June 2003 had caught about 380 tonnes. Ministry of Marine Resources officials estimate that about 100 tonnes a year are caught by foreign fishing boats operating illegally in the area.

The Cook Islands also receives about $1 million a year from a fishing treaty which allows a set number of US tuna fishing boats to operate in the country's EEZ each year. Fishing in the zone is monitored by Royal New Zealand Air Force and French military maritime patrols and the Cook Islands patrol boat Te Kukupa. There are heavy penalties for illegal fishing in Cook Islands waters.

Government has a strong policy of local involvement in the fishing industry, but allows some joint ventures with foreign companies. Growth of the fledgling industry has been encouraged by tax concessions. A project to enlarge the country's largest harbour at Avatiu, Rarotonga was prompted largely by a rapid increase in the number of longline fishing boats based at the port and government is also encouraging the growth of infrastructure such as training, processing and storage facilities.

Education and Training

The Ministry of Education has a significant level of engagement with Education for Sustainable Development and Climate Education. The Ministry has been involved with programmes such as Sea Read from the National Institute of Water and Atmosphere in New Zealand and Sand Watch through UNESCO. Links have been made between these programmes and the Science and Social Science curriculum documents which strengthen their position in learning programmes. Cook Islands schools have successfully participated in international competitions around these themes. Ministry staff has actively participated in a number of regional and international workshops around themes of education for sustainable development. There are also a number of NGOs running community awareness initiatives who work with schools in their immediate area on specific programmes.

Post secondary education facilities include the University of the South Pacific and a range of vocational opportunities. The USP Centre is developing methodologies for providing a greater level of opportunity for learners on other islands. At the tertiary level, a Postgraduate Certificate in Climate Change Vulnerability & Adaptation is available through the University of the South Pacific, including the local extension centre. The Association of Cook Islands Tertiary Institutes provides programmes in tourism and hospitality and tourism, automotive engineering, electrical and carpentry as well as a new range of courses in sports and life skills. Scholarships are available for students to attend university. These scholarships may be used to meet the cost of fees for students studying by distance in country or to attend university overseas. Preference is given to the regional university as a provider where possible.

Terrestrial and Marine Biodiversity

The vegetation communities can be broken down into six categories: atoll communities, makatea or raised coral reef, coastal ridge, wetlands, fernlands, and the interior cloud forest area of Rarotonga. It is this interior cloud forest area which is the most important supporter of species – with this area containing four endemic species not found elsewhere in the world.[133] The Cook Islands has 33 endemic plants, ranging from moss, ferns to shrubs and trees and 33 endemic animals ranging from insects, snails and birds. Rarotonga has more endemism of plants and animals with 24 endemic species.

There are a number of species at risk in the Cook Islands such as the Rarotonga flycatcher which was classified as critically endangered in 1989 and has now moved to endangered under the IUCN classification system. Other endemic species such as the Atiu swiftlet need urgent protection because of increased disturbances in their habitat, particularly by visitors. Long living coconut crabs have been exploited on many of the islands as a food source, although on atolls such as Suwarrow shows there is a need to protect this important species.[134]

Two of the uninhabited islands, Takutea in the Southern group managed by the Atiu Trust, and Suwarrow in the Northern Group, a National Park of the Cook Islands, play an important part in protecting tropical sea bird species. These islands are important breeding grounds for seabird colonies not only for the Cook Islands but also for the region. These colonies persevere on these islands because of limited human disturbance by human interference as in other localities in the Cook Islands and in the Pacific region.

Marine Biodiversity in the Cook Islands is impacted by onshore pollution, such as high sediment discharges through erosion and land disturbances from development practices, as well as sewerage seepage into lagoons from inadequate or ineffective disposal systems. On many islands the use of agricultural chemicals to manage crops and weed control has led to an increased concern over the effect that these chemicals may have on seafood resources and lagoon water quality. The overharvesting of seafood resources both inside and outside of the lagoon systems in the Cook Islands has led to some island authorities instituting methods of protection, such as reserve areas or 'raui'.

Terrestrial Biodiversity on the islands are also threatened by the introduction of plants and animals that has been intentionally introduced and those that are accidentally introduced to the islands. Introduced weeds have become a major concern and are considered to be a potential threat to the indigenous forest systems particularly on Rarotonga. The balloon vine (*Cardiospermum grandiflorum*), balsam bear (*Momordica charantia*) and red passion fruit (*Passiflora rubra*) are three such invasive species that often occur together. Seventy years ago, the balloon vine was only found in one part of Rarotonga, it has now spread across the whole island. On the other islands the balsam bear and red passionfruit are common, especially on old and unattended plantations. African tulip (*Spathodea campanulata*) is also found on the valleys and mountains of Rarotonga, this is of concern

133 FAO (2008), p188

134 Rongo, Teariki and Rongo, Julia, Cook Islands National Report: United Nations Convention to Combat Desertification (land Degradation), Island Friends Ltd environmental consultants, p34

not only does it compete with native plants for sunlight and nutrients but it can tap into the water table. The mile-a-minute (*Mikania micrantha*) is another commonly recognised invasive weed.[135] Increased vigilance at all border entry points is needed to minimise any further impact to these islands.

135 Rongo, Teariki and Rongo, Julia, Cook Islands National Report: United Nations Convention to Combat Desertification (land Degradation), Island Friends Ltd environmental consultants, p32

As part of the Convention on Biological Diversity (CBD) the Cook Islands completed its National Biodiversity Strategy Action Plan (NBSAP) in 2002 and have also completed its report to CBD, the Cook Islands 4th National report in 2011. These documents are a road map to better address biodiversity issues in a directed manner as well as coordinate national programs for the protection of its environment.



Left to right: Balloon vine (***Cardiospermum grandiflorum***); ***Merremia peltata***; Mile a minute (***Mikania micrantha***)

Annex 2: Climate Relevant Roles & Functions Of National Climate Change Country Team Members

THE COOK ISLANDS METEOROLOGICAL SERVICE (CIMS)

Vision: "To deliver quality weather information to the community"

.As part of the National Police Service, the core responsibilities of the Met Service include: monitoring meteorological systems; developing predictive capability of adverse weather conditions and imminent emergencies; communicating any predictions to communities; ensuring that systems are in place for early warning and ability to respond to natural disasters and emergencies.

The Service has twelve (12) staff including the Director and Deputy Director and a Climate Officer. The Director has been the Chair of NCCCT since 2006. The Director is a contributor to the IPCC as a co-author for Chapter 9 on extreme weather events. The Service contributes to the science of climate change through the weather information it gathers and its international partnerships. It is a member of the World Meteorological Organisation and participates in the World Climate Conferences. CIMS also oversees and maintains the sea level rise monitoring equipment linked to the National Tidal Facility of Australia based in Adelaide. Products received from the data include monthly newsletter and historical record of climate information.

NATIONAL ENVIRONMENT SERVICE / TU'ANGA TAPOROPORO (NES)

Vision: "*To protect, conserve and manage the environment of the Cook Islands, our heritage, in a sustainable manner through promoting community participation for the benefit of current and future generations*".

The National Environment Strategic Action Framework (NESAF) 2005-2009 is the main policy framework for the environment sector in the Cook Islands and the overall mandate for the formulation of the NESAF was given by the National Environment Act 2003.[136] An updated NESAF 2012-2016 is now being developed to further guide the environment sector. The NES does not have a specific mandate for Climate Change as Climate Change is not referred to in the Environment Act 2003 . Nevertheless, the NES has taken the lead in Climate Change-related activities as the operational focal point for the UNFCCC. The NES also serves as the Global Environment Fund's (GEF) operational focal point.

The NES's past business plans calls for the development of a Climate Change policy. This is now in progress with the assistance of various partners. The NES's Deputy Director and the Manager of Island Futures Programme are active negotiators for the Alliance of Small Island States (AOSIS) in UNFCCC-related fora. Both are contributors to the IPCC. All major Climate Change-focused projects and programmes were negotiated and implemented by and through NES. To all intents and purposes, NES has served and is looked upon as the focal point within government for climate change activities in the Cook Islands.

MINISTRY OF FOREIGN AFFAIRS AND IMMIGRATION (MFAI)

The Ministry's vision is to protect and advance the interests of the Cook Islands through targeted engagement and coordinated interventions in bilateral and multilateral for partnerships, as well as a national immigration policy and legislation that positively influences and improves quality of life in the Cook Islands. Amongst its key objectives, the Ministry will manage, sustain and develop the Cook Islands' political, economic and socio-cultural relationship with New Zealand as well as regional partners and countries beyond the Pacific; and develop and manage the Cook Islands' membership of international organisations including its obligations under treaties to which it is party.

Accordingly, MFAI is the political focal point for the UNFCCC; as such, it is responsible for receiving and disseminating official communications from the UNFCCC on all climate-related notifications. As the official channel of communication for government, the MFAI provides oversight of government's relations with regional and international partners. It also plays an advocacy role by ensuring that national priorities are reflected in regional and international initiatives. Ministry staff also participates in Climate Change negotiations.

OFFICE OF THE PRIME MINISTER (OPM)

The OPM is the co-chair to the NCCCT. The Prime Minister is the Chair of the National Disaster Risk Management Council (NDRMC) under the DRM Act 2007. Through its business plan, the OPM notes that the economy of the Cook Islands is heavily dependent on its natural environment and ecosystem. Sea level rise is a major concern for atolls which are impacting on resources and the wellbeing of the people of those islands.

CENTRAL POLICY AND PLANNING UNIT (CPPU), OPM

The Central Policy and Planning Unit (CPPU (CPPU) of the OPM is the primary architect of the 'Te Kaveinga Nui', which is the 2020 vision for the nation, as well as the NSDP (2007-10) which provides the overall direction for the country's development. The CPPO has been leading a comprehensive review of the NSDP that will culminate in an updated NSDP for the period 2011 to 2015. The CPPUCPPU Director has been involved as a member of Cook Islands delegations in Climate Change-related regional and international fora.

RENEWABLE ENERGY DIVISION (RED), OPM

This division has three staff and the key output of the RED is for an effective, efficient sustainable renewable energy system for the Cook Islands. The implementation of an Energy Policy that was approved in 2003 has been stymied with no funds allocated for that purpose from either internal or external sources. The Sustainable Energy Action Plan approved in 2009 was only recently allocated

136 Environment Act 2003 Section (9) (1 m, n, o), (3)

funding. Part two of the Plan which outlines the detailed priorities is yet to be developed. Scoping is under way for the supply of a hybrid solar and diesel power electrical system in Rakahanga as well as a solar power system for Pukapuka through external funding.

Efforts to secure budget funds for specialist staff on renewable energy have been unsuccessful. The Division's responsibility for renewable energy places it at the forefront of any drive for Climate Change mitigation activities across the Cook Islands.

EMERGENCY MANAGEMENT, COOK ISLANDS (EMCI)

The Emergency Management Unit of the Cook Islands was established in 2006 in the Office of the Prime Minister. Its primary role is to conduct auditing and assessment for disaster preparedness across Government ministries and agencies. This includes promoting cooperation amongst agencies with a role in disaster risk management, and enhancing their capacities to maintain the provision of essential services during periods of disaster and emergency; and enhancing the capacity of the government, relevant agencies and the community to effectively manage the impacts of disasters and emergencies and to take all necessary action to prevent or minimise threats to life, health and the environment from natural disasters, man made disasters and other emergencies.

Established in 2006 the EMCI is a division within the OPM with two staff, the Director and an Education/Information Officer who administer the Disaster Management Act 2007. They have worked closely with the NES and other stakeholders in developing the new Joint National Action Plan for Disaster Risk Management and Climate Change Adaptation (JNAP DRM CCA) which describes how the Cook Islands will implement the strategy of establishing a coordinated and effective national disaster risk reduction and disaster management system for all hazards that includes climate change..

MINISTRY OF FINANCE AND ECONOMIC MANAGEMENT (MFEM)

Vision: "To be a competent and professional organization, inspiring public trust in managing public finances in pursuit of our national development aspirations".

The Ministry is the key fiscal and economic advisor to government; the Financial Secretary is a member of the DRMC. The Financial Secretary has had some involvement in Climate Change fora internationally and staff are informed about the potential impacts of Climate Change on the economy. Within MFEM an officer is designated climate change focal point for the Ministry related to Climate Change financing. Through its mandate for providing responsible economic and financial advice, including the annual budgets for the whole of government and its oversight role for external funding for government activities, MFEM is well-placed to be a key player in mainstreaming Climate Change considerations across government.

AID MANAGEMENT DIVISION (AMD)

As a division of MFEM, the AMD's objective is to provide effective and efficient administration of donor assistance through:

- Providing an intermediary role between development partners and government agencies, assisting with proposal development, and monitoring and evaluation of progress.
- Providing a mechanism for financial transaction from donor to project or program implementation.
- Capturing the expenditure of aid funds.

The AMD's Director is a member of the National Sustainable Development Commission (NSDC) and has been involved in Climate Change-related conferences internationally. The AMD can therefore play a significant role in mainstreaming Climate Change considerations across government.

MINISTRY OF INFRASTRUCTURE AND PLANNING (MOIP)

The overall objective of MOIP is to improve the quality of infrastructure development in the Cook Islands by strengthening regulatory and monitoring functions of the Ministry; and to provide affordable, efficient, effective and sustainable infrastructure including water supply, waste management, roads and drainage for Rarotonga. Water and sanitation representatives from MOIP are also part of the country team. Furthermore, MOIP provides support to the Island Councils' (local governments) of the Pa Enua. Its energy division, until recently, included renewable energy as well as the electrical safety inspectorate. In early 2011 the Renewable Energy Division was transferred to the Office of the Prime Minister. The Electrical inspectorate responsible for the maintenance and enhancement of the electrical standards in the electrical industry has remained with MOIP. In addition, the Ministry is responsible for the monitoring of land mapping and custodianship of land information as well as the building control service.

The Secretary of MOIP is a member of the DRMC. Except for telecommunications, the Rarotonga electric power supply, and the Rarotonga and Aitutaki port and airports, MOIP is responsible for the maintenance and development of all other physical infrastructure. Except for Aitutaki, MOIP works jointly with the Island Councils in all other Pa Enua in the development of their airports, ports and landings. Climate Change is becoming a key consideration in the Ministry's infrastructure development plans and it is the Ministry's intention to incorporate climate change considerations in the design stage of its infrastructure development plans.

MOIP is the National Focal Point and Repository of the GEF-UNDP-SPREP Pacific Adaptation to Climate Change (PACC) Project and the GEF-UNDP-UNEP-SOPAC Integrated Water Resources Management (IWRM) Project. The PACC is the first major demonstration project on adaptation in the region. The development of the Mangaia Harbour was chosen for that purpose. The

main goal of this project is to enhance the capacity of the Cook Islands to adapt to Climate Change, including variability, in selected key development sectors. The main objective is to "increase the resilience of coastal zones and its associated infrastructure". The project is almost complete with the adaptation lessons learnt to be extended to other major infrastructure projects. Lessons learnt in similar development projects in other Pacific island countries through PACC will also be drawn on for this purpose.

The five-year IWRM Project aims to improve groundwater, freshwater and lagoon water quality using an integrated water resource management framework for Rarotonga. A secondary aim is to gain information on the availability of groundwater for drought relief.

The MOIP is poised to mainstream Climate Change considerations in all its infrastructure activities through its practical experiences in implementing PACC and the IWRM projects with external support. Its role as the building standards controller provides the opportunity for the Ministry to update the national building code informed by its experiences in the recovery process in Aitutaki in Cyclone Pat's destructive wake in February 2010.

MINISTRY OF INTERNAL AFFAIRS (INTAFF)

Vision is: "Empowered families, supportive communities, in harmony with our culture."

The Ministry's focus on people in need, promoting the rights of the disadvantaged, gender equity, workers' and employers' rights, consumer protection and close links with community organizations and NGOs, means that it is well placed to promote Climate Change considerations to the community.

It has a wide-ranging brief also to support the well-being of the Cook Islands through activities involving welfare and social services, labour and consumer regulation, community support and film censorship.

THE MINISTRY OF MARINE RESOURCES (MMR)

Vision: "To work in partnership with communities, businesses and other agencies so that, throughout the nation, the people of the Cook Islands are receiving maximum long-term benefits from the sustainable development and utilisation of marine resources. "

The Ministry administers the Ministry of Marine Resources Act 1984 and the Marine Resources Act 2005. The latter provides for the conservation, management and development of marine resources and related matters. The MMR describes the country's marine resources as being 'under increasing pressure' and lists both 'the need to conserve the resource' and 'climate change' as being among the five causes for such pressure.

The Ministry is well aware of the need for conservation of the nation's marine resources as a means of assuring food security and livelihoods. Climate Change considerations are taken into account as part of MMR's support for pearl production and the development of lagoon management plans.

MINISTRY OF AGRICULTURE (MOA)

Vision: "For the Cook Islands to be autonomous in food and livestock production, and to be protective and vigilant about threats from plant and animal pests and diseases."

The Ministry's 'Operating Environment' statement in its business plan reads in part as follows: "Climate Environment: The realities of climate change will invariably impact upon the production of food security and livestock. Extreme weather patterns of drought, cyclonic and heat stresses place harsh conditions upon production. The alternative is for the adoption of natural science to farming practice through 'biological agriculture' to build the resilience of horticulture." This indicates the Ministry's awareness of the need to consider Climate Change as a key factor in its plans for agricultural development and food security.

MINISTRY OF HEALTH (MOH)

The Ministry envisages 'all Cook Islanders living healthier lives and achieving their aspirations' through the provision of accessible and affordable health care of the highest quality, by and for all in order to improve the health status of the people of the Cook Islands. Amongst the Ministry's 14 strategic objectives, two are directly relevant to Climate Change:

- To reduce the impact of communicable diseases with an emphasis on Sexually Transmitted Infections (STI's), HIV/AIDS, vector borne diseases and the emergence of new infectious diseases.
- To improve environmental health focusing on food and water safety, clean air, improved sanitation, and waste management.

Under the Ministry of Health Act 1995-96, the principal functions of the Ministry include a requirement to assist the people in protecting themselves from infectious agents, injurious substances and practices likely to have a damaging effect on health. The Ministry also administers the Public Health Act 2004, Public Health (Sewage) Regulations 2008 and the Food Regulations 2008.

Part of the Ministry's operating environment statement in its Business Plan for the current financial year notes that the health of a population relies on a healthy environment with access to safe and sustainable water, air, and land resources. Inadequate sanitation and waste management facilities places stress on the environment and eventually leads to the transmission of communicable diseases among the population e.g. typhoid fever. Increased tourism throughput also places stress on the environment with the increased generation of waste. In addition, poor infrastructure affects quality water supply which can increase diseases such as gastroenteritis and skin sepsis. The Ministry makes no direct reference to the changing weather patterns or Climate Change being a contributing factor to the occurrence of mosquito borne diseases such as Dengue fever.

However, with the support of the World Health Organisation (WHO), by December 2010 the Ministry had

developed a draft Climate Change and Health Adaptation Plan for the Cook Islands. The draft recommends that the plan be incorporated in the DRM NAP and National Adaptation Programme for Action NAPA. This is a significant development that signals the integration of climate considerations into the Ministry's strategic objectives and plan through to its annual business plans in addition to the proposed integration into the NAP NAPA.

MINISTRY OF EDUCATION (MOE)

Part of the Ministry's vision is that it provides a dynamic and professional environment which promotes and supports lifelong learning through the provision of quality services. This supports the sector and the Education Master Plan 2008 – 2017 vision to "build the skills, knowledge, attitudes and values of Cook Islanders to put their capabilities to best use in all areas of their lives."

The MOE is working together with EMCI and SOPAC to integrate DRM in the school syllabus. The MOE also works with the CIRC and its Climate Change programme in schools and has successfully implemented the UNESCO Education for Sustainable Development (ESD) programme, which includes 'Sandwatch' as part of the Science Curriculum incorporating the wider school community and utilising traditional knowledge.

This provides a good example of collaboration within a sector and that positive partnerships are in place to address climate change impacts.

NATIONAL HUMAN RESOURCES DEPARTMENT (NHRD)

The role of NHRD is **"***to strengthen and enhance the coordination and facilitation of post-secondary education and skills training in order to meet the aspirations and market-based needs of the Cook Islands***".** It looks at strengthening capabilities of Cook Islanders in having foundation skills in particular technical and vocational education.

TOURISM COOK ISLANDS

Tourism Cook Islands role is primarily marketing and information provision. However they do have an accreditation scheme that could be a tool for fostering environmental sustainability and has recently received funding to advance work in this area.

The tourism industry has grown significantly and is now the nation's largest income earner. The number of visitors to the Cook Islands has more than doubled since 1998 from 48,630 to 101,110 in 2009.[137]

137 Cook Islands Statistics Tourism Visitor Arrivals 2009

The importance of tourism to the future economy is likely to continue to grow providing the special attraction of the Cook Islands is not destroyed by pressures including climate change. Such appeal derives from a blend of people, scenery, and nature tourism opportunity. However, increased pressure on water, land and waste resources has exacerbated an already critical environmental problem.

COOK ISLANDS INVESTMENT CORPORATION (CIIC)

Vision: "The efficient, profitable and professional management of Crown assets and Statutory Corporations".

Its outputs include the repairs and maintenance of all government ministerial buildings and venue facilities, management of State Owned Enterprises (SOEs) and subsidiaries, and repairs and maintenance of all government residential and commercial buildings. CIIC's responsibilities means that it is a key player nationally in mainstreaming Climate Change especially in the pursuit of climate proofing government assets and its oversight role of SOEs.

TE APONGA UIRA (TAU)

The primary functions of Te Aponga Uira as a state owned enterprise are the generation, distribution and retailing of electricity on Rarotonga. The main Acts governing TAU's operations are: the Te Aponga Uira O Tumu-Te-Varovaro Act 1991, the Te Aponga Uira O Tumu-Te-Varovaro Amendment Act 1999 and the Cook Islands Investment Corporation Act 1998. Such legislation constitutes TAU as a Government Business Enterprise (GBE) with its objectives being to:

- provide energy to all consumers in a reliable and economical manner; and
- operate its facilities in an efficient and profitable manner, having due regard to the interests of the community.

Due to the high development costs of any technological advancement programme that would be well beyond its capacity to support, TAU has not, until recently, considered any investment in renewable energy research to be worthwhile, preferring instead to await appropriate developments overseas from which to draw. However, with the current government policy of reducing the country's dependence on imported fossil fuel, TAU has committed to include in the electricity tariff 1cents/unit specifically for the purpose of funding investments in renewable energy on Rarotonga. Accordingly, beginning in the 2010/2011 FY, TAU has appropriated $260,000 in its budget for this purpose and established a Renewable Energy division to pursue this direction. The intention is to use already proven technology from overseas.

OTHER ORGANISATIONS

COOK ISLANDS CHAMBER OF COMMERCE

This is a voluntary organisation of individuals and businesses that represents the interests of the private sector in the Cook Islands. The organisations mission is "to serve the membership by providing leadership and influencing effective change for a healthy business environment".

The Chamber is governed by a constitution and is run by an executive consisting of President, Vice President, Secretary, Treasurer and three (3) Ordinary Members. Climate change considerations has somewhat been included in the private sector development and this should only increase and strengthen in the future.

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COOK ISLANDS ASSOCIATION FOR NON-GOVERNMENT ORGANISATIONS (CIANGO)

As the national umbrella organization for community groups and organisations, CIANGO is primarily focused on national advocacy and coordination of services to address development issues including those related to Climate Change.

COOK ISLANDS CLIMATE ACTION NETWORK (CICAN)

As a national Climate umbrella group, CICAN is primarily concerned on advocacy for Climate Change policy. Participation at international and regional fora through affiliation to CAN international is a priority. Awareness and adaptation are priorities at the local level.

138 Cook Islands Statistics Tourism Visitor Arrivals 2009

COOK ISLANDS RED CROSS (CIRC)

Through its mandate the CIRC provides a programme of training and services for the benefit of the community. These include emergency relief services for the victims of disasters, prevention of diseases, and improvement of health. The CIRC has one Climate Change officer dedicated to work with other agencies on disaster risk reduction activities in the community such as community awareness and education in schools in partnership with the MOE.

TRADITIONAL LEADERS

House of Ariki and Te Koutu Nui are the two legislated traditional leaders (chiefs and sub-chiefs) which provide advice to Parliament on matters pertaining to Maori customs and related land issues. This mandate has, in practice, been extended to incorporate advice on development issues generally. On the question of whether a separate or stand alone office should be established to address Climate Change Issues within government. The Executive Committee of Te Koutu Nui expressed a wish to see a standalone office in light of the gravity of the issues that such an office must deal with. Te Koutu Nui is well informed about the potential impacts of Climate Change on the Cook Islands and regards as urgent the necessity for the nation to put together a comprehensive adaptation and mitigation plan for immediate implementation.

RELIGIOUS ADVISORY COUNCIL

The council represents various religious organisations in the Cook Islands. They bring a different perspective about climate change impacts to the country team meetings that are taken into account when making decision and providing a way forward for the better of all Cook Islands people.

Annex 3: Climate Change Activities And Projects Undertaken Since The Initial National Communications

ACTIVITIES IN THE AREA OF CLIMATE AND IMPACTS ASSESSMENT

GLOBAL CLIMATE OBSERVING SYSTEMS (GCOS)

The Global Climate Observing System (GCOS) was established in 1992 to ensure that the observations and information needed to address climate-related issues are obtained and made available to all potential users. The Cook Islands participates in this program however it does not receive funding to do so.

The GCOS is intended to be a long-term, user-driven operational system capable of providing comprehensive observations across domains that are required for monitoring the climate system.

The Cook Islands Meteorological Service undertakes monitoring of weather and climate in the Cook Islands. It operates six Automatic Weather Stations (AWSs) were installed on three islands in the Southern group (Mangaia, Mauke, Aitutaki) and three islands in the Northern group (Pukapuka, Penrhyn, Manihiki). Synoptic three hourly weather reports are interrogated from a platform on each of these islands through a modem in the main office in Rarotonga.[139][140]

SEA LEVEL RISE (SLR)

The South Pacific Sea Level and Climate Monitoring Project (SPSLCMP)[141] was developed in 1991 as an Australian Government response to concerns raised by member countries of the South Pacific Forum over the potential impacts of human-induced global warming on climate and sea levels in the Pacific region.

Its primary goal is to generate an accurate record of variance in long-term sea level for the South Pacific and to establish methods to make these data readily available and usable by Pacific Island countries. The Cook Islands does not receive funds in country but is one of twelve Pacific Islands that are part of this programme.

SEASONAL CLIMATE OUTLOOK FOR PACIFIC ISLAND COUNTRIES (SCOPIC)

Seasonal Climate Forecasting system that will have application of climate forecast information in climate sensitive industries, most notably fisheries, agriculture and water. CIMS offices have been trained in forecast production and distribution of information. No funding received in country however request has been done to have research to be done in country. Funding support is still pending.

NATIONAL INSTITUTE OF WATER AND ATMOSPHERIC RESEARCH (NIWA)

'Island Climate Update' is a monthly summary of the climate in the tropical South Pacific islands, with an outlook for the coming months. This bulletin is a multi-national project with collaboration from a number of Pacific nations and support from various organisations. The Cook Islands supports this activity through the Meteorological Service in providing data to NIWA.[142][143]

PACIFIC CLIMATE CHANGE SCIENCE PROGRAM (PCCSP)

The PCCSP is part of the Australian Government's commitment through the International Climate Change Adaptation Initiative (ICCAI) to meet high priority climate change adaptation needs in vulnerable countries in the Asia-Pacific region, especially Pacific Island countries including Cook Islands and Timor Leste. No monetary funds received in country for this programme.[144][145]

The PCCSP works closely with the another key ICCAI program, the Pacific Adaptation Strategy Assistance Program, which aims to enhance country capacity to assess their vulnerability to climate change and develop evidence-based adaptation strategies.

The PCCSP aims to strengthen the capacity of 15 countries in the region to participate in and undertake climate change science research. This investment in better climate change science for the region will improve the basis for future decision-making about effective adaptation and development planning.

The objectives of the PCCSP are to:

- undertake research into climate change and variability;
- build research capacity in partner countries; and
- disseminate research findings.

Furthermore, the work on the Kyoto Protocol Adaptation Fund Programme proposal is currently in process. This is aimed at Strengthening the Resilience of our Islands and their Communities.

The objective of the programme is to strengthen the ability of all Cook Island communities and the public service to make informed decisions and manage anticipated climate change driven pressures (including extreme events) in a pro-active, integrated and strategic manner. In achieving this objective, the programme will support, at the national, sectoral, and island levels, implementation of the Cook Islands' new Joint National Action Plan (JNAP).

139 More information can be found at http://gosic.org/ios/GCOS-main-page.htm

140 More information can be found at http://gosic.org/ios/GCOS-main-page.htm

141 See http://www.bom.gov.au/pacificsealevel/ for more information

142 More information can be found at http://www.niwa.co.nz

143 More information can be found at http://www.niwa.co.nz

144 For more information visit http://www.cawcr.gov.au/projects/PCCSP/

145 For more information visit http://www.cawcr.gov.au/projects/PCCSP/

ACTIVITIES IN THE AREA OF ADAPTATION

CAPACITY BUILDING FOR THE DEVELOPMENT OF ADAPTATION MEASURES IN PACIFIC ISLAND COUNTRIES

The Capacity Building for the Development of Adaptation Measures in Pacific Island Countries (CBDAMPIC) was a $2.2 million dollar Canadian funded SPREP executed project that ran from 2002–2005 with the broad aim of increasing the ability of Pacific Island people to cope with climate change. It was a project involving four countries: Cook Islands, Fiji, Samoa and Vanuatu. The CBDAMPIC project is the first Stage III type project to have been piloted in the Pacific region. The Cook Islands pilot project at USD250, 000 focused on the almost atoll island of Aitutaki addressed the primary community concern of rainwater harvesting for drinking water. It is one of only a handful of projects world-wide that has actually achieved tangible improvements in the capacity of countries and communities to deal with risks associated with climate change.

ASSESSMENT OF IMPACTS AND ADAPTATION TO CLIMATE CHANGE

Assessment of Impacts and Adaptation to Climate Change (AIACC) project from 2002 to 2005 was a project of the GEF, implemented by UNEP. In addition, AIACC receives a total $625, 000 USD funding from the Canadian International Development Agency, the U.S. Agency for International Development, the U.S. Environmental Protection Agency, and the Rockefeller Foundation including the Asian Development Bank and the New Zealand Government). The developing country institutions that executed the regional assessments provided substantial in-kind support. The project goal was to enhance the technical and human capacity of Pacific Island countries to assess vulnerability and adaptation to climate change, including variability. The three main objectives: 1) to develop the "next generation" of integrated assessment methods and models, including the incorporation of "human dimensions" of vulnerability, adaptation options and economic evaluation procedures, for application at island and sub-island scales; 2) to implement, test and apply the improved methods in three case studies representing low atoll, high volcanic and large island situations; and 3) to build the in-country research capacity through training in, and transfer of, the advanced methods and models.

The Cook Islands research included a survey of community awareness of climate change and evaluation of the CBDAMPIC Project

CLIMATE CHANGE ADAPTATION PROGRAM FOR THE PACIFIC

The Cook Islands was a member of ADB's Climate Change Adaptation Programme for the Pacific (CLIMAP) 2002–2005. This program aimed to assist Pacific developing member countries to enhance their adaptive capacities and resilience to climate change, climate variability and extreme events. The project undertook risk assessment, adaptation planning and policy development and by identifying ways of "climate proofing" infrastructures, community and other development initiatives. In 2003 the CLIMAP program assisted with the climate proofing of the design of the Avatiu Harbour and the breakwater for the newly developed Western Basin in Rarotonga with a funding amount of USD $800,000.[146]

COMPREHENSIVE HAZARD AND RISK MANAGEMENT (CHARM)

The Cook Islands was also included in SOPAC's Comprehensive Hazard and Risk Management (CHARM) initiative in 1998 which provided a consistent approach to risk management across the Pacific region. The approach recognised the isolation factor of the Pa Enua and the transportation limitations which lead to the small island's vulnerability to disaster risks. The CHARM approach to disaster management shifts the focus from recovery and response to preparedness and risk reduction. There was some funding provided through SOPAC for technical assistance and training.

STRENGTHENING DISASTER MANAGEMENT AND MITIGATION

Component 1: Strengthening Disaster Risk Management

This component is designed to strengthen the disaster mitigation and preparedness arrangements in the Cook Islands. The program duration was from 2005–2006 funded by SOPAC

Component 2: Preventative Infrastructure Master Plan

In 2007, the ADB supported the review, prioritisation and design of existing and future infrastructure projects on Rarotonga and the Pa Enua with a view to economic growth and 'climate-proofing'. Included a review of the Building Code, and the development of a Climate Risk Profile for the Cook Islands. Developed 111 project briefs, of which 44 were prioritised for the first 5 years. Projects at risk from climate change were identified and adaptation measures identified as well as a process for additional CC studies to test feasibility.

DEVELOPMENT OF SUSTAINABLE AGRICULTURE IN THE PACIFIC

From 2007–2009, Food and Agriculture Organisation produced a case study report of climate change and food security for the Cook Islands. Ministry of Agriculture have then trial planted of certain crops from the recommendations of the case study.

FOOD SECURITY FOR SUSTAINABLE LIVELIHOODS PROGRAMME (FSSLP)

In 2010, a food security assessment was started and is currently being compiled by FAO focusing on the southern group of the Cook Islands

146 Asian Development Bank, Climate Change ADB Programs: Strengthening Mitigation and Adaptation in Asia and the Pacific, 2008, p24

PACIFIC ADAPTATION TO CLIMATE CHANGE (PACC)

The Pacific Adaptation to Climate Change (PACC) 2009–2013 is a regional Special Climate Change Fund of the Global Environment Facility GEF funded/supported project executed through SPREP) in partnership with UNDP involving 13 Pacific Island countries. The NES facilitated the national coastal infrastructure project component preparation and the Ministry of Infrastructure and Planning (MOIP) is the national implementing agency with a funding amount of USD $800,000. The regional PACC effort aims for a long term approach to adaptation measures by strengthening policy frameworks, instituting design guidelines, and improving capacity with technical expertise The main objective of the project is to build PIC capacity to adapt to climate change in key sectors, on a policy level basis, aiming to improve mainstreaming of climate change issues and on a project basis with the climate proofing of the new Mangaia harbour. .

RED CROSS PREPAREDNESS FOR CLIMATE CHANGE PROGRAMME AND VULNERABILITY AND CAPACITY ASSESSMENT (VCA)

Documenting of traditional methods of food preparation in the Pa Enua related to the climate change food security since 2009. The Cook Islands Red Cross is in the process of undertaking Vulnerability and Capacity Community Assessments for each of the Pa Enua where the assessments have not been completed. Based on these assessments, CIRC aim to carry out community driven programmes, linked to Disaster Preparedness and Risk Reduction, example emergency road access and emergency water supply.

WWF SOUTH PACIFIC

Enhancing participation in international climate change policy; the project aimed at 1) raising awareness on the impacts of climate change in the pacific and also on measures to address those impacts 2) enhance the role that Pacific governments and civil society organisations play in international climate change policies to prevent dangerous climate change. Activities including workshops, meeting participation, negotiation training and resource publications were funded directly by WWF.

MANAGING CLIMATE RISK IN THE COOK ISLANDS' VULNERABLE COMMUNITIES (ADB-SGA-WWF) COMMUNITY-BASED CLIMATE VULNERABILITY ASSESSMENT AND ADAPTATION PLANNING

ADB supported USD100, 000 partnerships between WWF, ADB and the Government of the Cook Islands to pilot a participatory approach to Protecting Island Biodiversity and Traditional Culture through Community based Risk Management under its Regional Technical Assistance 6420. It involved the development of community vulnerability and risk atlases to inform government planning and decision making processes.

KYOTO PROTOCOL ADAPTATION FUND PROJECT PROPOSAL STRENGTHENING RESILIENCE OF OUR ISLANDS AND COMMUNITIES (KPAF -SRIC) – AKAMATUTU'ANGA I TE ITI TANGATA NO TE TUATAU MANAKOKOREIA E TE TAUI'ANGA REVA.

UNDP Samoa in coordination with the NES and the OPM, Central Policy and Planning Division, assisted in developing a project concept designed to enhance the resilience of communities in the Cook Islands through integrated climate change adaptation and disaster risk management interventions. The focus of the proposed project is to build adaptive capacity at the national and local levels by supporting policy changes, implementing pilot adaptation activities at the community level, and by fostering knowledge management actions.

The project concept was submitted to the Adaptation Fund Board (AFB), which endorsed it in December 2010. A funding envelope of USD $5million was approved. A full programme proposal has been submitted to the AFB for their consideration in late 2011.

The project intends to result in on-the-ground adaptation and disaster risk reduction interventions in identified priority vulnerable sectors (agriculture, water, coastal protection, health) in at least seven islands, directly benefitting over 1500 households as well as addressing gender issues. It will also build adaptive capacity at the national by supporting policy changes and develop and share lessons learned and good practices.

PACIFIC ADAPTATION STRATEGY ASSISTANCE PROGRAM (PASAP)

The PASAP is a program aimed at developing adequate capacity for 14 Pacific Island countries and East Timor to adapt to adverse impacts of climate change. The PASAP has a number of components including the synthesis of current experience and knowledge of climate change.

The other component is focused on mainstreaming climate change adaptation into the national planning and budgetary processes. This component includes holding national adaptation planning workshops to consider ways and means by which mainstreaming can be undertaken in the countries within and across sectors. The national adaptation workshops will be held, to the extent possible, in each partner country over the next 12 months. The second workshop was held in Rarotonga, Cook Islands from February 28 – April 01 2011. Total funding is AUD $600,000; $100 K for institutional arrangement and support to be implemented by the Office of the Prime Minister; $100 K for policy support and $400 K for coastal assessment of the Avatiu to Avarua harbour.

PACIFIC CATASTROPHE RISK ASSESSMENT AND FINANCING INITIATIVE (PCRAFI).

PCRAFI is a joint initiative between the Secretariat of the Pacific Community SPC/SOPAC, the World Bank, and the Asian Development Bank, with financial support

from the Government of Japan and the Global Facility for Disaster Reduction and Recovery (GFDRR). The PCRAFI has developed a Pacific Risk Information System (including a regional geospatial database and country-specific catastrophe risk models), which offers technical tools for the development of sustainable and affordable disaster risk financing and insurance solutions for the Pacific Island Countries (PICs). The Pacific Island Countries covered under PCRAFI are: Cook Islands, Federate States of Micronesia, Fiji, Kiribati, Marshall Islands,Nauru, Niue, Palau, Papua New Guinea (PNG), Samoa, Solomon Islands, Timor Leste, Tonga, Tuvalu, and Vanuatu.

PACIFIC DISASTER RISK FINANCING AND INSURANCE PROGRAM

The Pacific Disaster Risk Financing and Insurance Program is the first of a series of applications of PCRAFI to be developed on disaster risk management and urban/infrastructure planning. The development objective of the Pacific Disaster Risk Financing and Insurance Program is to increase the financial resilience of the Pacific island countries (PICs) against natural disasters and to improve their capacity to meet postdisaster funding needs without compromising their fiscal balances and development objectives. It aims to assist the PICs in the improvement of their macroeconomic planning against natural disasters, and the design and implementation of a national disaster risk financing strategy, as part of their national disaster risk management and climate change adaptation agenda. The program supports the following activities: (i) Capacity building on integrated disaster risk financing and insurance; (ii) Development of private disaster risk insurance markets; and (iii) Piloting of Pacific disaster risk insurance program for governments. This program builds on the World Bank's experience in disaster risk financing and insurance and the expertise of the Secretariat of the Pacific Community SPC/SOPAC in disaster risk management in the Pacific. The program will start with an initial grant from the Government of Japan, and other donor partners are expected to join at a later stage. The Cook Islands is seeking to participate in this project despite not being a World Bank member

PUKAPUKA CYCLONE SAFETY SHELTER

In 2011, the Government of the Cook Islands in partnership with the European Union started the building of the Pukapuka emergency cyclone shelter that is designed to withstand a Category 4 cyclone and is built on community land at the highest point of the island.

ACTIVITIES IN THE AREA OF MITIGATION

PACIFIC ISLAND RENEWABLE ENERGY PROGRAM (PIREP)

Although a mitigation focused regional program, the Pacific Island Renewable Energy Program (PIREP), assisted the Cook Islands to improve its understanding on its energy vulnerabilities and risks, and worked to address those risks through the identification of possible renewable energy projects. The PIREP was an initial step toward a more comprehensive regional program to address the capacities of participating Pacific Island countries to work toward implementing mitigation projects in the renewable energy sector, as well as energy efficiency. Total funding for this project was USD $811,000 for 14 Pacific Island countries from 2002–2004. Some similar regional programs have also assisted in this way, such as REEP and PIGGAREP.

PACIFIC ISLANDS GREENHOUSE GAS ABATEMENT THROUGH RENEWABLE ENERGY PROJECT (PIGGAREP)

The Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP) aims to reduce the growth rate of GHG emissions from fossil fuel use in Pacific Island Countries by removing barriers to the widespread and cost effective use of feasible Renewable Energy Technologies (RET).

The specific objective of the project is to promote productive use of RE to reduce GHG emission by removing major barriers to the widespread and cost-effective use of commercially viable RE technologies (RETs) with funding of USD $1 million dollars. The project is expected to bring about in the Pacific Island countries:

- Increased number of successful commercial RE applications;
- Expanded market for RET applications;
- Enhanced institutional capacity to design, implement and monitor RE projects;
- Availability and accessibility of financing to existing and new RE projects;
- Strengthened legal and regulatory structures in the energy and environmental sectors; and,
- Increased awareness and knowledge on RE and RETs among key stakeholders.

ENERGY EFFICIENCY AND CONSERVATION (ADB-PEEP)

This ADB pilot promotes Energy Efficiency in the Cook Islands through Compact Fluorescent Light Bulbs (CFL). The Project focuses on the residential sector with funding of up to NZD $400 000. The outcome of the project will provide a benchmark for other energy efficiency incentives such as the commercial sector, street lighting and solar street lighting.

PACIFIC ENVIRONMENT COMMUNITY (PEC)

The Government of Japan, under the Pacific Environment Community (PEC) Fund, has committed funds to assist Pacific countries with the purchase and installation of renewable energy technologies specifically for solar PV electricity supply or for water desalination. The Cook Islands is a recipient of this funding and has committed solar PV systems for the islands of Rakahanga, Pukapuka, Nassau, Suwarrow and part of Manihiki to this scheme.

AITUTAKI WIND MONITORING PROJECT

A wind monitoring project was installed on Aitutaki in 2006 for the purpose of assessing potential for wind resources. The outcome of the project after two years stated that there is potential to explore wind farming on the island of Aitutaki.

RAROTONGA WIND MONITORING PROJECT

In 2007 a wind monitoring project was installed on the hillside in Kiikii for the purpose of wind resource assessment. The one year data has already proven that the average wind speed of 7m/s can be used for wind farming. However, a further study to verify the site was negative and showed it was costly to have a wind farm on that particular site. A new site is yet to be identified for the utilization of wind farming.

MITIARO WIND MONITORING PROJECT

In 2008 the wind logger from Aitutaki was transferred to Mitiaro for the same purpose of wind resource assessment.

PRIVATE SECTOR DRIVEN INCENTIVES

Small Wind Turbines and Solar PV systems are now being installed on the island of Rarotonga with the main emphasis of zero power bills. New business ventures are now being recognized in the Cook Islands with renewable energy technologies. There is more awareness now among businesses and communities for the usage of renewable energy especially solar power, wind energy and bio-fuel.

REPORTING AND INTERNATIONAL ENGAGEMENT

PACIFIC ISLANDS FRAMEWORK FOR ACTION ON CLIMATE CHANGE (PIFACC)

In 2005 the Pacific Leaders adopted the Pacific Islands Framework for Action on Climate Change 2006–2015. The major aim of this framework was to ensure that Pacific island people build their capacity to be resilient to the risks and impacts of climate change. Implementation of the Framework is further elaborated in the Pacific Islands Action Plan on Climate Change 2006–2015.

The Framework has the following objectives:

- implementing adaptation measures;
- governance and decision-making;
- improving our understanding of climate change;
- education, training and awareness;
- contributing to global greenhouse gas reduction; and
- partnerships and cooperation.

Each of the regional and country programs identified above assisted both the public and private sectors in the Cook Islands communities to enhance their understanding of the risks and impacts of climate change, how the information can be gathered and used for public use, and how all stakeholders had a role to ensure disaster preparedness was undertaken according to a robust and rigid framework of action[147].

PACIFIC PLAN

The Pacific Plan was endorsed by Forum Leaders at the Pacific Islands Forum meeting in Port Moresby in 2005. Its four key pillars are designed for development progress: economic growth, sustainable development, good governance, and security. Climate change is one of many threats that impacts upon the sustainable development of Pacific island countries. The Cook Islands report to the Pacific Islands Forum Secretariat in Fiji regularly on the progress in-country with regards to the Pacific Plan.

CAIRNS COMPACT ON STRENGTHENING DEVELOPMENT COORDINATION IN THE PACIFIC

This is an initiative of the Pacific Islands Forum. It is a development compact which was agreed by Forum Leaders and endorsed by key development partners at the Pacific Islands Forum Leaders' meeting in Cairns, August 2009.

The Cairns Compact sets out collective actions by Forum member countries and development partners designed to strengthen coordination and use of all development resources in the Pacific, in line with international best-practice as expressed in the Paris Declaration on Aid Effectiveness, the Accra Action Agenda and Pacific Principles on Aid Effectiveness. The key objective of this compact will be to drive more effective coordination of available development resources from both Forum Island Countries and all development partners, centred on the aim of achieving real progress against the MDGs.

PACIFIC ISLANDS CLIMATE CHANGE ASSISTANCE PROGRAMME (PICCAP)

A program from 1996–2002 that helped Pacific Island countries including the Cook Islands to implement the UNFCCC reporting obligations. It supported the Cook Islands to undertake and completed its INC. It was implemented through the South Pacific Regional Environment Program (SPREP).

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE SPECIAL AND ASSESSMENT REPORTS

The Cook Islands through the Director of Meteorological Services contributes to the reports by the IPCC. Furthermore, other research that is done within the Cook Islands for the Cooks Islands also feeds into the special reports by the IPCC.

Other important websites for further information:

- http://ipcc.ch/
- http://unfccc.int/2860.php
- http://ipcc.ch/
- http://www.sprep.org/

147 For more information visit http://www.sprep.org/

OTHER RELEVANT INFORMATION

NATIONAL CAPACITY SELF ASSESSMENT

Funded by the Global Environment Facility from 2006–2009, the project looked at the capacity needs to address United Nations Multilateral Environment Agreements – United Nations Convention to Combat Desertification, United Nations Convention on Biological Diversity and United Nations Framework Convention on Climate Change.

COMMUNITY-CENTRED SUSTAINABLE DEVELOPMENT PROGRAMME

Supported by UNDP in 2008, Sustainable Village Development Plans have been developed in Pukapuka and Mitiaro islands, and similar exercises are being planned in Rarotonga. These plans created good momentum for community engagement and participatory processes, and identified community needs and plans in agriculture, water, and coastal issues, but without integrating climate risks, and providing funds for actual implementation.

CYCLONE EMERGENCY ASSISTANCE LOAN PROJECT (CEAL)

ADB provided a loan of US$2.85 million to assist the Government implement a comprehensive recovery programme following the five cyclones experienced in 2005. The total cost of the CEAL Project is estimated at US$7.9 million.

CYCLONE PAT: RECOVERY AND RECONSTRUCTION PROJECT – AITUTAKI

In 2010–2011, New Zealand Aid in partnership with the Government of the Cook Islands provided support to the people of Aitutaki after the island was hit by cyclone Pat. An estimated cost totalled to NZD 9.5 million dollars and of which NZD 5.5 million was provided by NZAID.

CYCLONE RECOVERY AND RECONSTRUCTION (CRR) AND OUTER ISLANDS DEVELOPMENT (OID) PROGRAMMES

This programme has various sub programmes that is implemented from 2007–2012 funded by NZAID and Government of the Cook Islands. Includes:

- Building of new building for the CI Red Cross, which will double up as a Cyclone Safety Shelter
- Supply of new roofing sheets and rainwater tanks to households in Pukapuka, Nassau, Tongareva (Penrhyn), Rakahanga
- Repair of community tanks in Manihiki
- Harbour/Wharf repairs: Mauke, Mitiaro
- Manihiki Cyclone Management Centers refurbishment
- Mauke Water Upgrade

Annex 4: Stakeholders

Table 26: Stakeholder Consultations & individuals consulted

DATE	OFFICIAL	DESIGNATION	AGENCY	TIME
3 June 2010	Tai Nooapii		Ministry of Infrastructure Planning	8.30am
11 June 2010	Arona Ngari	Director	Cook Islands Meteorological Service	12.15pm
11 June 2010	Kura Metuariki		Cook Islands Tourism	3.00pm
16 June 2010	Aukino Tairea	Secretary	Ministry of Transport	12.30pm
17 June 2010	2NC CCT			11.00am
18 June 2010	Karen Tairea		Ministry of Health	9.00am
18 June 2010	Ulimila Wragg		Womens NGO	10.30am
18 June 2010	Charles Carson		Emergency Management Team	1.30pm
	Willie Tuivanga		Emergency Management Team	
			Emergency Management Team	
18 June 2010	Tereapii Timoti	CEO	Te Aponga Uira	3.00pm
21 June 2010	Mata Nooroa		Energy	8.30am
	Tangi Tereapii		Energy	
21 June 2010	Anthony Brown	Secretary	Ministry of Agriculture	9.30am
	Willie		Ministry of Agriculture	
	Edwin		Ministry of Agriculture	
21 June 2010	Arona Ngari	Director	Cook Islands Meteorological Service	10.00am
21 June 2010	Keu Mataroa		Ministry of Infrastructure & Planning	1.30pm
	Vaipo Mataora			
	OthenialTangianau			
23 June 2010	Ben Ponia		Ministry of Marine Resources	9.00am
	Kori Raumea		Ministry of Marine Resources	
	N Roi		Ministry of Marine Resources	
2 Nov 2010	Othenial Tangianau	Acting Secretary	Ministry of Infrastructure and Planning	10 am
3 Nov 2010	Dr. Fran Mc Grath Karen Tairea Tangata Vaeau		Public Health Department	10am
4 Nov 2010	Metua Vaiimene		Tourism Cook Islands	10am

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- Will McGoldrick and Kevin Hosking: *Second National Greenhouse Gas Inventory 2000–2006* and *Second National Greenhouse Gas Inventory: Methodologies.*
- Gerhard Zieroth: *Mitigation Analysis and Technology Needs Assessments – Mitigation*.
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- Youth & Sports Division Ministry of Internal Affairs, International Youth Day 2008, *Youth & Climate Change: Time for Action*, Final Report. 2008.
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National Climate Change Country Team members and guests after a country team meeting
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