

# MAINSTREAMING CLIMATE CHANGE ADAPTATION IN THE PACIFIC

A PRACTICAL GUIDE





**RECOMMENDED FORM OF CITATION:**

SPREP and UNDP 2013, *Mainstreaming Climate Change Adaptation in the Pacific: A Practical Guide*, Secretariat of the Pacific Regional Environment Programme (SPREP) and United Nations Development Programme (UNDP), Apia, Samoa.

Arrangements: Part 1: General; Part 2: Strategic; Part 3: 'On-the-Ground'.

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p. ; 29 cm

ISBN: 978-982-04-0489-2 (print)  
978-982-04-0490-8 (online)

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# Acknowledgements

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This publication is based on a Pacific Adaptation to Climate Change (PACC) Project consultancy carried out by Dr Padma Narsey Lal of Tiri2 Action Research, Canberra, for the Secretariat of the Pacific Regional Environment Programme (SPREP). It was supported by a Regional Technical Team comprising Dr Netatua Pelesikoti, Mr Taito Nakalevu and Mr Aaron Buncle of SPREP; Mr Gabor Vereczi and Mr Kevin Petrini of UNDP (Samoa and Fiji Regional Office); Ms Paula Holland and Mr Andrea Volentras of the Secretariat of the Pacific Community (SPC); and Ms Marita Manley of SPC-Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

This assignment could not have been completed without the assistance of the PACC project coordinators and respective country teams, and the Mainstreaming Reference Group established by SPREP. Many other people in the region shared their experiences as well as their draft reports and notes about their mainstreaming efforts at the strategic- and/or 'on-the-ground'-level demonstration projects.

The PACC project coordinators and their country team members include: Ms Mavis Depaune, Mr Hazelton Buraman and Mr Russ Kun of Nauru; Mr Casper Supa Suko of Solomon Islands; Ms Loia Tausi of Tuvalu; Ms Moira Faletutulu of Samoa; Mr Paula Fokikovi Taufua of Tonga; Mr Dennis Alvos and Mr Ian Iercet of Vanuatu; Mr Abraham Simpson of Kosrae; Mr Vaipo Mataora of Cook Islands; Mr Vinesh Kumar of Fiji. Comments on respective draft case studies by Dr Dough Ramsay, Mr Andrew McGregor, Mr Casper Supa, Ms Mavis Depaune and Mr Ian Iercet are also gratefully acknowledged.



# Acronyms

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<b>ACIAR</b>	Australian Centre for International Agricultural Research
<b>ADB</b>	Asian Development Bank
<b>AusAID</b>	Australian International Aid Agency
<b>BCR</b>	Benefit Cost Ratio
<b>BOM</b>	Bureau of Meteorology (Australia)
<b>CBA</b>	Cost-Benefit Analysis
<b>CBD</b>	Convention on Biological Diversity
<b>CBVA</b>	Community-Based Vulnerability Assessment
<b>CCA</b>	Climate Change Adaptation
<b>CCM</b>	Climate Change Mainstreaming
<b>CCPIR</b>	Coping with Climate Change in the Pacific Islands Region
<b>CCU</b>	Climate Change Unit (Fiji)
<b>CDDE</b>	Capacity Development for Development Effectiveness Facility for Asia and Pacific
<b>CEDRA</b>	Climate Change and Environmental Degradation Risk and Adaptation Assessment
<b>CePaCT</b>	Centre for Pacific Crops and Trees (Samoa)
<b>CIE</b>	Department of Commerce, Industry and Environment
<b>CLIMAP</b>	Climate Proofing: A Risk Based Approach to Adaptation (ADB)
<b>CM</b>	Common Methodology (IPCC)
<b>CPEIR</b>	Climate Public Expenditure and Institutional Review
<b>CRED</b>	Centre for Research on the Epidemiology of Disasters (Belgium)
<b>CRiSTAL</b>	Community-based Risk Screening Tool – Adaptation and Livelihoods
<b>CRM</b>	Climate Risk Management
<b>CROP</b>	Council of Regional Organisation in the Pacific
<b>CSIRO</b>	Commonwealth Scientific and Industrial Research Organisation (Australia)
<b>CVCA</b>	Climate Vulnerability and Capacity Analysis
<b>DAC</b>	Development Assistance Committee (OECD)
<b>DCCEE</b>	Department of Climate Change and Energy Efficiency (Australia)
<b>DFID</b>	Department for International Development
<b>DM</b>	Disaster Management
<b>DPSIR</b>	Driver-Pressure-State-Impact-Response [framework]
<b>DRR</b>	Disaster Risk Reduction
<b>DRR&amp;DM</b>	Disaster Risk Reduction and Disaster Management
<b>EbA</b>	Ecosystem-based Adaptation
<b>ECD</b>	Environment and Conservation Division (Kiribati)
<b>EIA</b>	Environment Impact Assessment
<b>EIRR</b>	Economic Internal Rate of Return

<b>EIS</b>	Environmental Impact Statement
<b>EM-DAT</b>	Emergency events database
<b>EMP</b>	Energy Management Plan
<b>ENSO</b>	El Niño Southern Oscillation
<b>ERA</b>	Environment Risk Assessment
<b>EU</b>	European Union
<b>FFA</b>	Forum Fisheries Agency
<b>FOB</b>	free-on-board (also freight-on-board)
<b>FSM</b>	Federated States of Micronesia
<b>GCM</b>	Global Climate Models
<b>GDP</b>	Gross Domestic Product
<b>GEF</b>	Global Environment Facility
<b>GEF-SCCF</b>	Global Environment Facility – Special Climate Change Fund
<b>GEF-SGP-KI</b>	Global Environment Facility-Small Grant Program-Kiribati
<b>GHG</b>	Greenhouse Gas
<b>GIS</b>	Geographic Information System
<b>GIZ</b>	[Deutsche] Gesellschaft für Internationale Zusammenarbeit
<b>GTZ</b>	[Deutsche] Gesellschaft für Technische Zusammenarbeit
<b>HFA</b>	Hyogo Framework of Action
<b>HH</b>	Household
<b>IFRC</b>	International Federation of Red Cross and Red Crescent Societies
<b>IISD</b>	International Institute for Sustainable Development
<b>IPCC</b>	Intergovernmental Panel for Climate Change
<b>ISDR</b>	International Strategy for Disaster Reduction (United Nations)
<b>ISP</b>	Island Strategic Plan (Tuvalu)
<b>IUCN</b>	International Union for Conservation of Nature
<b>IWRM</b>	Integrated Water Resources Management
<b>JNAP</b>	Joint National Action Plan for Climate Change and Disaster Risk Management
<b>KANGO</b>	Kiribati Association of NGOs
<b>KiriCAN</b>	Kiribati Climate Action Network (an NGO)
<b>KNTO</b>	Kiribati National Tourist Office
<b>M&amp;E</b>	Monitoring and evaluation
<b>MCA</b>	Multi-criteria analysis
<b>MCTTD</b>	Ministry of Communication, Transport and Tourism Development (Kiribati)
<b>MCTPU</b>	Ministry of Communication Transport and Public Utilities (Tuvalu)
<b>MDG</b>	Millennium Development Goals
<b>MEA</b>	Multilateral Environment Agreement
<b>MECC</b>	Ministry of Environment and Climate Change (Tonga)
<b>MECDM</b>	Ministry of Environment, Climate Change, Disaster Management and Meteorology (Solomon Islands)

<b>MECM</b>	Ministry of Environment, Climate Change and Meteorology (Solomon Islands)
<b>MFAT</b>	Ministry of Foreign Affairs and Trade (New Zealand)
<b>MFATEL</b>	Ministry of Foreign Affairs, Trade, Tourism, Environment and Labour (Tuvalu)
<b>MFMRD</b>	Ministry of Fisheries and Marine Resources Development (Kiribati)
<b>MHARD</b>	Ministry of Home Affairs and, Rural Development (Tuvalu)
<b>MIPU</b>	Ministry of Infrastructure and Public Utilities (Vanuatu)
<b>MOH</b>	Ministry of Health
<b>MPU</b>	Ministry of Public Utilities (Tuvalu)
<b>MSI</b>	Mauritius Strategy for Implementation
<b>MTEF</b>	Medium-Term Expenditure Framework
<b>NAC</b>	National Adaptive Capacity
<b>NAP</b>	National Action Plan
<b>NAPA</b>	National Adaptation Plan of Action
<b>NBSAP</b>	National Biodiversity Strategic Action Plans
<b>NCCAS</b>	National Climate Change Adaptation Strategy (Fiji)
<b>NDMO</b>	National Disaster Management Officer (Vanuatu)
<b>NEC</b>	National Environment Council (Fiji)
<b>NECC</b>	National Environment Coordinating Committee (Tonga)
<b>NEMO</b>	National Emergency Management Office (Tonga)
<b>NEMC</b>	National Emergency Management Committee (Tonga)
<b>NEPO</b>	National Economic Planning Office (Kiribati)
<b>NGO</b>	Non-Government Organisation
<b>NIWA</b>	The National Institute of Water and Atmospheric Research (New Zealand)
<b>NSAP</b>	National Strategic Action Plan
<b>NSDS</b>	National Sustainable Development Strategy
<b>NZAID</b>	New Zealand Aid Programme
<b>OB</b>	Office of Te Beretitenti (Kiribati)
<b>ODA</b>	Official Development Assistance (from OECD)
<b>OECD</b>	Organisation for Economic Cooperation and Development
<b>OPM</b>	Office of Prime Minister (Tuvalu)
<b>PAA</b>	Prioritised Action Agenda (Vanuatu)
<b>PACC</b>	Pacific Adaptation to Climate Change
<b>PACE</b>	Pacific Centre for Environment and Sustainable Development
<b>PacRIS</b>	Pacific Catastrophe Risk Information System
<b>PCCSP</b>	Pacific Climate Change Science Program
<b>PCRAFI</b>	Pacific Catastrophic Risk Assessment and Financing Initiative (of the World Bank)
<b>PCFAF</b>	Pacific Climate Finance Assessment Framework
<b>PIC</b>	Pacific Island Country
<b>PIFACC</b>	Pacific Islands Framework of Action on Climate Change

<b>PICTs</b>	Pacific Island Countries and Territories
<b>PRS</b>	Poverty Reduction Strategies
<b>PIFS</b>	Pacific Islands Forum Secretariat
<b>PPAC</b>	Pacific Plan Advisory Committee
<b>PWD</b>	Public Works Department (Vanuatu)
<b>RFA</b>	Regional Framework of Action (Pacific Framework of Action on Disaster Risk Reduction and Disaster Management)
<b>SEA</b>	Strategic Environment Assessment
<b>SEI</b>	Stockholm Environment Institute
<b>SIACCC</b>	Solomon Islands Advisory Committee on Climate Change
<b>SIRIP</b>	Solomon Islands Road Improvement Project
<b>SLA</b>	Sustainable Livelihood Assessment / Analysis / Approach
<b>SLR</b>	Sea Level Rise
<b>SNC</b>	Second National Communication
<b>SOE</b>	State-Owned Enterprise
<b>SOI</b>	Southern Oscillation Index
<b>SOPAC</b>	Applied Geoscience and Technology Division of the SPC
<b>SPC</b>	Secretariat of the Pacific Community
<b>SPREP</b>	Secretariat of the Pacific Regional Environment Programme
<b>SREX</b>	Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (Working groups of IPCC)
<b>TLB</b>	Taro Leaf Blight
<b>ToR</b>	Terms of Reference
<b>TWG</b>	Technical Working Group
<b>UNDP</b>	United Nations Development Programme
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>USAID</b>	United States Agency for International Development
<b>USP</b>	University of the South Pacific
<b>V&amp;A</b>	Vulnerability and Adaptation
<b>VARTC</b>	Vanuatu Agricultural and Technical Centre
<b>WB</b>	World Bank
<b>WHO</b>	World Health Organization
<b>WRI</b>	World Resources Institute
<b>WST</b>	[Western] Samoa Tala



# Foreword

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Climate change risks that impact development in the Pacific region will be with us for a long time. Social, economic, political and environmental development goals will not be achieved in the region if climate change risks are not given consideration at all phases of the development process. This guide provides a practical tool for planners and practitioners at the national level, as well as supporting the climate change mainstreaming efforts of regional organisations and partners.

The Pacific Adaptation to Climate Change (PACC) project, implemented by the Secretariat of the Pacific Regional Environment Programme (SPREP), has put together this guide as a response to the need from PACC-participating countries to integrate climate change risks into their national and sector strategies and plans, and budgetary processes. The relevance of this guide will not only be limited to PACC, but will be applicable to other climate change and risk management projects that are currently being implemented in the region or are currently at the development phase.

SPREP gratefully acknowledges the funding from the Global Environment Facility (GEF) and technical guidance from the United Nations Development Programme (UNDP), provided through the PACC project, which made the development of this guide possible. Up-scaling and replication of some national PACC activities has already commenced in some countries using added financial resources from AusAID. We look forward to further support in this area, and for other mainstreaming efforts in the region.

The support of regional organisations and partners in the development of this guide, such as the Secretariat of the Pacific Community (SPC); Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ); and the Pacific Regional and Samoa National Offices of UNDP, are also gratefully acknowledged, as is the work of the consultant, Dr. Padma Lal.

In time, this guide will be reviewed and updated as Pacific Island Countries and Territories (PICTs) gain more experience and access more climate change information. This guide is a first step, and it is based on Pacific experiences to advance climate change mainstreaming efforts.

I would like to commend initiatives that support climate change mainstreaming efforts, both at the regional and national levels, and call for its continuation in order to reach every sector, every level, every woman and man, young and old, in the region.



**DAVID SHEPPARD**

Director General  
SPREP



# About the Guide

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Managing weather and climate risk in the Pacific is not a new activity. Countries have always responded in different ways to the challenges of climate-related hazards such as droughts, floods, cyclones and storm surges. More recently, the focus has shifted to reducing risks of weather and climatic variability. This includes climate change due to global warming and how this change influences climate risks and impacts that the Pacific Island Countries and Territories (PICTs) experience. At the regional level, responses to these risks have been guided by the regional Pacific Islands Framework of Action on Climate Change (PIFACC) and the Pacific Regional Framework for Action on Disaster Risk Reduction and Disaster Management (referred to in this guide as the RFA); and their respective international instruments, the United Nations Framework Convention on Climate Change (UNFCCC) and the Hyogo Framework of Action (HFA).

Pacific Island Countries and Territories (PICTs) have implemented a wide spectrum of initiatives and activities across national and subnational levels, targeting specific communities and sectors. These have focused on producing policies, plans, strategies and programmes as well as 'on-the-ground' initiatives aimed at reducing and managing disaster risks, including targeting climate compatible developments. The Pacific Adaptation to Climate Change (PACC) project is an example of such an initiative. It is funded by the Global Environment Facility's Special Climate Change Fund (GEF-SCCF) and implemented by the United Nations Development Programme (UNDP), in partnership with the Secretariat of the Pacific Regional Environment Programme (SPREP), across 14 countries. Mainstreaming climate change adaptation into overall national and sectoral levels of policies and plans is a key outcome of the PACC project, together with the 'on-the-ground' pilot demonstration activities in each of the participating countries.

Recent reviews of disaster risk management and climate change adaptation projects in the Pacific, and discussions about disaster risk and climate change officers in-country, highlight several operational and technical challenges in responding to climate change. Countries often ask questions such as:

- What does mainstreaming mean?
- How can climate risk considerations be integrated in their development process?
- How can relevant climate change adaptation measures be identified?
- What information and knowledge is required to support mainstreaming exercise?
- What institutional and human capacity may be required?
- Who needs to be involved in the mainstreaming exercise and what role they could play?
- What tools are available?
- Which key decisions are to be made?

This guide aims to provide an insight in to these headline questions as well as provide a practical step-by-step framework on how to mainstream climate change into PICTs development planning and decision-making processes.

The approach recommended in this guide combines standard policy cycles that are commonly used in the Pacific and elsewhere around the world with analytical inputs from the climate risk management (CRM) framework. These are presented as a sevenphase process with corresponding analytical inputs,

outputs and key decisions described for each step. The process is also illustrated with detailed case studies drawn from the Pacific region.

This guide is for country practitioners, regional governments and organisations, and development partners to guide and support their mainstreaming efforts by integrating climate risk into 'mainstream' development planning and policy-making processes. While efforts to mainstream climate change into national development planning are still at a relatively early stage in many PICTs, in time there will be increased experiences, new information and new lessons learned that could be shared.

## Structure

This guide is divided into three parts, outlined below, which can be read individually according to user interests and needs, referring to other sections of the guide as required.

**Part 1** provides an overview of the approach recommended in this guide to mainstream climate change into national development planning and decision-making. It describes climate change mainstreaming, and outlines the proposed approach to mainstreaming climate change adaptation. This is presented as a seven-phase process combining standard policy cycles and analytical inputs from the climate risk management framework. **Parts 2 and 3** provide more detail on the activities, tools and outputs corresponding to each of the seven phases in the framework. Part 2 does this for mainstreaming at the strategy/policy level, and Part 3 does this for mainstreaming at the project level (i.e. 'on-the-ground' initiatives). These volumes also illustrate each phase with case studies drawn from the Pacific region.



PART 1

INTRODUCTION

**Pacific Adaptation to Climate  
Change Project TONGA**



*Building resilience to climate  
change for Hihifo communities  
Fo'ui, Ha'avakatolo, Kolovai, 'Aha,  
Kanokupolu , Ha'atafu*



# Introduction

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## 1.1 Understanding Mainstreaming Climate Change

Climate change mainstreaming is about *integrating* climate *risks* into development planning processes and decision-making. This means incorporating climate risk considerations into every aspect of the policy and project development process. This applies to all key Government agencies and sectors (e.g. Finance, Planning, Health, Agriculture, and Environment), and all levels of government (i.e. national and sub-national).

This can be thought of as applying a 'climate lens' to the work the Government is already doing. That is, analysing each stage of policy and project formulation from a climate risk perspective, so that the policy or project under consideration is more effective at reaching its original objectives, do not create or increases vulnerability and sustainable.

For some policy and projects, climate risk will be a major consideration and will require substantive analytical inputs. For others, climate risk may be a very minor consideration and thus would only warrant a small amount of analytical work. Mainstreaming climate risks should further be thought of as a *process* rather than as a goal. Outputs of mainstreaming exercises are just a means to an end, with the end being the actual development outcomes.

### Climate (and disaster) risk

The IPCC (2012) defines risk as the *expected* losses resulting from interactions between (i) natural hazards; (ii) exposure, and (iii) vulnerability. In order for practitioners to properly integrate and manage the risk from climate change and natural disasters, it is important that these components of climate (and disaster) risk are well understood.

### Natural hazards

Natural hazards are a naturally occurring event such as drought, cyclones, and extreme rainfall events. The threat from natural hazards can be described in terms of the frequency and intensity of those climate and weather events occurring in the future. These are the probabilities of an event taking place. Under the effects of climate change, the frequency and intensity of natural hazard events is changing. However, the direction and magnitude of these changes are not well understood. Accounting for this uncertainty is a key part of climate change adaptation policy development and for mainstreaming climate risks generally.

## Exposure

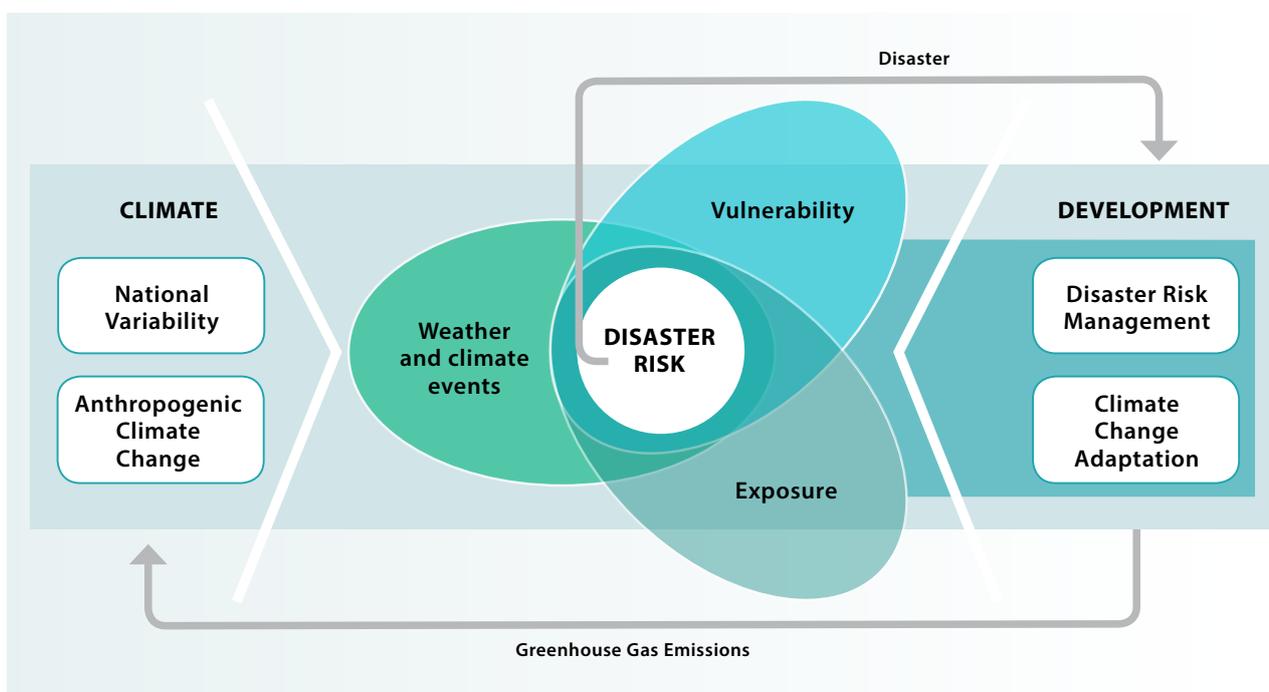
Exposure refers to the inventory of elements – human lives, livelihoods, and assets – that are in an area in which hazard events may occur. If no population and economic resources are located in a potentially dangerous setting, then no climate or disaster risks would exist.

## Vulnerability

Vulnerability refers to the sensitivity of exposed elements to damage and loss from a hazard event in that area. It also refers to the ability or capacity of impacted parties to respond to extreme events and to cope with the immediate effects of an event and rebuild. The vulnerability to natural disasters, development and environment are inextricably linked (ISDR 2004). At the national level, vulnerability is high in areas with poor infrastructure, which affects people’s ability to engage in income-generating activities and reduces their ability to respond to disasters. Poor infrastructure standards, weak government regulations (such as the absence of building codes) and weak regulatory enforcement also increase disaster risks. Pacific island countries rely heavily on the primary sector and are generally very sensitive to the effects of natural disasters (Benson 1997; Benson & Clay 2004), particularly disasters of hydro-meteorological origin.

The relationships between hazard (weather and climate events), exposure and vulnerability in the broader context of climate change and development are summarised in Figure 1 below.

**FIGURE 1.** Disaster risk results from interactions between hazards caused by climate factors, exposure and vulnerability of social, economic and environmental systems, that are also influenced by development programmes.



Source: IPCC (2012)

## 1.2 An approach to Climate Change Mainstreaming

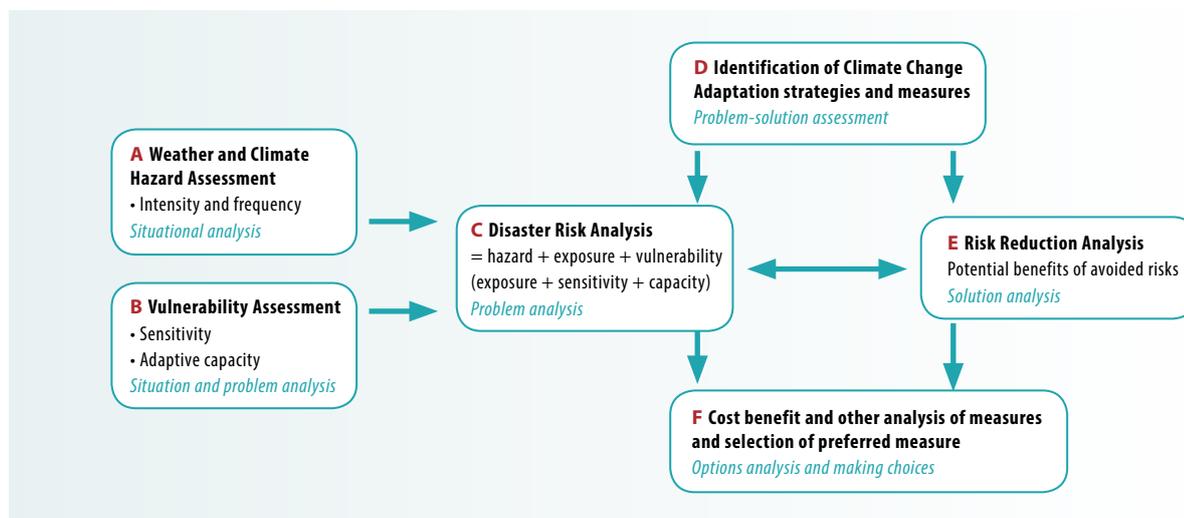
The approach to climate change mainstreaming set out in this guide combines the normal decision-making processes based on a policy and project cycle, together with inputs from the climate risk management framework. This is a risk-based approach to mainstreaming climate change.

The (policy and project) cycle follows a standard set of steps including (1) preparatory, (2) situation analysis, (3) problem analysis, (4) solution analysis, (5) design, (6) implementation, monitoring and evaluation, and (7) review. These are the broad steps that Governments normally need to work through when developing and implementing evidence-based interventions or informed decisions, where the earlier step informed the next. This cycle can be applied to high-level strategies, plans, and policies as well as 'on-the-ground' initiatives and measures. The specific activities, tools, and outputs performed under each of these broad steps are numerous and will depend on the nature of the problem and the level of the policy intervention (i.e. strategy versus on-the-ground initiative) under development.

Climate risk management (CRM) is a systematic framework for undertaking technical analysis to support risk-based decisions. It is a sub-set of standard disaster risk reduction (DRR), which is widely practiced across the Pacific region. The assessment of hazards in the context of CRM and DRR is becoming less differentiated. Historical climate and weather information along with climate change predictions are being used to estimate the likelihood and severity of hydro-meteorological hazards as well as their potential impacts on exposure.

The key technical steps of DRR and the CRM framework are essentially the same. These are (A) Hazard assessment; (B) Vulnerability assessment; (C) Risk Assessment; and (D) Identification of DRR & climate change adaptation strategies and measures. To support this, cost-benefit analyses and other assessments are also carried out to identify viable measures. The selection of DRR or CCA measures depends on a range of factors that may not always be cost effective.

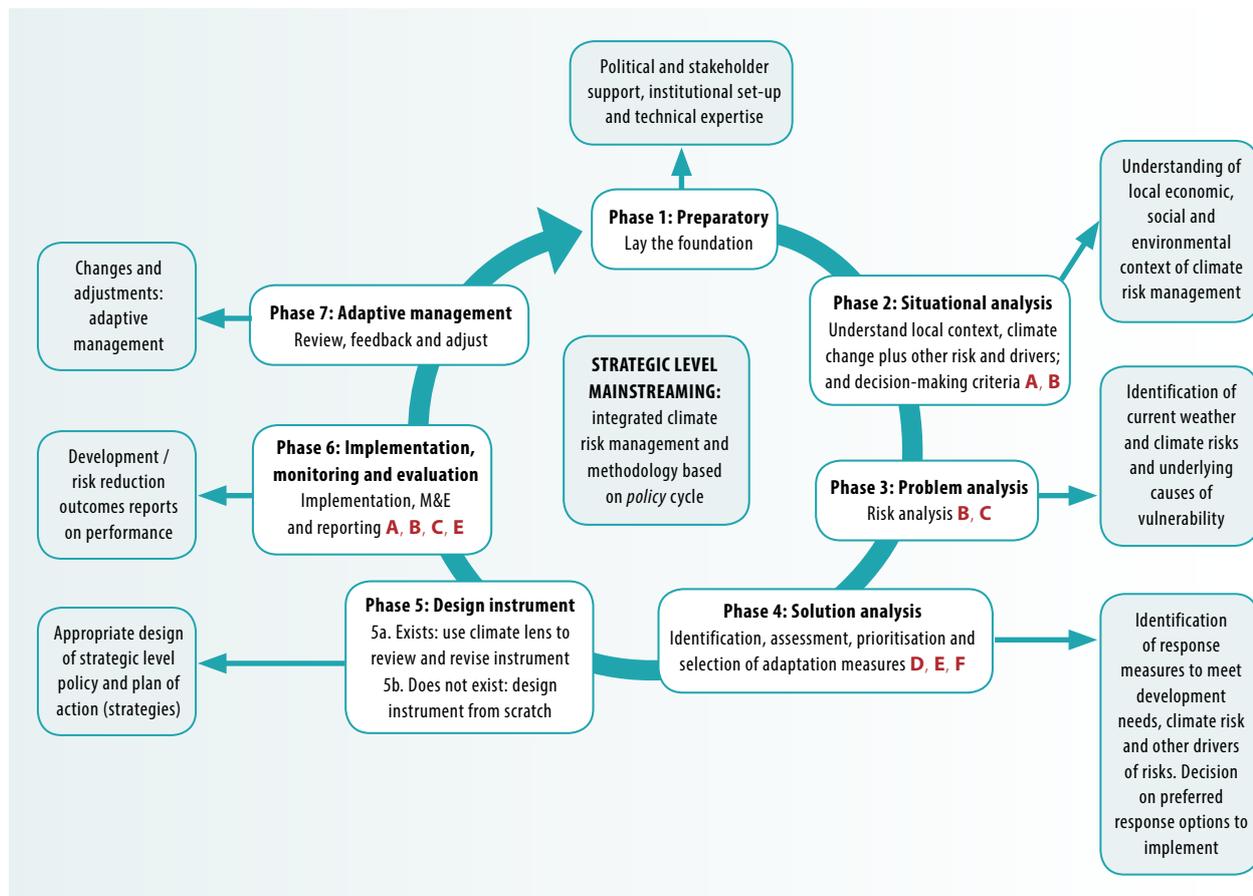
**FIGURE 2.** Key technical steps to underpin climate risk management [**RED LETTERS**] are key technical analysis; terms in *blue italics* reflect key process-oriented steps summarised in Figure 2.2.



Source: Adapted from Mechler (2005)

The proposed approach is presented as a seven-phase process, with a preparatory step included in the policy cycle to 'lay the foundation' for mainstreaming climate change. It can be viewed as an addition to what is commonly done as part of mainstreaming disaster risk under DRM. This seven-phase approach is summarised in Figure 3 below. Relevant policy cycle-based phases are shown as white boxes (1 to 7). Corresponding analytical inputs from CRM (as described above) are shown as red letters (A to F) within the relevant cycle phase. Green shaded boxes show the key decisions and outputs at each respective phase of the mainstreaming process.

**FIGURE 3.** Integrated climate risk management mainstreaming methodology based on policy cycle: key phases, respective decisions and outputs.



It is important to recognise there are multiple entry points to mainstream climate risk into policy processes. This can be done at the level of a national sustainable development plan, or for existing sector-level policies, or bottom-up through 'on-the-ground' initiatives. Regardless of the entry point, the seven-phase process can be applied to helpfully guide this mainstreaming work. Each of the seven phases are discussed further below:

## PHASE 1 – Preparatory

The preparatory phase 1 ensures that the multi-faceted nature of climate risk management is adequately addressed. Climate risk management requires a national systems approach where:

- different arms of the government, with other stakeholder inputs, integrate climate risks in their respective programmes;
- coordination exists of adaptation efforts across and between government agencies (vertical and horizontal);
- decision-makers can access data and information maintained by different agencies to make informed decisions.

Encouraging the engagement of different arms of government, operating under their respective legislation, requires support from higher levels of government. To facilitate such a cross-sectoral engagement, there is a need to secure appropriate political and stakeholder support at the earliest stage possible. This could help to:

- integrate climate risk considerations across key government decision-making processes;
- coordinate access to data maintained by different arms of government. To make informed decisions, interdisciplinary data, information and knowledge sets are required;
- secure inputs from different arms of the government and other stakeholders so collective decisions across all stages of the mainstreaming exercise are made;
- emphasise the point that climate change is everyone’s business and a national systems approach to climate risk management is essential.

This preparatory phase would thus help to lay the political, organisational and institutional foundation to operationalise the mainstreaming exercise. This phase involves six steps.

Phase 1: Preparatory steps	Key outputs
<p>1.1 Raise awareness</p> <p>1.2 Establish stakeholder support, including political support</p> <p>1.3 Establish appropriate institutional arrangements</p> <p>1.4 Identify types of scientific information, analysis and expert support that may be relevant</p> <p>1.5 Identify desired level of mainstreaming. Different levels of mainstreaming include national (e.g. NSDS, Joint National Action Plans, national climate change policy), sector, sub-national, and on-the-ground initiatives. Levels here also refer to whether mainstreaming intends to ‘climate-proof’ an already existing policy that has a development focus, or whether it is aiming to create a new policy which has climate change risk reduction as its primary focus.</p> <p>1.6 Establish a decision-making process to ensure community members are integrally involved in each of the cycle stages – to calibrate their knowledge against scientific analysis; and help select adaptation measures that reflect their risk preferences and absorptive capacity (this step is primarily for mainstreaming of ‘on-the-ground’ initiatives).</p>	<ul style="list-style-type: none"> <li>▪ Improved understanding and secured political support</li> <li>▪ Secured cross-agency and other stakeholders’ engagement and support</li> <li>▪ Interagency committees and stakeholders groups established to guide and support mainstreaming</li> <li>▪ Technical committee to help access and analyse data and provide technical inputs</li> <li>▪ Products of mainstreaming exercise objectively identified</li> <li>▪ Decision-making processes that encourage active engagement of community members and sharing of their experiential knowledge</li> </ul>

## PHASE 2 – Situation Analysis

The purpose of this phase is to understand the development situation, current weather and climate risks, and projected climate change scenarios. This provides the context and scope for undertaking the next phases of the mainstreaming exercise. This phase involves three steps:

Phase 2: Situation analysis steps	Key outputs
2.1 Understand national and, if mainstreaming at the on-the-ground level, community development context, their vulnerability and drivers of vulnerability (A) 2.2 Understand current weather and climate risks (B) 2.3 Understand projected climate change scenarios (B)	A status report on: <ul style="list-style-type: none"> <li>▪ economic, social and environmental context, together with institutional and political environment</li> <li>▪ current weather and climate context</li> <li>▪ projected climate change scenarios</li> <li>▪ (if on-the-ground mainstreaming) community vulnerability, including drivers of vulnerability</li> </ul>

## PHASE 3 – Problem Analysis

The purpose of this phase is to undertake a detailed risk assessment under current and projected climate conditions, and identify gaps in current disaster risk management. This helps to better understand the nature and extent of the climate risk and to clarify the objective(s) of both the mainstreaming exercise and the broader development policy effort. It involves four steps:

Phase 3: Problem analysis steps	Key outputs
3.1 Analyse current weather and climate risks, other drivers of risks, including root causes (B, C) 3.2 Assess gaps in current disaster risk management and development needs 3.3 Assess projected weather and climate risks, and other drivers of risks (B, C) 3.4 Document community experiences with climate hazards and knowledge in coping with disasters (B, C)	A status report on: <ul style="list-style-type: none"> <li>▪ current weather and climate risks and other drivers of risk and root causes</li> <li>▪ gaps in disaster risk management and development needs</li> <li>▪ projected climate risks and vulnerability</li> </ul> Decisions about: <ul style="list-style-type: none"> <li>▪ priority risks to target</li> </ul>

The steps listed for the problem analysis phase are primarily targeting the climate risk component of a given development problem. As mentioned above, for most development planning problems, climate risk will be only one component. There will also be other non-climate components (causes and drivers) of the problem which will require other technical inputs and outputs as appropriate to the field.

## PHASE 4 – Solution analysis

The purpose of this phase is to identify different options to reduce the identified climate risks. The options to be identified will correspond to the level of mainstreaming (national strategy, sector-policy, 'on-the-ground' initiative) being performed. There is more than one way to solve a climate or development problem. It is important that all feasible options are identified and properly considered in order to allow for the most effective option to be selected. There is one step:

Phase 4: Identification of options	Key outputs
<p>4.1 Identify adaptation (and/or climate compatible development) measures, including through research of options implemented in other parts of the country (sectors, geographical areas, time), other PICTs, and (if necessary) other regions. (D) Risk reduction analysis, including research of experience (including evaluation reports) of other parts of the country (sectors, geographical areas, time), other PICTs, and other regions in developing and implementing similar measures. (E)</p>	<ul style="list-style-type: none"> <li>▪ Brief report outlining process followed and basis for identifying main options</li> <li>▪ Key adaptation and development measures identified for further analysis</li> </ul>

### Selection of preferred options

This phase helps to help inform which of the identified options will be most worthwhile for addressing the problems at hand and should be selected for implementation. There are two steps:

Phase 4: Solution analysis steps	Key outputs
<ul style="list-style-type: none"> <li>▪ Identify decision-making criteria</li> <li>▪ Conduct cost-benefit analysis and/or other appraisal assessments (F)</li> </ul>	<ul style="list-style-type: none"> <li>▪ key decision-making criteria for selecting options</li> <li>▪ cost-benefit analysis or other assessment report of alternative options.</li> <li>▪ preferred option(s) selected.</li> </ul>

Cost-benefit analysis (CBA) is one of the methods that can be usefully applied to inform the selection of the preferred option(s). There are other methods that can complement a CBA.

It is also important that the uncertainty of future climate hazard scenarios and implications for success are made very clear in the above-mentioned assessment reports and related communication activities. This is sometimes done through the categorisation of options as 'no-regret', 'low-regret', and 'high-regret' measures. Measures characterised by low investment, are reversible (e.g. conservation and sustainable use of natural resources), and which are shown to generate net benefits under all climate change scenarios, are considered to be 'no-regret' or 'low-regret' options. Measures characterised by high investment costs, high irreversibility (e.g. large infrastructure projects such as sea walls) and only generate net benefits under certain climate change scenarios are considered to be 'high-regret' options.

## PHASE 5 – Design of the output

The purpose of this phase is to develop a detailed design document to be submitted to Government and/or development partners for approval and funding allocation. These design documents should include objectives, activities and their respective methodology, inputs required and expected outputs, and a budget. It should also include specific performance and outcome indicators and an M&E plan. There are five steps:

Phase 5 Design steps	Key outputs
5.1 Prepare content of the initiative 5.1a Initiative/instruments already exists and needs to be revised or 'climate-proofed'. 5.1b Initiative/instrument does not exist 5.2 Prepare Implementation strategy 5.3 Prepare Monitoring and Evaluation (M&E) strategy 5.4 Consolidate all of the above into a detailed (or revised) design document. 5.5 Submit design document to Government and/or Development Partners for approval/endorsement	<ul style="list-style-type: none"> <li>▪ Design document.</li> <li>▪ Initiative approved by Government and budget allocated.</li> <li>▪ Initiative approved by Development Partners and funding allocated.</li> </ul>

## PHASE 6 – Implementation, Monitoring and Evaluation (M&E)

The purpose of this phase is to implement, monitor, evaluate and report on progress against the stated objective of the policy and/or plan of action, or on-the-ground initiative, and with respect to the countries development goals. There are two steps:

Phase 6: Implementation, M&E steps	Key outputs
6.1 Implementation	Implement activities
6.2 Monitoring, evaluation and reporting (A, B, C, E, and F)	<ul style="list-style-type: none"> <li>▪ Regular M&amp;E reports across different stakeholders and all levels of government, reflecting vertical relationships between project, programme, sector, climate change policy goals, objectives and strategies and the NSDS</li> <li>▪ An Evaluation report, including ex-post cost-benefit analysis and discussion about lessons learnt</li> <li>▪ A decision to change current initiative design, and/or replicate if CBA indicates the benefits outweigh the costs</li> <li>▪ Use lessons learnt to inform other climate risk management initiatives</li> </ul>

## PHASE 7 – Review

- The purpose of this phase is to review the effectiveness of the initiatives. The analysis may be used to inform other initiatives.

### Concluding Remarks

The seven-phase process represents a broad outline of how to mainstream climate risk into development planning and policy processes. More details on the steps and the supporting tools are provided in Volume 2 and Volume 3, which support this guideline. Volume 2 provides this information and Pacific case studies for mainstreaming at the 'strategic' level. Volume 3 provides this information and Pacific case studies for mainstreaming for 'on-the-ground' initiatives.

Because efforts to mainstream climate risk into national development planning are still at a relatively early stage in many PICTs, the proposed approach will need to be tested and improved as the body of knowledge and experience across the Pacific region increases.

The hope is that country practitioners, regional Governments, and Development Partners working on climate change and disaster risk management in the Pacific can share their experiences and lessons learned from mainstreaming climate risk into development planning processes. This guide is designed to assist the mainstreaming exercise. Based on user feedback and a broader evaluation of climate risk mainstreaming in the Pacific, this guide will be revised and updated in 2015.





## PART 2

# STRATEGIC-LEVEL MAINSTREAMING





# Strategic-Level Mainstreaming

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## 2.1 Introduction

This guide outlines a decision-making process that integrates the technical aspects of climate change risks. Mainstreaming is seen as a process rather than a goal. At the strategic level, mainstreaming outputs include national policies, plans, guidelines and programmes. The outcomes are the achievement of national development goals, such as improved economic well-being, social conditions, environmental conservation, and improved resilience to climate hazards in people, economies and the environment.

## 2.2 Seven-Phase Mainstreaming Process

Generally, the policy-cycle decision-making process has seven phases (Figure 2.1).

- **PHASE 1:** Preparatory
- **PHASE 2:** Situation analysis
- **PHASE 3:** Problem analysis
- **PHASE 4:** Solution analysis
- **PHASE 5:** Design
- **PHASE 6:** Implementation, Monitoring and evaluation
- **PHASE 7:** Review and adjustment.

Each phase is subdivided into key steps that are described below.

Making decisions about managing climate change risks or impacts differs from the usual government approach, where involving a single agency is often adequate. When dealing with complex climate change issues, many agencies and stakeholders will be involved. This is a greater level of engagement which requires strong political and stakeholder support from the start. This helps to integrate climate risk assessments across government agencies; coordinate access to data maintained by different arms of government, and secure inputs from the government and other stakeholders.

A mainstreaming exercise normally results in several linked outputs. These could include a national climate change policy linked to the country's National Sustainable Development Strategy (NSDS), its climate change strategic action plan and/or enabling legislation, or a National Food Security Policy where climate change risks have been incorporated in every key strategy of the policy. Both national policies would reflect a country's approach to reduce the risks of climate change related disasters and to adapt to climate change, within the context of its national sustainable development strategy and its national food policy. The policy may be given effect in legislation, regulations and bylaws.

A national plan complements the sector plans which are implemented at the agency level. These relationships are summarised in Figure 2.2A and Figure 2.2B.

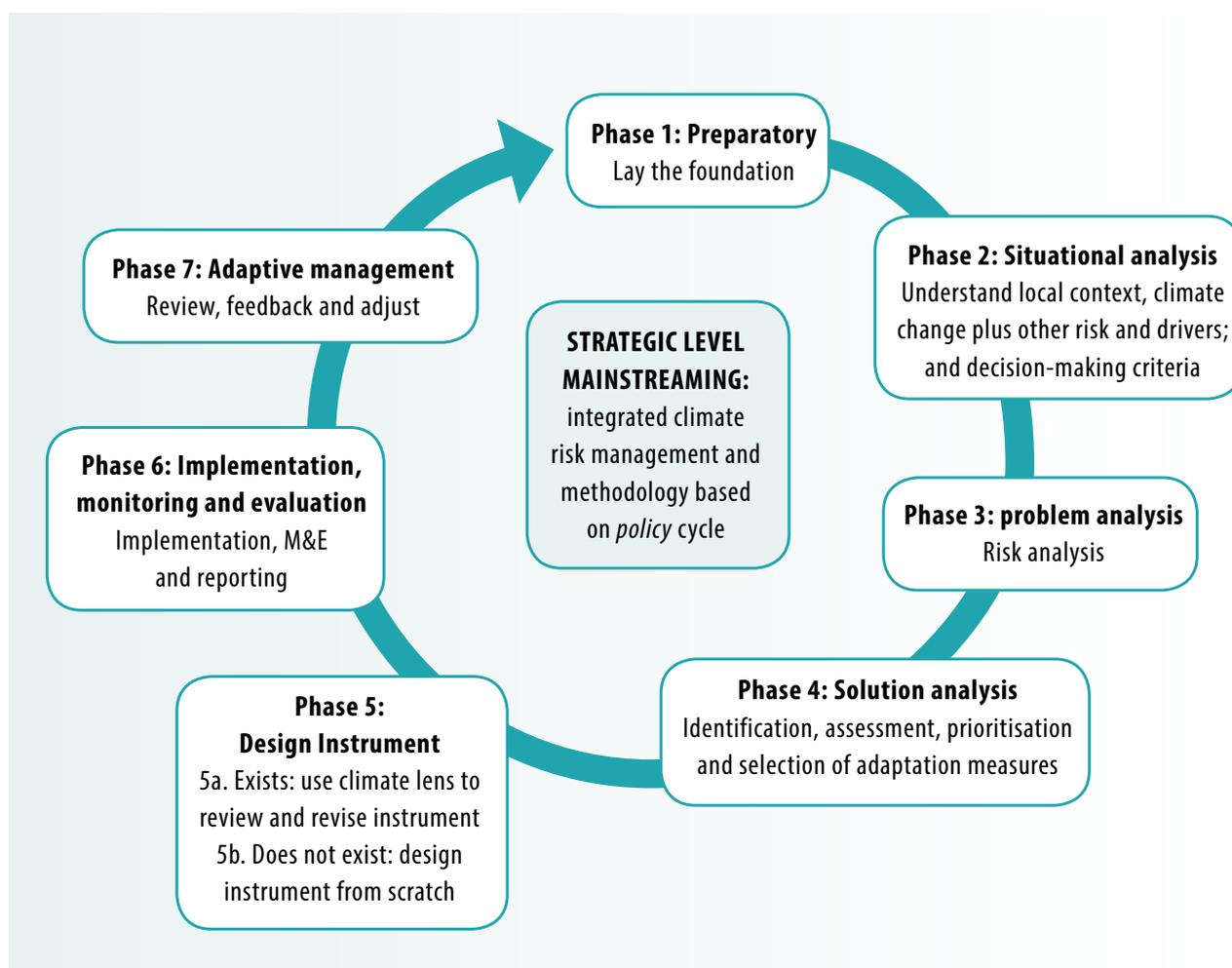
### Technical dimensions

Technical analysis is required to inform policy formation and to develop climate change risk management. This involves key activities, shown in Figure 2.3:

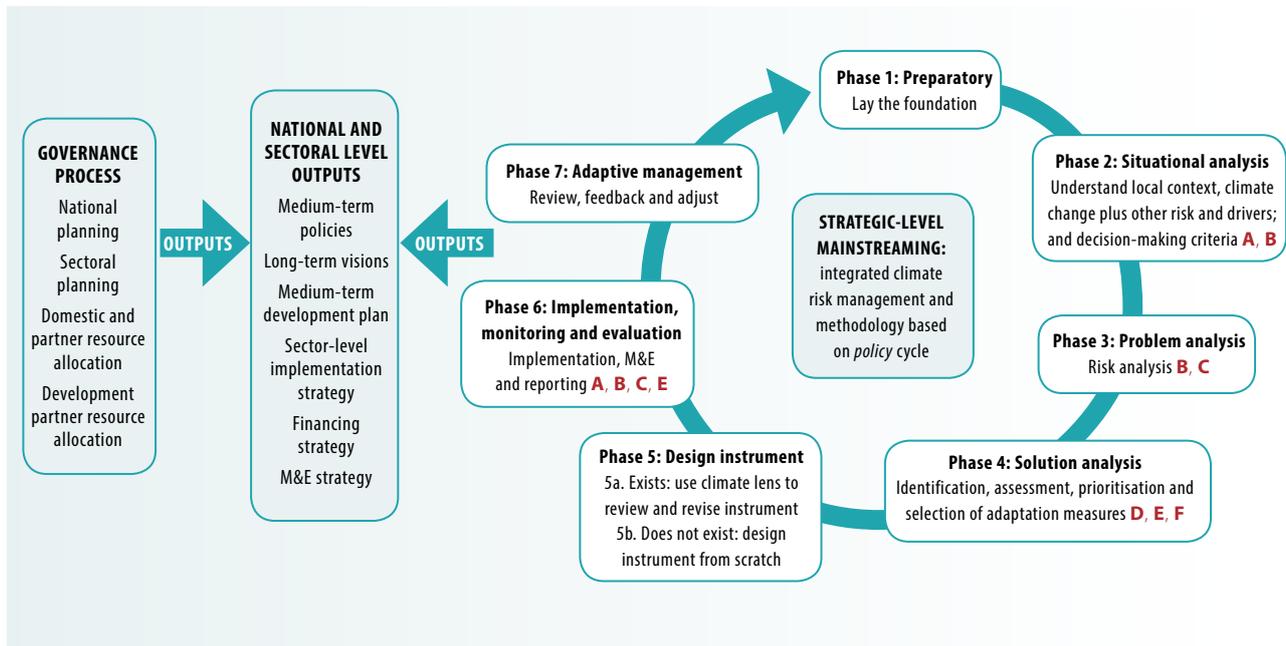
- A. Weather and climate hazard assessment
- B. Vulnerability assessment
- C. Disaster risk analysis
- D. Identification of DRR & climate change adaptation strategies and measures
- E. Risk reduction analysis
- F. Evaluation and selection of preferred measures.

Decisions about adaptation measures will differ, as each country is unique in terms of its economic, social and environmental development. Another factor is the capacity of a country to respond to climate change risks.

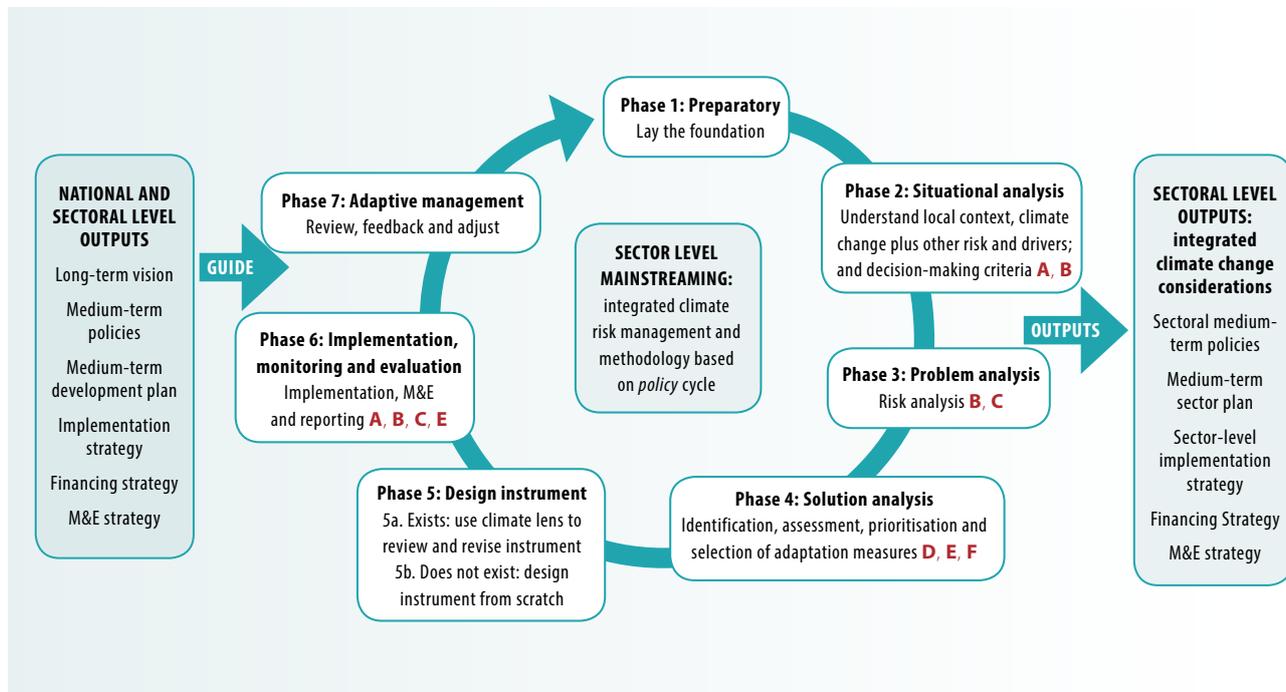
**FIGURE 2.1** Integrated climate risk management and process of key decision-making based on the policy cycle: seven phases at strategic level.



**FIGURE 2.2A** Relationship between governance, integrated climate risk management and decision-making based on *policy*: national strategic outputs.

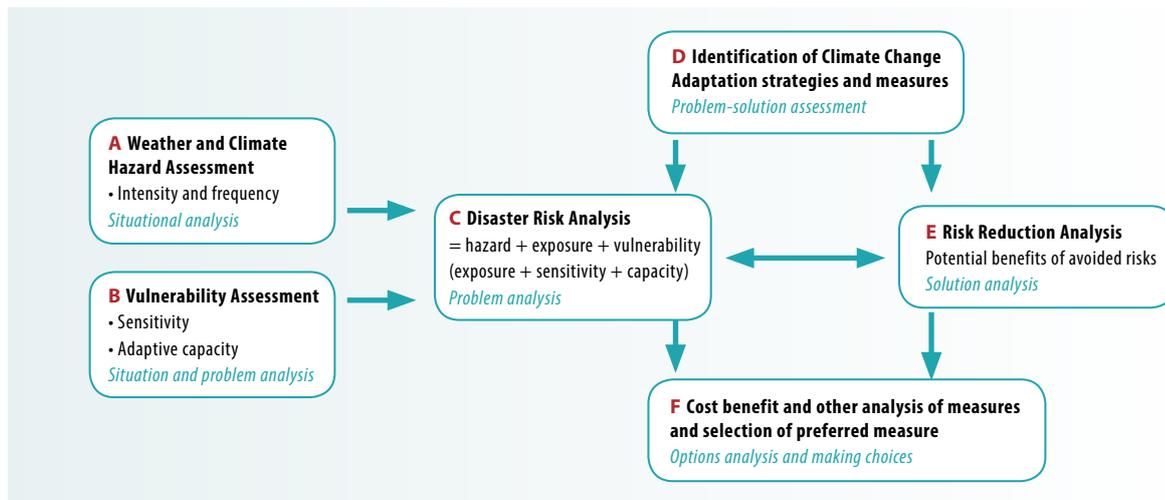


**FIGURE 2.2B** Relationship between governance, integrated climate risk management and decision-making based on *policy*: sectoral-level outputs.



Source: Adapted from Olhoff & Schaer (2010): figure 1

**FIGURE 2.3** Types of technical analysis (letters **A, B, C, D, E** and **F**), and where they may occur in the policy cycle. Each phase has outputs that feed into the next phase (Figure 2.4).



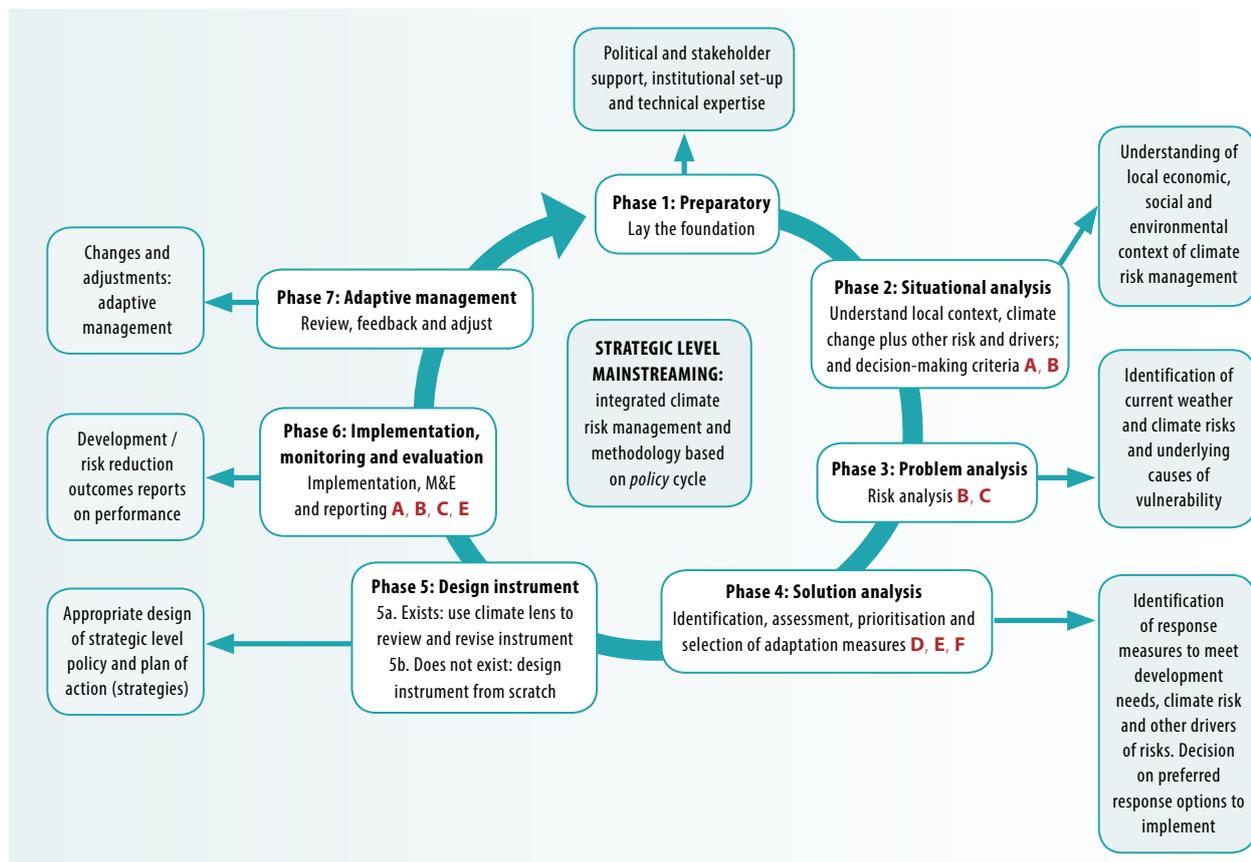
Source: Adapted from Mechler (2005)

Mainstreaming climate change may involve changing development policies and plans to reflect climate risks. The whole process requires the best scientific knowledge.

### Strategic-level mainstreaming outputs

At the strategic level, climate risks may be integrated in to development plans at the national, sectoral and agency level. They might also enable institutional designs to better reflect the role of the agency in climate change risks management, including legislation and other instruments. Budget resources may come from government or development partners.

**FIGURE 2.4** Integrated climate risk management mainstreaming process based on policy cycle:



## 2.3 Step-by-Step Guide

A step-by-step guide is given below for the seven phases of the process.

### PHASE 1 – Preparatory

**PURPOSE:** Establish an institutional foundation for the mainstreaming exercise. A successful mainstreaming exercise requires cooperation from different government agencies and communities, using data and other inputs. Collective decisions need to identify responses that are required for climate risk management.

#### STEP 1.1 Raise awareness

Awareness raising must be clear about who the target audience is and what types of information best suit them. User-friendly information is needed about the impacts of climate change, what can be done to reduce the risks, and how people can help.

#### STEP 1.2 Establish stakeholder support, including political support

The mainstreaming exercise has to engage key stakeholders across society. The involvement of government and non-government agencies will vary depending on the exercise being targeted, as well as the inputs required. Box 2.2 provides an example.

In the Solomon Islands, for example, in the development of their National Climate Change Policy, faith-based organisations who were implementing adaptation activities were consulted and were among the participants in one of the many nation-wide consultation workshops carried out while developing the policy. Consultations were also held with private sector companies. Their views were sought about possible changes in development processes, including Environmental Impact Assessments (EIA) that the government may consider as part of the responses to climate change<sup>1</sup>. Gaining political support from the highest level in government is also critical for mainstreaming (see Table 2.1).

An example of how to engage government agencies (ministries and departments) comes from Tonga. In July 2009, the National Emergency Management Office (NEMO) requested SOPAC to help develop a National Action Plan (NAP) on Disaster Risk Management (DRM). Separately, the Ministry of Environment and Climate Change (MECC) began developing Tonga's second national communication. With guidance from SPREP and SOPAC, the two agencies decided on a joint plan, merging their planning process efforts. As a result, the Government of Tonga Cabinet established the Joint National Action Plan (JNAP) Task Force, comprising the Climate Change Technical Working Group (Climate Change TWG) and the DRM Task Force.

Champions within government agencies may emerge in different ways, as shown below:

- **Cook Islands:** The Director of the Emergency Services and the Director of Climate Change Cook Islands jointly led the JNAP process.
- **Nauru:** Coordinators of PACC and IWRM projects jointly led the sector-level mainstreaming, supported by the Secretary of the Department of Commerce, Industry and Environment.
- **Tonga:** The Honorable Minister and the Director of the Ministry of Climate Change and Environment and the Director of the National Emergency Management Office.

1 Source: Casper Supa, PACC coordinator, Completed country template on mainstreaming, July 2012

- **Tuvalu:** The Permanent Secretary of Foreign Affairs, Trade, Tourism, Environment and Labour and PACC coordinator, supported by the Department of Environment officials.
- **Vanuatu:** The Director of Meteorological Services led development of the national action plan for DRM, with the National Disaster Management Officer (NDMO).

Community-based champions also play a vital role, for example, in the area of environment conservation. Local champions can help to raise awareness in the community about climate risk management, and act as focal points for other partners to secure greater local ownership, channel information and build capacity. Examples include:

- **Cook Islands:** Strong involvement of the Cook Islands Red Cross in their JNAP process.
- **Nauru:** Strong support from Nauru Community Based Organisations and the Media.
- **Tonga:** Strong involvement of the Tonga Red Cross, Radio Tonga TANGO in their JNAP process.
- **Tuvalu:** Strong involvement of all media in Tuvalu plus representatives from communities.
- **Vanuatu:** Strong support from the Vanuatu Broadcasting and Television Corporation.

**TABLE 2.1** Diversity of stakeholder groups and their likely roles at different phases of the mainstreaming exercise.

Stakeholder group	Stage of active involvement	Likely key roles
Government agencies	Phases 1 to 7: through membership of steering and technical committees.	Joint ownership and partnership. Collective decision-making about risks, risk reduction and risk management
Department of Meteorology	Phases 1 to 7: through membership of steering and technical committees	Source of primary data on weather and climate; scientific expertise on climate change, analysis and modelling
National Disaster Management Office	Phases 1 to 7: through membership of steering and technical committees	Source of primary data on disaster events, impacts and response capacity; knowledge about disaster management
Ministry of Development Planning and Aid Coordination	Phases 1 to 7: through membership of steering and technical committees During design phase 6, and costing of plans and programs	Source of primary information about the economy, planning and budgetary processes; cross-sectoral NSDS coordination; technical support
Prime Minister's Office	Phase 1 During government's approval process (through Cabinet and Parliament)	Political support; enabler for cross-sectoral and cross-agency collaboration
Ministry of Environment and Climate Change	Phases 1 to 7: through membership of steering and technical committees During mainstreaming exercises at each of the sectoral level	Usually the lead agency, coordinator of the mainstreaming exercise in the country Source of primary information about international and regional dimensions of climate change debate and instruments

Stakeholder group	Stage of active involvement	Likely key roles
Ministry of Agriculture and Livestock	Phases 1 to 7: through membership of steering and technical committees During agriculture sector mainstreaming exercise	Source of primary data on economic activities, and knowledge about the effects of climate on human livelihoods
Ministry/Department of Energy Government's Utility Corporation	Phases 1 to 7: through membership of steering and technical committees During energy sector mainstreaming exercise	Source of primary information about the energy demand and supply, renewable energy, climate change mitigation
Provincial/Local Governments	Mainly during integration of climate change in the preparation of provincial-level plans and programmes	
Non-Government Organisations and other stakeholders	As members of stakeholder consultation groups, and as participants during workshops	
Faith-based organisations	As members of stakeholder consultation groups, and as participants during workshops Mainly phases 5 to 7: Design of 'on-the-ground' strategies and programs	Practical experience in dealing with local communities, in adaptation and disaster management activities
Civil society-representatives from women's groups and youth organisations	Participants during stakeholder workshops	Active engagement and empowerment Practical experience in dealing with local communities, in adaptation and disaster management activities
International NGOs, e.g. Save the Children, Red Cross	Mainly phase 6: Implementation	As members of wider stakeholder consultation groups
Private sector, particularly mining	Phase 1 and others, particularly phase 5	
CROP agencies (SPREP, SPC-SOPAC)*	Throughout the process, including as technical backstops	As members of technical group and/or wider stakeholder consultation groups
Development partners—multi-lateral and bilateral partners	Stakeholder consultation	As members of wider stakeholder consultation groups As potential donors and partners for the implementation phase
College of Higher Education, University of the South Pacific	Phase 1 and subsequent capacity development programs	As trainers at different levels

An example of how to engage government agencies (ministries and departments) comes from Tonga<sup>2</sup>. In July 2009, the National Emergency Management Office (NEMO) requested SOPAC to help develop a National Action Plan (NAP) on Disaster Risk Management (DRM). Separately, the Ministry of Environment and Climate Change (MECC) began developing Tonga's second national communication. With guidance from SPREP and SOPAC, the two agencies decided on a joint plan, merging their planning process efforts. As a result, the Government of Tonga Cabinet established the Joint National Action Plan (JNAP) Task Force, comprising the Climate Change Technical Working Group (Climate Change TWG) and the DRM Task Force.

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### STEP 1.3 Establish appropriate institutional arrangements

A strong cross-agency decision-making body is required to support technical aspects of the mainstreaming exercise, as well as the decision-making and approval process. Examples include:

- **Fiji:** A National Environment Council subcommittee served as the high-level 'political' steering committee.
- **Nauru:** A political-level steering committee, comprising heads of departments, guides water policy and the Nauru Water, Sanitation and Health Plan.
- **Tuvalu:** A Cabinet Development Subcommittee served as the political-level steering committee for Climate Change Policy, and a Climate Change Strategic Action Plan.

A steering group comprising heads of departments can help to provide political-level support. This makes it easier for the lead agency to get inter-agency support, and to steer the output through

2 Source: The Government of Tonga (2010)

Government approvals. Where such mechanisms do not exist, specific committees could be established to complete the process, as was done in Nauru.

## STEP 1.4 Decide on strategic level for mainstreaming

The mainstreaming process can focus on national, sectoral or local levels. This allows countries to select a level that produces results within their planning horizon and resources. For example, some countries develop just one national-level strategic document, linked to the National Sustainable Development Strategy (NSDS), to guide the Disaster Risk Management (DRM) and climate change adaptation and mitigation. This joint national action plan (JNAP) approach was decided by Tonga to 'avoid duplication of effort and to maximise the use of the limited resources in Tonga'<sup>3</sup>. Tuvalu took a similar approach under their PACC project, such as the Integrated Water Resource Management (IWRM), and the Second National Communication. It is then left to each sector and agency to take the relevant strategy/action from this national level strategic document and integrate it into their sector policy and annual action plan, so it could be budgeted. This is where mainstreaming implementation and monitoring occur (also refer to Phase 5 Step 1.5).

Reviewing the DRM and climate change initiatives helps to identify gaps and what needs to be targeted. Countries may choose to adapt existing national plans, develop their national policy and plan where none exists, or focus on sectoral-level mainstreaming. In Vanuatu, changing their national development plan, *Prioritised Action Agenda (PAA)*, was not feasible, as the country had only recently approved their *PAA, 2006–2015*. Instead, a supplementary PAA was developed with the goal of reducing risk and building resilience. This emerged at the same time as the National Action Plan (NAP) for DRR and DM, and was endorsed by the government. The PAA was reviewed in 2010–2011 and a 'PAA 2012 update' was produced, with DRM and climate change issues included. A national-level policy may not exist, and the commitment to develop one may be difficult to secure. If it is the case, countries may decide to focus on the sectoral level, incorporating challenges of climate change and disaster risk management as part of a broader policy. One example is from Nauru (Box 2.1).

### BOX 2.1 WATER, SANITATION AND HEALTH POLICY DEVELOPMENT AND MAINSTREAMING CLIMATE CHANGE.

The Nauru Government recently approved a water, sanitation and health policy developed under a GEF-funded Integrated Water Resource Management (IWRM) project with the support of PACC. This focused on one of the water and sanitation strategies listed in the NSDS. The two IWRM and PACC project coordinators formed an informal 'water unit' to help coordinate their work. This occurred in the absence of a national climate change policy, or any similar document other than NSDS and the infrastructure plan.

Nauru had prepared a NAPA as part of their second communication requirement, called RONADAPT, (still in draft). The team combined three separate goals under the NSDS 2005–2025 to produce a vision for the policy: *Reliable, safe, affordable, secure and sustainable water supplies to meet socio-economic development needs and appropriate sanitation systems for healthy communities and environments*. In the development of the water policy and plan, some ground had been covered during the RONADAPT process.

Sources: Nauru Department of Commerce Industry and Environment (2010); Government of Nauru (2012a).

3 Source: Government of Tonga 2010

Different paths were used by Fiji and Tuvalu. Under the PACC project, Tuvalu developed a National Climate Change Policy linked to its *Te Kakeega II*. They also developed their National Strategic Action Plan (NSAP) for Climate Change and Disaster Risk Management, 2012–2016. The NSAP is the Implementation Plan for the National Climate Change Policy, *Te Kaniva*.<sup>4</sup>

The Fiji Cabinet endorsed the National Climate Change Policy Framework in 2007. The framework defined the position, and responsibilities, of the government and other stakeholders on the issues of climate change, climate variability and sea level rise. The framework was reviewed in 2011. Fiji then developed a National Climate Change Adaptation Strategy for Land-Based Resources 2012–2021 (draft), with the assistance of GIZ and SPC through their Regional Programme ‘Coping with Climate Change in the Pacific Island Region’ (CCCPIR). Box 2.2 describes the rationale adopted by Kosrae, Federated States of Micronesia, to amend their State Code 19 legislation.

### **BOX 2.2** GAPS IDENTIFIED BY KOSRAE, FSM, BEFORE DEVELOPING THEIR CLIMATE CHANGE LEGISLATION AND AMENDING EXISTING STATUTES

- FSM CC policy 2009 needs to be given effect
- Absence of CC legislation or legally binding instrument
- Lack of CC strategic and policy direction
- Disconnect between stakeholders (resource users, developers, policy makers, communities)
- Lack of information about climate change impacts tailored to the needs of the people
- Need to coordinate CC programs in FSM
- Help attract development partner funding

Source: Based on completed country template for mainstreaming by PACC Coordinator, (August 2012)

Agencies would ultimately integrate climate risks into their medium-term corporate and annual plans. For example, when Vanuatu’s Public Works Department reviewed its corporate plan, climate risks were included (Box 2.3).

4 Sources: Government of Tuvalu (2012a, 2012b)



**BOX 2.3** RELATIONSHIP BETWEEN VANUATU'S PAA, 2006–16 (2012 UPDATE), PAA ACTION PLAN STRATEGIES AND PWD'S CORPORATE PLAN, 2011 (REVISED)

**National Strategic Priority 4:** Primary Sector Development, Environment, Disaster, Climate change, DRM

PAA Action Plan Priority Objective <sup>1</sup>	PAA Action Plan Strategy <sup>1</sup>	MIPU Corporate Plan, 20112	PWD Agency-level strategy – integrating climate risk in its revised Corporate Plan <sup>2</sup>
<i>PO 4.5</i> Ensure the protection and conservation of Vanuatu's natural resources and biodiversity, in view of climate change issues	<i>Strategy 4.5.5</i> Finalise and implement the Vanuatu climate change policy, and integrate it into the PAA, sector plans and ministry corporate plans	Objective 1: Ensure the provision of commercial, quality, reliable, safe, efficient and competitively priced infrastructure, utilities and services, through public or private enterprises	Within 10years, 1800km of road are upgraded and sealed Within 10years, all 26 outer island airport runways are upgraded to an all-weather surface and new airports constructed where necessary
<i>PO 4.6</i> Prepare the people of Vanuatu to face disasters	<i>Strategy 4.6.1</i> Strengthen planning and decision-making at national and provincial level for DRR/DRM		

Sources: 1 Government of Vanuatu (2012); 2 Ministry of Infrastructure and Public Utilities (MIPU 2012)

A decision about which level to target for mainstreaming climate change depends on country priorities and resource constraints. At times, the national and sectoral levels may be targeted together. A discussion of issues in Table 2.2 can help to confirm the most effective approach.

**TABLE 2.2** Types of questions for guiding which level of mainstreaming to target first.

*National and/or sectoral-level mainstreaming exercise:*

Does the NSDS refer to disaster risk management and climate change?

Is there a national policy on DRR and DM, and/or CC to guide its efforts across sectors and agencies?

*Sectoral and corporate-level mainstreaming:*

Which sectors are most sensitive to climate change?

Which ones have sectoral policies and what climate (and other disaster) risks can be identified?

What assessments have been completed as part of DRM and climate risk management initiatives?

Can you identify any local champions who could drive the climate change mainstreaming process?

Can you identify development partners who may support sector-level mainstreaming exercises?

*Mainstreaming enabling legislation*

What gaps can be identified in legislation, regulation and codes of practice to address climate change?

## PHASE 2 – Situation Analysis

**PURPOSE:** *Understand the development context, current weather and climate risks, and projected climate change scenarios.*

Understanding the social, economic and environmental context is essential to a cost-effective mainstreaming exercise. Combined with the local governance and political decision-making process, this helps to place risk and risk reduction assessments into context. The poorer the economic and social well-being at the household level, the more sensitive the household, economy and society will be to external shocks. At the same time, the process of development adopted in many countries affects their vulnerability to disasters. Coastal developments that are subject to the effects of cyclones increase vulnerability of assets and communities to natural disasters. Unsustainable development practices, such as logging in areas prone to landslides, increase disaster risks. Environmental degradation is also a major driver of disaster risks, by aggravating the impact of hazards.

The development agenda followed by governments impact on the risks and risk reduction strategies, particularly when cross-sectoral effects are not considered in their decisions. As the effects of climate risks take multiple pathways, they are not easy to predict: sound science and knowledge, and cooperation across sectors and agencies are essential. Human vulnerability is heightened by weak disaster warning systems, and the limited ability of people to manage residual risks, and respond to disasters. Other drivers of change include increasing population, urbanisation, globalisation, and the loss of traditional knowledge.

A situation analysis would be undertaken as a desktop assessment, covering several broad areas:

- economic and social overview
- resource and environmental context
- national governance and decision-making process
- regional and international commitments made by government
- national planning and governance context
- sector plans and sectoral planning process
- economic development and poverty reduction strategies
- DRM-related policies, plans or programmes
- National and sectoral climate change policies
- Policy assessment and other planning tools
- Organisation mapping
- Data/information sources

Box 2.4 summarises the types of sources of data and information accessed by Fiji and Tonga in their recent mainstreaming exercise.

## BOX 2.4 BACKGROUND MATERIAL USED IN NATIONAL-LEVEL MAINSTREAMING EXERCISES IN FIJI AND TONGA

	<b>Mainstreaming output (national level)</b>	
	National Climate Change Policy process (Fiji) – joint PACC (SPREP), SPC and GIZ initiative	Joint National Action Planning process (Tonga)
<b>International context</b>	International and regional frameworks on climate change (UNFCCC and PIFACC); and development (MDGs and MSI)	International and regional frameworks on climate change (UNFCCC and PIFACC); Yokohama Plan of Action and HFA
<b>Regional context</b>	PIFACC and PPAC	RFA on DRR and DM, PIFACC and PPAC
<b>National context</b>	Context of People(s) Charter strategies on environment, food security and governance	National Strategic Development Framework Goal 7 on the integration of environment sustainability, climate change, and disaster risks into national plans and programs
<b>National development status</b>	Geography and population	Geography Population, density and distribution, trends National economy structure and GDP share
<b>Climate and climate-induced hazards and impacts</b>	Climate variability due to ENSO, South Pacific Convergence Zone Trade winds Seasonal trends	Climate variability due to ENSO, South Pacific Convergence Zone Trade winds Seasonal trends in weather conditions Climate-induced hazards, such as cyclones and storm surges Impact assessment of variability and extreme weather and climate events on key sectors, and disasters
<b>Climate trends</b>	Current trends in: rainfall; maximum and minimum temperature; sea surface temperature; mean sea level; extreme events such as tropical cyclones; drought; floods, storm surges and sea flooding	Rainfall; maximum and minimum temperature; sea surface temperature; mean sea level; climate induced hazards and trends, including cyclones and storm surges
<b>Climate projections</b>	Based on global climate models and statistical downscaling providing estimates of climate parameters: rainfall; maximum and minimum temperature; sea surface temperature; mean sea level; extreme events such as tropical cyclones; drought; floods, storm surges and sea flooding	Based on global climate models and statistical downscaling providing estimates of key parameters: rainfall; maximum and minimum temperature; sea surface temperature; mean sea level; extreme events such as tropical cyclones; drought; floods, storm surges and sea flooding

Mainstreaming output (national level)		
<b>Disasters</b>	Not included	Geological hazards, documenting incidence of earthquakes and their impacts; volcano and tsunami
<b>Sources:</b>	Government of Fiji (2012)	Government of Tonga (2010)

## STEP 2.2 Understand current weather and climate risks

**OBJECTIVE:** *To provide an overview of historical weather and climate conditions and recent trends, including extreme weather events and disasters.*

The assessment helps to identify vulnerable communities, effects of past extreme events, and key gaps in risk assessments and response strategies. An overview summarises data about weather conditions such as temperature, precipitation, wind, and sea level rise. It also documents El Niño/La Niña events, depressions, cyclones, droughts, floods, storms, and coastal storm surges. Much depends on data that can be easily analysed, given the capacity constraints. Box 2.5 shows an example of disaster statistics.

### BOX 2.5 AGGREGATE-LEVEL DISASTER IMPACTS STATISTICS FOR FIJI, 1970–2007

Disaster	Number of events	Number of people affected	Number of people killed
Flood	41	221,724*	88
Tropical cyclone	63	791,653*	309
Earthquake	10	0	5
Drought	6	840,857	0
Tsunami	2	0	0
Severe local storm	2	8,369	17
<b>Total</b>	<b>124</b>	<b>1,862,603</b>	<b>419</b>

\*Only for years when number of affected people was recorded; actual numbers could be much higher

Source: Lal et al (2009), Compiled from EMDAT, Glide, Fiji Meteorological Services, and NDMO

## STEP 2.3 Understand projected climate change scenarios

**OBJECTIVE:** To identify and understand projected climate change scenarios.

Identification of future climate change scenarios is at the core of climate risk management decisions. Until late 2011, global scenarios were the main source of information for the Pacific. Since then, each country has assessments provided under the Australian-funded Pacific Climate Change Science Program (PCCSP): they can be accessed from the country's meteorological services, or from [www.pacificclimatechangescience.org](http://www.pacificclimatechangescience.org).

## PHASE 3 – Problem Analysis—Current and Projected Risk

**PURPOSE:** Undertake detailed risk assessment under current and projected climate conditions.

### STEP 3.1 Analyse current weather and climate risks

**OBJECTIVE:** To assess current weather and climate risks.

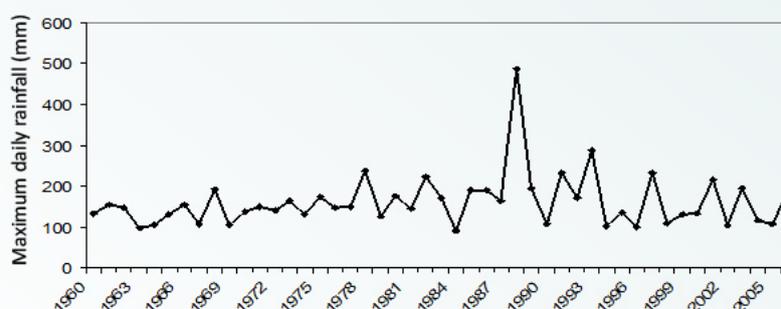
Risk analysis is about assessing the nature of hazards produced by weather and climatic events; how these hazards emerge, and how they affect people. Vulnerability assessment is the starting point for risk analyses in the Pacific, given the constraints of poor data, limited impact models, and capacity.

The 'Vulnerability First' approach has several features:

- identifying current weather and climate events that produce hazards, and creating hazard maps.
- identifying areas, communities and activities that are most sensitive to specific hazards; their effects; and the communities' ability to cope and rebuild
- documenting root causes of vulnerability e.g. poverty or living in a hazard-prone area. Box 2.6 uses such data to show recent changes in Samoa.

Vulnerability assessments are normally presented as disaster or climate risk profiles, such as those under the PCRAFI project (see <http://pacrisk.sopac.org>). Country disaster risk profiles are available from the Pacific Catastrophic Risk Information System (PacRIS) database.

#### BOX 2.6 PROJECTED WEATHER AND CLIMATE DATA PRESENTATION (SAMOA)



Above: Maximum daily rainfall per year, for Apia, 1960–2006

Below: Return periods in years or changes in hazard conditions: daily rainfall in Apia.

Source: Government of Samoa (2009)

## STEP 3.2 Assess gaps in current disaster risk management

**OBJECTIVE:** *To identify gaps in current disaster management or disaster deficits.*

Gaps are assessed in disaster risk reduction and management systems to help communities prepare for climate risks. Such gaps may relate to early warning systems, baseline information or poor coordination of government support. There may also be gaps in the enabling environment, such as building codes, legislation, insurance options, or financial resources.

## STEP 3.3 Assess projected weather and climate risks

**OBJECTIVE:** *To identify projected changes in the weather and climate hazards, and their potential effects and economic costs to people.*

This step builds on the disaster risk profile assessment described earlier, and focuses on the effects of projected climatic conditions on exposure, vulnerability and expected impacts. The assessment uses different types of data, analysis, and information sets, including material collected during the preparatory phase. It is at the sectoral level ('on-the-ground' or project level) that robust scientific analysis is required. This helps decision-makers to understand not only climate change impacts, but also the impact on livelihoods.

The level of detail depends on factors such as:

- availability of baseline data
- past research and assessments already undertaken, for example, for the NAPA, NAPs, etc.
- country-specific climate change scenarios, and disaster risk profiles
- expertise and resources for further assessments, including local and externally sourced capacity

### BOX 2.7 COMMUNITY-LEVEL CLIMATE CHANGE MAINSTREAMING: THE ROLE OF SCIENTIFIC INFORMATION AND CBVA IN NATIONAL PROCESSES (COOK ISLANDS)

The Asian Development Bank (ADB) implemented a community-based vulnerability assessment (CBVA) and adaptation planning in four villages on two isles of the Cook Islands. Results of a 2004 ADB project, the Climate Change Adaptation Program (CLIMAP), were used as a baseline for the project. The community mapping exercise used hand-held GPS units, photographs and household surveys to map household-level vulnerabilities. The GPS data was converted into GIS layers and integrated with government GIS maps. The maps included data such as elevation, infrastructure, land use and land cover, and geology; and socio-cultural data, primarily of significant cultural sites. Other data layers were also incorporated, including remote sensing imagery and GIS layers on the hydrology, physical features, and biotic communities of the project sites.

A household survey gained a picture of the vulnerability of individual households. Stakeholders decided which risks were important and identified priority adaptation options. The communities rated the risk levels from minimal to high, and the severity of impacts in a decreasing scale of 1 to 5. This process helped to identify priority risks and their adaptation strategies, taking into account the needs and priorities of the local people and their traditional knowledge.

Source: ADB (2011)

Key tools used to assess risks are summarised in Table 2.3.

**TABLE 2.3** Tools commonly used in mainstreaming exercises in the Pacific.

Type of assessment	Tools used in the Pacific	Key Pacific references
Climate change modelling and sea level scenario analysis and impact assessment	SIMCLIM: CoastClim of Simulator of Climate Change Risks and Adaptation Initiatives	info@climsystems.com Warrick (2007)
Vulnerability assessments	CV&A: Community Vulnerability Assessment and Adaptation Assessment-and Action Community-Based Vulnerability Assessment and Adaptation Planning using hand-held GPS and GIS VRA: Vulnerability Risk Assessment	Nakalevu (2006) ADB (2011) Droech et al (2008)
Participatory process, problem and solution (objective) analysis Log frame	Root cause /solution tree analysis Problem /objective tree	Government of Tonga (2010) Pacific Disaster Risk Management Partnership Network (2009)
Disaster risk assessment	CHARM	SOPAC (2002)
Sector-level impacts	PlantGro (agriculture) WATBAL9F (water resource) Cook Islands Coastal Calculator	Topoclimate Services Ltd and CLIMSystems (2005) Hackett & Vanclay (1998) Ramsay (2012)
Prioritise sectors to target for climate change integration in the sectoral-level strategic planning	Multi-criteria analysis	Government of Nauru 2012c Department of Communities & Local Government (UK) (2009) Brown & Corbera (2003)

### STEP 3.4 Identify decision-making criteria

**OBJECTIVE:** *For government and other stakeholders to collectively decide on an adaptation path, as well as adaptation measures.*

Decisions about the balance between the three pillars of sustainable development are implicitly made when government agencies allocate their budgets; decide which areas to support, or when they respond to development partner interests. A more explicit discussion about relevant criteria to use can help countries to identify pathways.

The criteria used to decide on the balance may include:

- status of human development conditions and sensitivity of communities to climate variability
- status of current disaster risks and gaps
- local perception of disaster risks and the relative importance they place on addressing them
- priority sectors where projected climate change must be urgently considered.

Box 2.8 describes Nauru's approach to identifying their adaptation options.

### **BOX 2.8** CRITERIA SELECTION TO GUIDE THE ADAPTATION PATHWAY, STRATEGY AND OPTIONS (NAURU)

As part of its NAPA development process and using UNFCCC NAPA guidelines for Least Developed Countries (LDCs), Nauru identified country criteria for selecting its adaptation options, and to help identify vulnerable communities and areas.

A Vulnerability and Adaptation Thematic Working Group prepared background information for each sector, which was consolidated by the NAPA team. This was discussed during stakeholder workshops which identified six sectors to target: water resources, fisheries and marine resources, agriculture, coastal zones, human health and disaster management.

To prioritise the options, the stakeholders agreed the selection criteria should cover:

- severity of adverse effects and the underlying vulnerability
- complementarity with existing projects, national development efforts, multi-lateral environmental agreements, and sustainable development goals as outlined in the NSDS
- culturally acceptable options owned by those affected
- cost-effectiveness, feasibility and viability
- increased community resilience to climate change, improved livelihoods and incomes
- enhanced capacity of communities and sectors to adapt to climate change
- equity – gender and resources
- sustainability in the long term.

Source: Nauru Department of Commerce, Industry and Environment (2012 draft)

## **PHASE 4 – Solution Analysis – Risk Reduction Measures and Prioritisation**

**PURPOSE:** *Identify context-specific adaptation responses to climate change risks.*

### **STEP 4.1 Identify priority risks and adaption pathway**

**OBJECTIVE:** *To identify priority risks to address and select the adaptation pathway based on the balance between DRM and CCA measures*

The choice of adaptation pathways can position countries to target donor support (see Box 2.9). This improves if countries target economic and social development as part of the climate change agenda, and decide on the emphasis for different parts of the adaptation measure.

In the Pacific, a 'Vulnerability First' approach is relevant, as compared with the 'Impacts First' top-down approach. Technical input would come from government agencies and experts, supported by the experiences of the communities. The information is used by technical committees and stakeholders to identify 'higher-level' or generic adaptation measure.

## BOX 2.9 AUSAID'S SUPPORT TO VANUATU INFRASTRUCTURE PROGRAM INTEGRATING CLIMATE CHANGE

Australia provided AU\$17 million towards the Vanuatu Transport Sector Support Program, 2009–2012. Infrastructure in Vanuatu is extremely vulnerable to the impacts of cyclones, storms, heavy rains and flooding. Recognising the critical economic and social value of coastal roads, Australia provided a further AU\$3 million to help climate-proof the roads, by improvement of planning, construction, and maintenance of priority road links on the islands of Ambae, Tanna and Malekula.

Source: AusAID (2010)

## STEP 4.2 Identify adaptation measures

**OBJECTIVE:** *To identify appropriate climate change adaptation strategies.*

Adaptation responses may range from development strategies to reduce vulnerability, to ones that address climate risks. A problem-tree analysis identifies key concerns, their root causes and drivers. Solutions are based on knowledge about ecological, social and economic processes. Tonga's approach is shown in Box 2.10.

## BOX 2.10 TONGA'S PROBLEM-SOLUTION ANALYSIS AND STRATEGIES TO ADDRESS CLIMATE RISKS

The Tonga Task Force identified priority climate factors for specific communities. Stakeholder workshops identified general risks and impacts in key sectors. Where new resources were required, these were considered as gaps to be addressed in the JNAP.

Sector	Impacts	Adaptation option
Water resources (water security)	Shortage of water, pollution and contamination	Expand water collection and water tanks Install solar panels on groundwater pumps Wise use of water Desalination machine
Agriculture	Loss of crop, decreased crop and yield and food shortage	Plant drought-resistant crop varieties Irrigation Grow more fruit-bearing trees
Health	Water contamination, epidemic and dust from roads	Increase public awareness Boil water before consumption Improved health care
Fisheries	Lagoon fisheries affected; shallow marine life killed	Raise awareness

Source: Government of Tonga (2010)

Countries with limited resources may postpone decisions about future climate risks, while they address their immediate development needs. They could still avoid decisions that increase risks. Or countries may choose development and DRM options that could be adjusted over time. Planned adaptation strategies may also be aimed at building individual and institutional capacity. Countries may decide to strengthen their early warning system, or decide on crop germplasm banks and the technical capacity to recover. Adaptation measures may include individual interventions, or a package of actions. Such measures could include risk transfer and sharing: for example, disaster insurance, including social insurance, allows access to financial and other resources in times of disaster. Figure 2.5 gives examples of agricultural options.

**FIGURE 2.5** Planning horizon, adaptation pathway and sector specific adaptation options: some examples for Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA).

Action	Choice of crop to meet immediate food security needs	Whole farm planning and management	Drought- and salt-tolerant crops improvement	Drainage infra-structure	Community relocation
DRR and CCA focus	Food security needs as a determinant of vulnerability	Current weather-related disaster risks	Current and projected climate risks	Projected climate risks	Projected climate risks
Planning horizon	Now	5 years	10–20 years	>30 years	> 50 years

Source: Based on PACC-food security projects in the Solomon Islands, Fiji and Palau

### STEP 4.3 Select priority adaptation measures

**OBJECTIVE:** *To select preferred priority adaptation measures.*

The options include financial analysis, cost-effectiveness analysis and cost-benefit analysis (CBA). However, quantitative assessment is often difficult in the Pacific, where scientific cause and effect are poorly understood, baseline data is limited, and not all costs and benefits can be estimated. Other analyses are often used to compare adaptation options, such as Sustainable Livelihood Adaptation (SLA). In SLA, the focus is on analysing and integrating climate change adaptation based on sustainable livelihoods.

Because of the complexity of climate change issues, interventions are required within a development context. Governments often have to decide between investments to address current development issues, including disaster risks, while also preparing for uncertain longer-term climate scenarios. There is no single approach that countries can use in assessing and prioritising adaptation measures. The OECD (2009) recommends the use of the following set of criteria when selecting preferred options:

- Effectiveness – This addresses the extent to which an adaptation action reduces vulnerability and provides other benefits. It includes the concept of flexibility, where a strategy can be adjusted in response to changing conditions
- Cost – This concerns the relative cost of the adaptation strategy, including the initial costs of implementation, operation and maintenance, administration and personnel
- Feasibility – This addresses the practicalities of implementation, such as knowing if the necessary financial, technical, human, and other resources are available
- Social acceptance – The degree to which an adaptation strategy is acceptable by communities, might be based on traditional knowledge and practices as well as cultural and religious values.

Box 2.11 describes the multi-criteria approach used by Nauru to prioritise its sectors.

### BOX 2.11 MAKING CHOICES USING MULTI-CRITERIA ANALYSIS (NAURU)

Nauru undertook multi-criteria analysis to select priority sectors. The stakeholders first selected the following criteria that reflected their own areas of interests, using NAPA guidelines:

- Severity of adverse effects and the underlying vulnerability
- Complementarity with existing projects, national development efforts, multi-lateral environmental agreements and sustainable development goals as outlined in the NSDS
- Culturally acceptable and owned by those affected
- Cost-effectiveness, feasibility and viability
- Increased community resilience to climate change and improved livelihoods and income generation
- Enhanced adaptive capacity of communities and sectors to climate change
- Equity – gender and resources
- Sustainability in the longterm.

The stakeholder groups ranked and scored their preferences, out of 100, for each sector.

Vulnerable sectors:		Fisheries & Marine Resources	Water Resources	Agriculture	Human Health	Disaster Management	Coastal Zones
Group							
One	Ranking	2	6	5	3	1	4
	Rating	11	21	40	18	5	5
Two	Ranking	5	6	4	3	2	1
	Rating	20	35	17	14	8	6
Three	Ranking	4	5	2	6	1	3
	Rating	16.5	22	10.5	32	8	10
Four	Ranking	5	6	3	4	1	2
	Rating	20	25	15	20	8	12
<b>National</b>	Ranking	<b>4</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>6</b>	<b>5</b>
	Rating	67.5	103	82.5	84	29	33

Source: Nauru Department of Commerce, Industry and Environment (2012 draft) and stakeholder workshop raw data (personal communication Mavis Depaune, Nauru PACC Project Coordinator, May 2012).

## PHASE 5 – Design of the Strategic Output

**PURPOSE:** *Produce a strategic-level document that articulates the country's policy and plan of action.*

This phase produces a design document for implementation, which shows relationships across the NSDS, climate change policy, national action plan, sectoral programme of work, and corporate plans.

The level of detail will depend on the instrument. In the design phase, the steps will depend on whether a strategic-level instrument already exists, or whether one needs to be developed. Subsections of the design document will describe how this will be implemented and financed, as well as how the instrument will be monitored and reported.

### STEP 5.1: Content of the strategic-level instrument

The detail of the strategic documents depends on whether the instrument is to lay down a policy, and spell out the national-level and sector-specific strategies. Where a strategic instrument already exists, a full redesign may not be cost-effective. This approach was used in Vanuatu (Box 2.12).

#### BOX 2.12 INTEGRATING DISASTER RISK MANAGEMENT (DRM) AND DISASTER MANAGEMENT (DM) INTO VANUATU PRIORITY ACTION AGENDA (PAA), 2006–2015

A joint national development partners' team reviewed Vanuatu's PAA, 2006–2015, using a DRM lens to identify gaps. As the PAA had recently been approved, the team developed a supplementary PAA, simultaneously with the National Action Plan for DRR and DM.

Changes included:

- Rephrasing the National Vision from “An Educated, Healthy and Wealthy Vanuatu” to “An Educated, Safe, Healthy and Wealthy Vanuatu”.
- Adding an additional national priority goal, called Safe, Secure and Resilient Vanuatu. Under this propriety, eight specific objectives were identified:
  - recognise DRM as a development issue and mainstream all hazards risk management into all sectors and decision-making processes at all levels of government
  - recognise DRM as a development whole-of-country responsibility and actively engage communities, NGOs and the private sector in disaster risk reduction and disaster management
  - ensure a strong governance framework for DRR and DM, with clear policies and legislation, accountable institutional arrangements, across government, sectors and communities
  - ensure adequate resources and coordination mechanisms are devoted to DRR and DM
  - integrate DRR concerns into policies, plans and programmes of all levels of government in order to assist communities to reduce their risks and vulnerability to disasters
  - recognise that DRM is about supporting communities to reduce and manage risks, and empower communities by providing appropriate and timely information; building their capacity to make informed decisions; and promoting community-based DRM through participatory planning and public-private sector partnerships
  - promote knowledge-based decision-making, including traditional knowledge about disaster risk reduction and coping mechanisms in times of disasters
  - provide for support for regional organisations and development partners.

Sources: Government of Vanuatu (2006b, 2006c).

Kosrae, Federated States of Micronesia adopted a similar approach in its PACC project, when it reviewed its State Code with reference to their climate change policy. This is shown in Box 2.13.

### BOX 2.13 CLIMATE PROOFING OF EXISTING LEGISLATION (KOSRAE)

In 2011, the Government approved changes to the Kosrae State Code to *recognise and define climate change and climate change adaptation measures and to require development activities in Kosrae to take account of projected climate changes, and to require the design and implementation of public infrastructure such as roads and buildings incorporate climate change adaptation measures consistent with the requirements of the FSM National Climate Change Policy, 2009.*

The amendments were identified as part of the mainstreaming exercise carried out under the PACC–Kosrae project. Stakeholder consultations identified that although the FSM Climate Change Policy was endorsed in 2009, it had not been operationalised. The steering committee decided that a statute was needed to give effect to the Policy, together with the need for a Climate Change Management Plan. The Department of Environment, with the help of the Steering Committee, identified key areas of the Kosrae State Code that needed amending to reflect key areas of climate change issues of concern: sea level rise, flooding due to intensive rainfall, storm surges, and gaps in governance systems.

A draft Bill was reviewed by the PACC Steering Committee before submission to the Government. The Bill was passed by the 10th Kosrae State legislature, as State Legislation, 10-2- Kosrae Act, 2011. Some changes made to the Kosrae State Code are, for example:

- Inclusion of a new clause under S5.202: establishing Department of Transport and Infrastructure, and its role, including d),... *public projects, with all location, design and construction to include and incorporate considerations of weather and climate extremes and climate change adaptation measures;...*
- Amend Title 7. 405 to read: Environment Impact Studies: *The Authority requires...an environment impact assessment study which shall include consideration of the effects of climate change and potential adaptation options in accordance with regulations established by the Authority.*

This exercise may be repeated by the other three governments of the Federated States of Micronesia.

Source: Based on FSM (Kosrae State Government) (2011) and the completed Mainstreaming Country Template by the PACC Coordinator, August 2012.

To ‘climate-proof’ existing national policies and strategies in instruments such as the NSDS, or a sectoral plan, a climate lens would help to review them. This will assess if climate risk is factored in the national priorities and strategies. If not, then parts of the national policy need to be changed to better reflect climate risks. This can be done using standard Strategic Environment Assessment (SEA), a two-way evaluation of the influence of policies, plans and programs on the environment; and vice versa. Although SEA has not yet been adopted in the Pacific, its principles and steps could be used to guide climate proofing of policies and strategies.

Guiding questions may include:

- Which climate change factors are likely to be of concern?
- What impacts associated with these factors have been observed, and what are the drivers?

- What are the impacts under projected climate and socio-economic conditions?
- Which development priorities, geographical areas, and sectors are likely to be affected?
- Has climate change been considered in the national policies, plans and programmes of interest?
- What changes in policies, strategies and programs need to be made to reflect climate risks?

## Sectoral-level climate proofing

**OBJECTIVE:** *To climate-proof an existing sector-level instrument.*

The steps followed in climate-proofing national policies, plans and strategies would also be implemented at the sectoral level. Questions to be asked include:

- Which sectoral development priorities, geographical areas, and strategies are likely to be affected by climate factors?
- Has climate change been considered in the current sectoral policies, strategies and programmes? If not, then what changes need to be made?
- If there is a national climate change policy and strategic action plan, are these reflected in the sectoral plan; and are the sectoral policies, plans and programmes fully aligned with them?

Box 2.14 gives an example of the process used in Fiji for climate-proofing sectoral plans.

### BOX 2.14 KEY STEPS IN DEVELOPING CLIMATE-PROOFING OF SECTOR-LEVEL PLANS AND PROGRAMMES CONSISTENT WITH THE NATIONAL CLIMATE CHANGE POLICY (FIJI)

Under the German Government-funded project, 'Coping with Climate Change in the Pacific Islands Region (CCPIR), the Fiji Government developed its National Climate Change Adaptation Strategy (NCCAS) for land-based resources. Technical support was provided by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). Key climate risk management steps to be followed included:

- Documenting recent and anticipated changes in Fiji's climate
- Identifying recent and anticipated risks and vulnerabilities– sensitivity and adaptive capacity with reference to land based resources
- Reviewing current adaptation efforts / projects and programmes
- Identifying specific adaptation measures to address strategic gaps for each land-based sector. This was referenced to Fiji's National Climate Change Policy for agriculture, forestry, water, biodiversity and environment, and land.

Source: Government of Fiji (2012 draft)

## Community-level climate proofing

**OBJECTIVE:** *To adapt a community-based strategic document where an instrument already exists.*

Climate proofing of a community-based strategic instrument is focused on the local area. One would assess if climate risk is factored into the local priorities and strategies. If not, the plan needs to be changed to reflect climate risks. It would also include an implementation strategy as well

as a governance approach, together with monitoring, evaluation and reporting. Where strategic documents do not exist, these will be developed using information generated in phases 1–4, usually by a lead agency with the support of working groups. Box 2.15 gives an example of Tuvalu’s National Strategic Action Plan, and its link to the National Climate Change Policy.

**BOX 2.15 EXTRACT FROM TUVALU’S NATIONAL STRATEGIC ACTION PLAN LINKING SPECIFIC GOALS AND STRATEGIES IDENTIFIED IN THE NATIONAL CLIMATE CHANGE POLICY**

<b>Goal 1 – Strengthening Adaptation Actions to Address Current and Future Vulnerabilities</b>			
<b>Strategies</b>	<b>Actions</b>	<b>Lead agency*</b>	<b>Partners*</b>
1.3 Integrated and coordinated water resources (including desalination) planning and management including preparedness and response plans for each island	1.3.1 Assess water availability and feasibility of water security options including rainwater harvesting, underground water and desalination on all islands	Ministry of Communication Transport and Public Utilities (MCTPU), MFATEL	OPM
	1.3.2 Implement improved rainwater harvesting, access to underground water and install energy efficient desalination on all islands.	MFATEL, MPU, MOH	OPM
	1.3.3 Prepare awareness materials on water conservation and safety		
	1.3.4 Implementation consistent with National Water Policy, Integrated Waters Resource Management (IWRM) Plan and other water-related plans, Public Health Act (Water Sector) and recommendations from previous studies	MOH, Ministry of Home Affairs and, Rural Development (MHARD)	MFATEL, OPM
	1.3.5 Develop drinking water safety components for the Island Strategic Plans (ISPs)	MCTPU, MOH	
	1.3.6 Develop a national IWRM Plan	As above	
<b>Goal 2 – Improving Understanding and Application of Climate Change Data, Information and Site-Specific Impacts Assessment to Inform Adaptation and Disaster Risk Reduction Programmes</b>			
2.1 Upgrading capacity of the National Meteorology Services including stations on the outer islands	2.1.2 Develop protocols for sharing weather and climate data 2.1.6 Develop weather and climate products for the agriculture and fisheries sectors, tourist operators, women and men 2.1.7 Develop and conduct relevant public awareness of weather and climate information	MCTPU	MFATEL, OPM

Source: Government of Tuvalu (2012a, 2012b)

**BOX 2.16** EXTRACT FROM CLIMATE CHANGE POLICY, SHOWING THE TYPES OF INFORMATION THAT MAY BE CONTAINED IN AN IMPLEMENTATION PLAN (FIJI)

STRATEGIES	TIMEFRAME					Lead agency	Implementing agency
	2012	2013	2014	2015	2016		
<b>Objective 1: Mainstreaming</b>							
1 Incorporate climate change into National Plans and budgets in line with the Climate Change Policy Implementation Framework.						Ministry of Planning	Line ministries
2 Ensure that reviews of national and sectoral policies align with the Climate Change Policy.						Climate Change Unit	Line ministries, Solicitor General's Office
3 Consider the Climate Change Policy in legislative review processes and develop cooperative and coordinated agreements between sectors to ensure enforcement.						Solicitor General's Office	Solicitor General's Office, all government agencies
4 Consider lessons learnt and recommendations of national and local-level reports, projects and studies relating to climate change in the national, divisional and local planning processes.						Climate Change Unit	Line ministries, provincial councils, local governments, municipal councils
5 Consider climate change implications in all strategic national development planning, including land use planning, development assessment, infrastructure and settlement planning.						Ministry of National Planning	Climate Change Unit, Departments of Agriculture, Forestry, Fisheries, Infrastructure, Tourism, Health, Housing, Urban Development
6 Ensure all sectors coordinate climate change adaptation and disaster risk reduction efforts to enhance aid effectiveness and streamline implementation.						Ministry of Planning	Line ministries, Climate Change Unit
7 Climate Change Unit to facilitate the design and implementation of a National Monitoring and Evaluation tool to assess and improve on climate change integration in sectors, including enforcement of climate change related legislation.						Climate Change Unit	Ministry of National Planning
8 Include climate change programs in the responsibilities of the Environment Management Unit within all Departments.						Climate Change Unit	Ministry of National Planning, provincial councils, line ministries
9 Review public health and social policies to ensure consideration of climate change impact projections and appropriate mitigation and adaptation measures.						Ministry of National Planning	Climate Change Unit, Ministry of Health, Social Welfare,
10 Review the national building code to ensure consideration of climate change impact projections and appropriate climate change resilience measures.						Climate Change Unit	Local Government, Urban development, Tourism, Housing

Source: Government of Fiji (2012): table 9

## STEP 5.2: Implementation strategy

**OBJECTIVE:** *To ensure the design document covers implementation, monitoring and review, and future adjustments.*

A strategic policy document has an implementation strategy with key strategies under each objective, a lead agency, an implementing agency and a timeline. Box 2.15 (above) shows an implementation plan for the Fiji Climate Change Policy. At times, a separate instrument may be prepared, as was done in Tuvalu. This could provide policy directives for government agencies and other stakeholders, as done in the Solomon Islands (Box 2.17).

### BOX 2.17 GOVERNMENT DIRECTIVES FOR POLICY IMPLEMENTATION IN THE NATIONAL CLIMATE CHANGE POLICY INSTRUMENT (SOLOMON ISLANDS)

**POLICY DIRECTIVE AND STRATEGIES:** The government shall work together with stakeholders and development partners to strengthen the capacity of national, provincial and community organisations and human resources for the effective planning and implementation of appropriate climate change adaptation, disaster risk reduction and mitigation actions.

Accordingly, the government shall:

- support agencies and partners to develop and implement climate change communication strategies to ensure that clear messages about climate change are produced and disseminated
- integrate climate change into the national primary, secondary and tertiary and non-formal curricula
- assess capacity needs from time to time and identify and prioritise human resources development needs and train specialised experts through targeted scholarships and training activities
- design and deliver training packages aimed at raising people's understanding of climate change and enhance knowledge and skills to plan and implement adaptation, DRR and mitigation actions
- strengthen data and information management systems and protocols to enable effective dissemination and sharing of information.

Source: Government of Solomon Islands (2012b)

## STEP 5.3 Monitoring and Evaluation (M&E) Strategy

A policy instrument normally states how its effectiveness will be monitored, evaluated and reported back to the government. M&E is carried out to make changes in line with national needs and climate risks as new information becomes available. Each action plan document would contain indicators to report back on performance against their objectives and the country's development goals. No single type of M&E system would work for all types of interventions. Ideally, an M&E system would track outcomes over time. At the project and programme level, the choice of indicators will also depend on which adaptation pathway was selected, for example:

- Develop adaptive capacity – by increasing assets (human, social, financial, physical, and natural) and institutional function (policies, database, early warning system)

- Reduce climate hazards – by adopting ‘no-regrets’ adaptation measures to improve resource and environment management that helps reduce the chances of flooding
- Reduce vulnerability and drivers of vulnerability– by improving livelihoods and better environment management.

UNDP-GEF suggests four categories of indicators to use when monitoring climate change adaptation at the strategic level, as seen in Box 2.18.

### BOX 2.18 HIGHER-LEVEL INDICATORS THAT COULD BE USED FOR MONITORING, EVALUATING AND REPORTING AT STRATEGIC LEVELS

#### Coverage – Number of:

- policies, plans or programmes introduced or adjusted to incorporate climate change risks
- stakeholders (communities, households, agencies, decision-makers) engaged in capacity building activities for vulnerability reduction or improved adaptive capacity
- stakeholders served by new or expanded climate information management systems (early warning systems, forecasting, etc.)
- investment decisions revised or made to incorporate climate change risks
- risk-reducing practices / measures implemented to support adaptation of livelihoods and/or resource management.

#### Impact – Percentage change in:

- stakeholders' *behaviours* using adjusted processes, practices or methods for managing climate change risks, assessed via questionnaire based surveys (QBS) or other evidence (relevant across processes i to v).
- stakeholders' *capacities* to manage climate change (such as communicating climate change risks, disseminating information, or making decisions based on high quality information), as relevant, assessed via questionnaires
- *use of information management systems* (such as early warning response times)
- stakeholder *perceptions of vulnerability* (or adaptive capacity) to a recurrence of primary climate change-related stress(es), assessed via QBS
- availability of narrative description of the *role of project interventions* in reducing vulnerability (or improving capacity to adapt to climate change-related threat(s)), assessed via QBS
- relevant quantitative *development outcome* (food security, water resources, health outcomes, etc.) as supplemental indicators

#### Sustainability

- Number of stakeholders involved in capacity building for implementing specific adaptation measures, policy/planning processes or decision-support tools
- Availability of skills and resources necessary to continue adaptation after conclusion of project (at relevant scale), assessed via QBS
- Stakeholder perceptions of adaptation sustainability, assessed via QBS

#### Replication

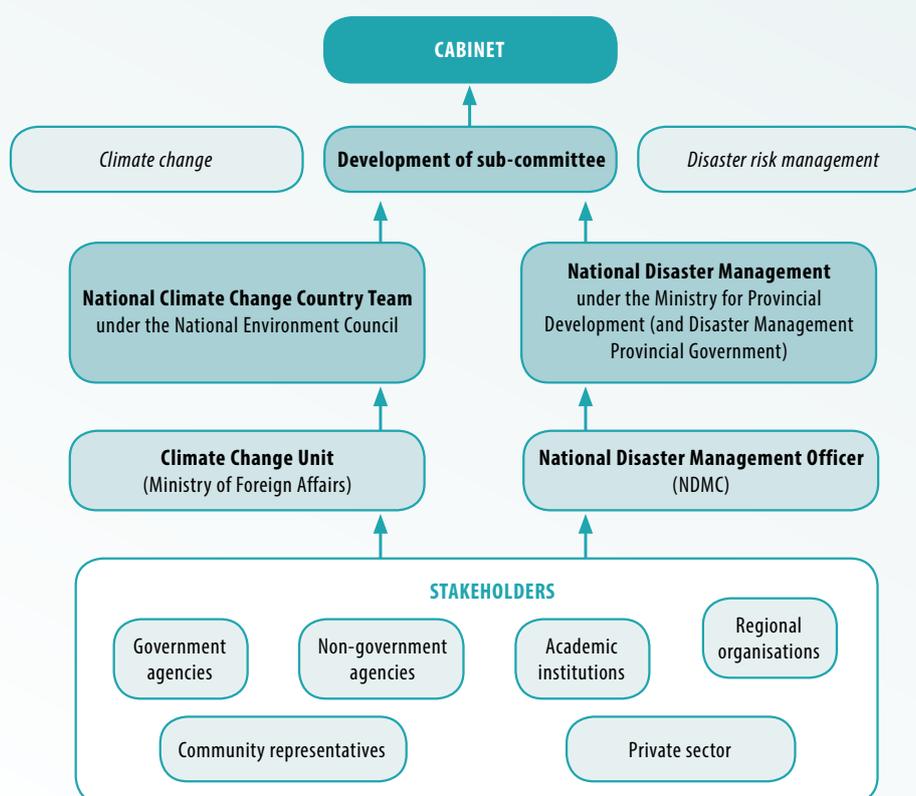
- Number of ‘lessons learnt’
- Number of relevant networks or communities with which lessons learnt are disseminated

Source: UNDP (2008)

## STEP 5.4 Governance for Climate Change Management

It is critical for national and sectoral strategic instruments to have a clear governance arrangement, across key government agencies. This is ideally included in the design of the instrument and endorsed by government. Each country decides on its own governance arrangement. This will depend on existing national government structures, and on the ministry responsible for climate change management and DRM. It also depends on the relationship between climate change management and disaster risk reduction and disaster management. Box 2.19 summarises the arrangements adopted in Fiji.

### BOX 2.19 NATIONAL-LEVEL ARRANGEMENT FOR CLIMATE CHANGE AND DISASTER RISK MANAGEMENT (FIJI)



Source: Government of Fiji (2012 draft): figure 18.

## PHASE 6 – Implementation, Monitoring and Evaluation (M&E)

**PURPOSE:** Implement, monitor, evaluate and report on progress against the stated objective of the policy and plan of action and with respect to the countries development goals.

### STEP 6.1 Implementation

**OBJECTIVE:** *To ensure implementation of the national-level instrument is carefully supported, using national and development partner resources.*

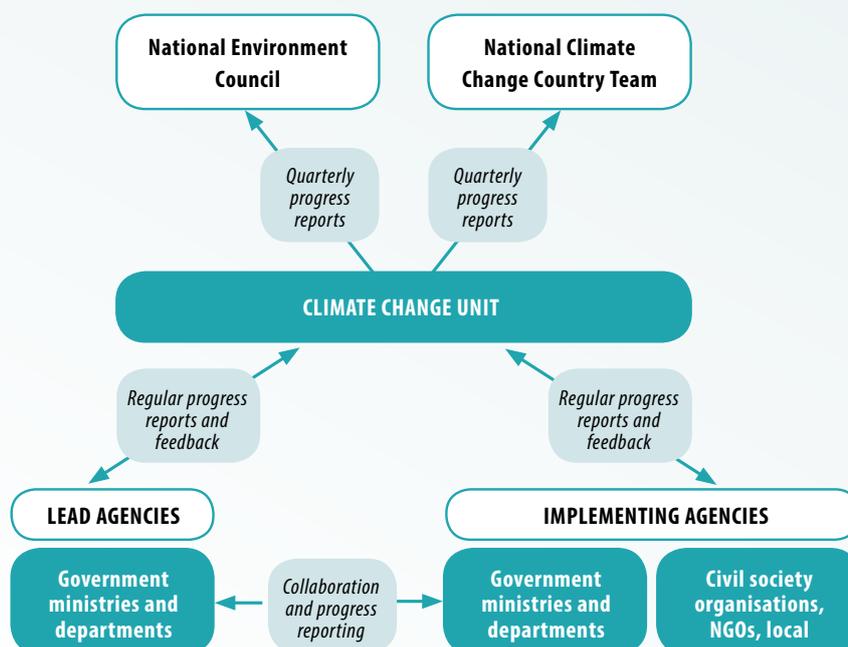
Before strategies are implemented, work is needed to design the activities across sectors and agencies. Once resources are secured, the projects will be implemented.

## STEP 6.2: Monitoring, evaluation and reporting

Objective: *To ensure regular monitoring and reporting occurs on a regular basis.*

Monitoring, evaluating and reporting are key to any strategic plan. This helps all stakeholders to track progress, as well as learn ‘what works’ and what changes need to be made. Box 2.20 summarises how Fiji’s National Climate Change Policy is reported on a quarterly basis.

### BOX 2.20 HIERARCHICAL REPORTING OF PROGRESS AGAINST THE NATIONAL CLIMATE CHANGE POLICY (FIJI)



Source: Government of Fiji (2012): figure 5

Box 2.21 shows an example from the Solomon Islands.

### BOX 2.21 THE M&E STRATEGY FOR NATIONAL CLIMATE CHANGE POLICY (SOLOMON ISLANDS)

Monitoring this Climate Change Policy will be done annually at the following levels:

- Political – by the Parliamentary Standing Committee
- Policy – by the National Climate Change Council and Provincial Climate Change
- Coordination bodies
- Programme and project – by the national lead agency for climate change and the Climate Change Working Group.

Source: Government of Solomon Islands (2012b)

Governments need to establish appropriate M&E and reporting mechanisms to help identify the actual reporting chain, frequency of reporting (such as annually) and by whom, the format of reports, and appropriate databases. The process could be linked to the regular national development reporting against the NSDS and other commitments. To be effective, there should be capacity development for undertaking M&E and report writing. Box 2.22 gives an example of an M&E strategy in the Solomon Islands climate change policy.

### **BOX 2.22** MONITORING AND EVALUATING EFFECTIVENESS OF NATIONAL CLIMATE CHANGE POLICY

The Solomon Islands Climate Change Policy identifies the approach the Government intends to undertake its M&E and reporting on the National Climate Change Policy.

It notes: The government shall establish a mechanism to monitor the implementation of this climate change policy. To ensure this is achieved, the government shall:

- Ensure all government agencies, NGOs, churches, institutions and private sector organisations and communities that implement climate change-related programmes and projects, are required to register with the national lead agency for climate change and provide annual reports for purposes of monitoring
- Strengthen the capacity of the lead agency for climate change to undertake the following monitoring and evaluation activities:
- Establish a database of all actors involved in climate change programmes and projects and disseminate information on climate change programmes and projects;
- Produce and disseminate an annual report on progress in addressing climate change;
- Communicate regularly with partners to obtain information on progress of implementation of the climate change policy and strategies; and
- Develop the National Communications to the UNFCCC. Support national and provincial government agencies, and civil society actors, strengthen capacity for monitoring the implementation of this policy through existing mechanisms such as sectoral committees, and national councils.
- Evaluate the implementation of this policy every five years to gauge the effectiveness and efficiency of implementation of strategies against the policy goal, objectives, directives and strategies.
- Building on the reporting process of projects, assessments and surveys, develop and build capacity for a community feedback mechanism where experiences and lessons learnt at the community level feeds back into the policy implementation process.

Source: Government of Solomon Islands (2012b)

A recently developed toolkit, AdaptMe, by the UK Government could help to design a robust evaluation processes ([www.ukcip.org.uk/adaptme-toolkit/](http://www.ukcip.org.uk/adaptme-toolkit/)).

## PHASE 7 – Review and Adjust

**PURPOSE:** *Update key strategic instruments with lessons learnt and information on future climate.*

The M&E reports prepared in Phase 6 will be reviewed against key impacts and indicators, together with any new climate change information. The review will decide if adaptation strategies and responses need to be updated. At a minimum, the review will take place when the strategic instrument or the NSDS comes up for review.

### Concluding Remarks

There are clear benefits for governments and other stakeholders when they mainstream climate risks into their development planning. While such efforts are at a relatively early stage in many PICTs, valuable lessons are being learned from the sharing of experiences and expertise. A proactive approach now, will return far more to Pacific communities than the initial costs of such initiatives.



A woman with dark hair tied back, wearing a maroon t-shirt with a white graphic, is pouring water from a white bucket into another white bucket. She is holding a red rope attached to the handle of the bucket she is pouring from. The scene is outdoors, with a clear blue sky and some clouds. A building with a brown roof is visible in the background.

PART 3

'ON-THE-GROUND'-LEVEL MAINSTREAMING



## 'On the Ground'-Level Mainstreaming

### Overview

An 'on-the-ground' mainstreaming may target economic and social development, resource and environment management, and capacity development. Each initiative may comprise a suite of activities, and include community-based adaptation. Initiatives for implementation are identified through a project cycle, whose steps include situation analysis, problem analysis, identification and selection of solutions, implementation, and monitoring and evaluation (as detailed in Part 2). The project cycle integrates climate risks at key stages.

'On-the-ground' initiatives may include:

- Discrete projects that address reducing development risks e.g. water security, renewable energy, food security and capacity.
- General projects that have an integrated or combined goal of socio-economic development or resource management while minimising risks.

Discrete projects may address weather and climate change risks, and be implemented at a local level. An example is the solar water purifier water project in Nauru (case study 2), or climate proofing the drainage network in Fiji. These projects also address reliability and allow for cleaner and cheaper water for Nauru (also meets social, economic and health goals), and minimising flooding for Fiji (also meets social, economic, transportation and health goals). Projects may increase or decrease climate related vulnerability of socio-economic and ecological systems. Adaptation efforts may thus be targeted at reducing climate risks while at the same time leading to the achievement of the development goal, such as in the Western Guadalcanal road improvement project (case study 5). The outputs of the two approaches are as follows:

'On-the ground' mainstreaming types	Key output
When a government or other stakeholder is developing an initiative to address climate risks	An initiative that addresses current disaster and climate risks
When government is requested to approve an initiative with climate risks, the initiative may require climate proofing	Initiatives are amended to reflect climate risks reduction actions

# 'ON-THE-GROUND' PROCESS: RESPONDING TO CLIMATE RISKS

## 3.1 Introduction

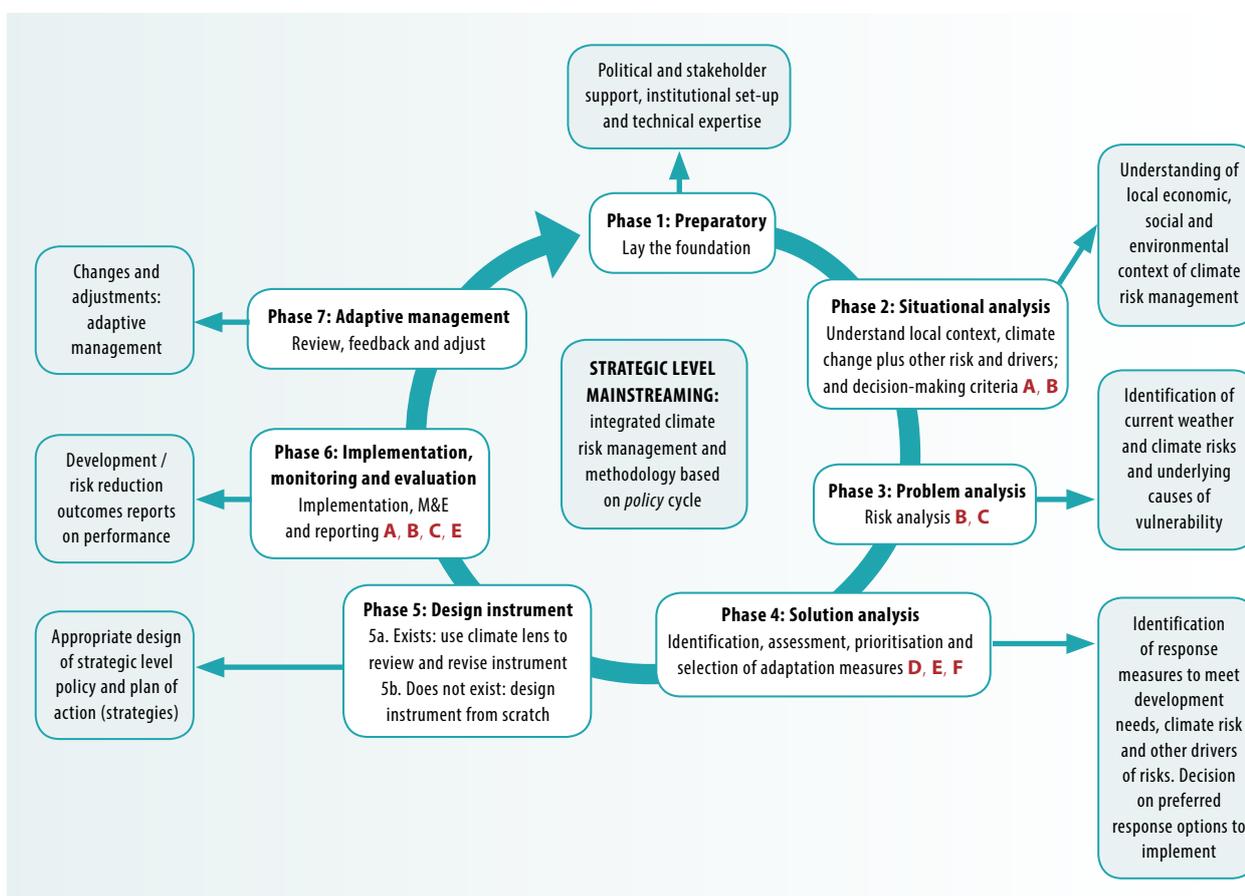
There are seven guiding principles for 'on-the-ground' initiatives. These are similar to those for the strategic-level mainstreaming, but are aimed at the local level. The project cycle includes situation analysis, problem and solution assessment, selection of solutions, project design, implementation, monitoring and evaluation, and review.

The preparatory phase ensures political and stakeholder support is secured early. This helps to:

- involve community and government stakeholders throughout the key decision-making stages.
- coordinate access to data and information maintained by different arms of government.
- ensure technical experts are identified to help guide decision-makers

## 3.2 Step-by-step guide

The process for 'on-the-ground' mainstreaming is similar to that of strategic-level mainstreaming (part 2 of this guide). However, the on-the-ground initiatives more clearly involve a community-level engagement with the planning, design, implementation and evaluation of initiatives. The seven phases are listed below, and key themes are highlighted in the case studies.



## PHASE 1 – Preparatory

**PURPOSE:** Establish the political, organisation and technical foundation required to support the mainstreaming exercise.

## PHASE 2 – Situation Analysis

**PURPOSE:** Understand the local development context, weather and climate risks, and vulnerable groups, including drivers of vulnerability.

## PHASE 3 – Problem Analysis – Current and Projected Risks

**PURPOSE:** Assess risks under current and projected climate conditions, gaps in DRM, and desired balance between development and risk management.

## PHASE 4 – Solution Analysis: Risk Reduction Measures and Prioritisation

**PURPOSE:** Identify adaptation responses to climate change risks, including cost-benefit analysis to identify the most appropriate measures in terms of sustainability, social, economic and ecological benefits, gender specific benefits, vulnerable community/groups, and other priority issues identified by the target community.

## PHASE 5 – Design of the Output

**PURPOSE:** Produce a design document that includes objectives, activities, inputs and outputs, budget, performance indicators and an M&E plan.

## PHASE 6 – Implementation, Monitoring and Evaluation (M&E)

**PURPOSE:** Implement, monitor and evaluate progress.

## PHASE 7 – Review Lessons Learnt to Inform Other Climate Risk Management Projects

**PURPOSE:** Review effectiveness of the 'on-the-ground' initiative, identify lessons learnt, including an ex post cost-benefit analysis of the adaptation measure(s) to see if the intended benefits were achieved or if risks were reduced and why. A review may occur during the initiative, e.g. midterm, and at the completion. The lessons learnt may inform other initiatives.

### 3.3 Case studies

Four case studies from the Pacific show that access to technical skills and capacity are essential to developing robust project designs. Such expertise may be sourced in-country, or externally. The importance of active interaction between community members, stakeholders and technical analysts is also highlighted. Table 3.1 gives a brief overview of the case studies.

**TABLE 3.1** Implementing the seven-phase process in four case studies.

Case study	Key issues highlighted
<b>Case study 1: Cook Islands PACC coastal zone project</b>	<ul style="list-style-type: none"> <li>▪ relevance of discussion with local communities about their coastal issues to define the ‘on-the-ground’ adaptation initiative, reflecting their needs (phase 1)</li> <li>▪ relevance of identifying and securing external sources as team at the early stages of the CCA initiative (phase 1); and the use of specialised expertise (phases 3 and 4)</li> <li>▪ relevance of detailed technical analysis combined with community-based knowledge to understand climate risks (phase 3); and to inform identification and selection of adaptation pathway and strategies (phase 4)</li> </ul>
<b>Case study 2: Nauru water security project</b>	<ul style="list-style-type: none"> <li>▪ relevance of establishing a high-level steering group as well as a technical and inter-agency steering group to support the mainstreaming process</li> <li>▪ establishing stakeholder-based processes for climate risk management decisions, supported by sound technical information and advice (phases 1 to 4)</li> <li>▪ importance of collecting detailed information about current risks, and other drivers of risks, to inform adaptation pathways and choices (phases 2 to 4)</li> <li>▪ approach used to identify selection criteria and how the decision-making process can make informed choices, even with limited information (phase 4)</li> <li>▪ use of technical expertise is critical to inform sound and technically robust decisions (phases 2 to 5)</li> </ul>
<b>Case study 3: Vanuatu and Samoa crop improvement projects</b>	<ul style="list-style-type: none"> <li>▪ use of analysis to inform the choice of the ‘on-the-ground’ activity (phases 2 to 4)</li> <li>▪ selection of an adaptation measure that addresses climate risks as a starting point for adapting to projected changes in climate, and its effects on food security (phase 4)</li> <li>▪ relevance of investing in institutional capacity to make informed adaptation choices (phase 4)</li> <li>▪ relevance of partnerships across countries, organisations and with communities directly affected by climate risks (phase 5)</li> <li>▪ use of cost-benefit analysis to inform replication of the adaptation measure (phase 7)</li> </ul>
<b>Case study 4: Solomon Islands PACC food security project</b>	<ul style="list-style-type: none"> <li>▪ V&amp;A assessment together with robust science is required to inform integrated climate risk management and decision-making based on the project cycle, with selection of an ‘on-the-ground’ initiative to realise practical benefits</li> <li>▪ relevance of engaging experts (or advice) to inform problem-solution analysis and design of the ‘on-the-ground’ initiative. This will help support decisions during phase 4 about the most effective adaptation measure, and their design for implementation during phase 5</li> <li>▪ relevance of a systematic analysis of adaptation options, including cost-benefit and feasibility analysis, to inform adaptation choice (phase 4) and project design</li> </ul>

## CASE STUDY 1 – Adapting to climate change: Integrating scientific and experiential knowledge and community preferences in making informed choices

This case study analyses the seven-phase process used in the PACC-Cook Islands project. It uses information contained in the UNDP and SPREP initial country consultation report (UNDP 2006), SPREP's tender document (SPREP 2010), the SOPAC-NIWA Proposal for PACC-Cook Islands (SOPAC and NIWA 2010 October) and discussions with Taito Nakalevu, PACC Project Manager, the SPREP project summary report prepared by NIWA (Stephens & Ramsay 2012 April), and follow-up discussion with Doug Ramsay, National Institute of Water and Atmospheric Research, New Zealand (NIWA).

The following issues relate to the seven phases of the mainstreaming exercise:

- Phase 1: Relevance of:
  - discussion with local communities to identify climate-sensitive coastal issues of importance
  - identifying gaps in technical skills early and then securing technical service providers
- Phases 2 to 4: Relevance of using:
  - detailed technical knowledge to understand climate risks (phase 3) and to inform identification and selection of adaptation pathway and strategies (phase 4);
  - historical climate and weather records, including cyclones; and scientific measures required to assess risks of inundation from coastal run-up (phases 2 to 3)
  - specialised scientists to understand causes and drivers of risk, and to identify solutions (phases 2 to 4).
- Phases 2 to 4: Involvement of community members in partnership with scientists, including:
  - calibrating scientific assessments with community's knowledge (phases 2 to 3)
  - selecting criteria based on community's own level of risk preference, their planning horizon, functional life of their physical structures and the projected coastal run-up (phase 3)
  - selecting the adaptation pathway (phase 3):
    - adaptation measures to adopt now, given current inundation risks
    - changes in adaptation strategies over time, particularly when new infrastructure decisions are to be made, taking into account projected climate change and coastal inundation.

### PACC Project background

A situation analysis about the vulnerability of Cook Islands to climate change was documented during the initial PACC project consultation (UNDP 2006). It focused the PACC project on 'Climate Proofing of Manihiki Coastal Zone Management and Airport Redevelopment'. The Cook Islands Government hoped to align this PACC project with an ongoing New Zealand-funded coastal project. The focus was changed to "Climate Change Adaptation in the Coastal Zone of Mangaia", when the two projects at Manihiki could not be synchronised<sup>5</sup>.

5 This situation highlights the difficulty at times in aid coordination when project-based funding is sought. In an approach focused on programmatic outcomes, the activities would have been identified, including their relevant sequencing. Development partner engagement would also have been sought and secured by the Government, had it been equipped with the prioritised programme of work.

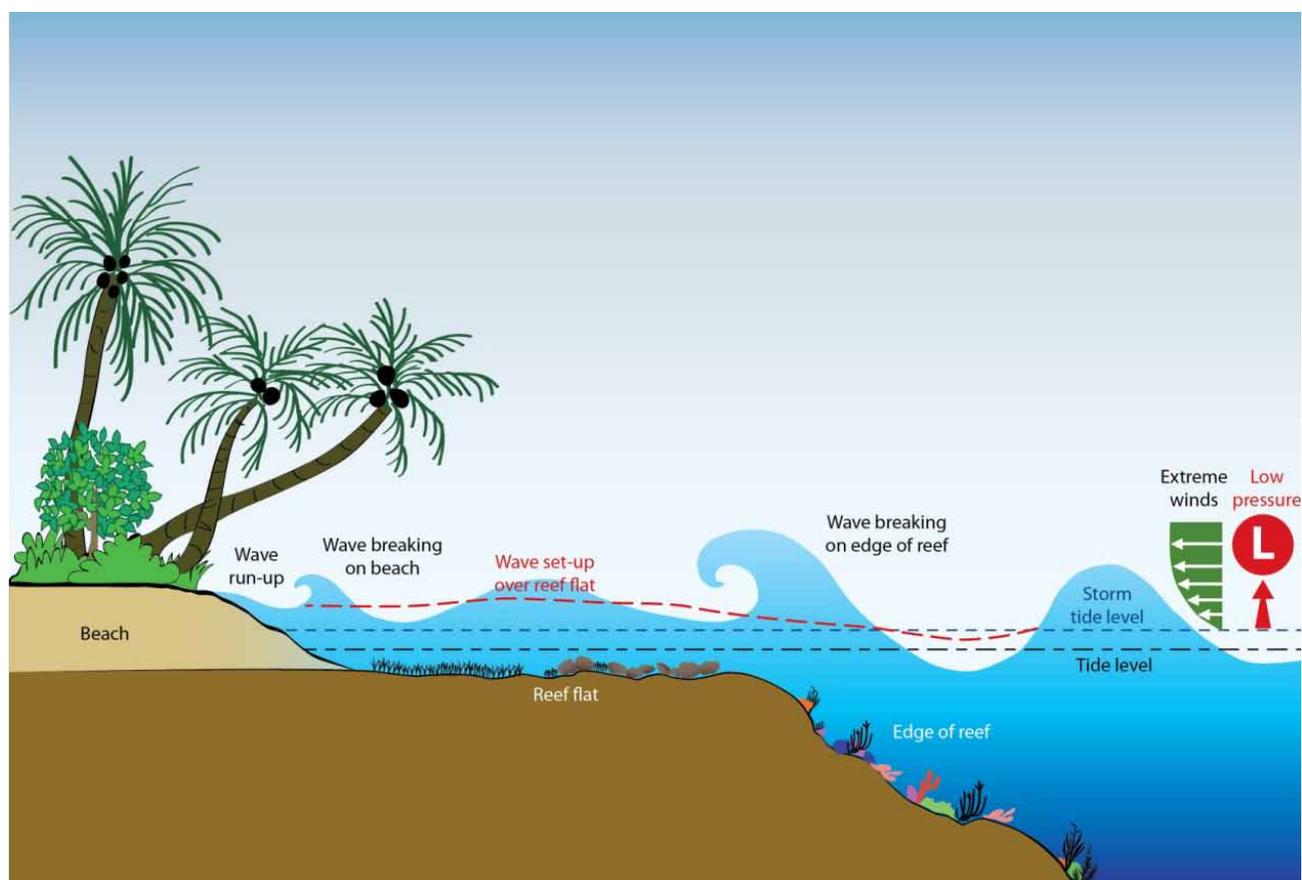
## PHASE 1 – Preparatory

The NZAID-funded project focused on the rehabilitation of the Mangaia Harbour, including a seawall. Initial consultation with the Mangaia Island Council under the PACC project identified the need to address the broader coastal zone issues on the island. Communities were particularly concerned about 'freak waves' that could move up to 50 metres inland, during high tide, heavy swells and cyclonic conditions. The Cook Islands Ministry of Infrastructure and Planning (MOIP), the Mangaia Island Administrator, and the Island Council, confirmed the lack of local technical expertise. SPREP, as the PACC Project executing agency in collaboration with the MOIP, called for tenders to document nearshore wave run-up, climate, bathymetry, coastal topography, shoreline positions, and coastal morphology for Mangaia Island. The tender was won by a joint proposal from SOPAC and NIWA. The Mangaia Island Council interacted with scientists during the planning and implementation of the PACC project.

## PHASE 2 – Situation analysis

Property and infrastructure in the coastal margins of the Cook Islands are highly vulnerable to coastal hazards, which are exacerbated by climate change and sea level rise. Coastal bathymetry causes waves, wave set-up, waves breaking and wave run-ups, as illustrated in Figure 3.1.

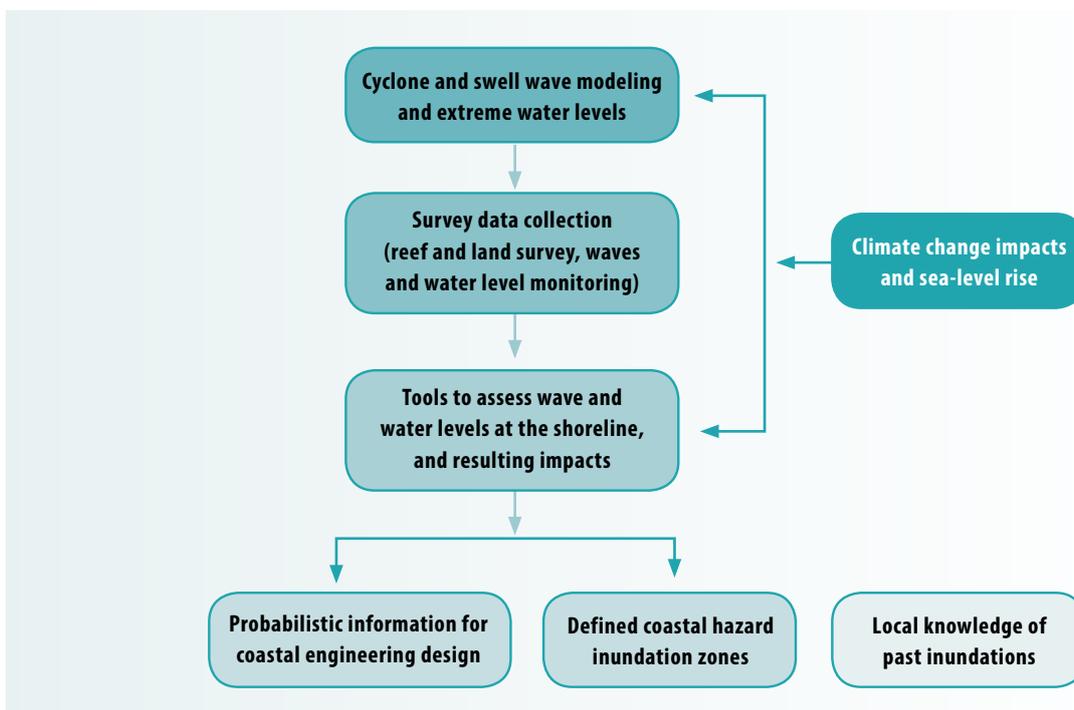
**FIGURE 3.1** Coastal inundation depends on a complex set of factors such as weather, bathymetry and tide, as well as coastal physical characteristics.



Source: Stephens (2011)

An 'Impacts First' approach was used in the situation analysis to understand historical weather and climate patterns, including cyclones. Scientists also identified the likely risks that communities may be exposed to, due to coastal inundation during extreme water levels and wave condition. Technical aspects of weather and climate conditions and associated risks were assessed by a team from SPC-SOPAC and NIWA, with assistance from the Cook Islands Ministry of Infrastructure and Planning, and the Cook Islands Meteorological Services. The technical assessment is summarised in Figure 3.3. Information from the local communities about inundations in the past was collected during the risk assessment phase. Decision-making criteria for adaptation responses were jointly determined by the scientists and community members, as more detailed scientific information became available.

**FIGURE 3.2** Basic process adopted by the PACC-team in the Mangaia (Cook Islands) coastal zone adaptation project.



Source: Stephens & Ramsay (2012) Phase 3: Problem analysis

## PHASE 3 – Problem analysis

NIWA scientists undertook a modeling exercise to address questions such as:

- How will climate change and sea level rise impact on cyclone and swell conditions and hence on extreme wave and water level conditions at Mangaia?
- How will this influence coastal wave set-up, run-up, overtopping the shoreline; and what are the effects on coastal inundation along the village, harbour and airport shorelines of Mangaia?

The data and method were developed in to an Excel-based tool called the Cook Island Coastal Calculator (CICC). This allows assessments of extreme wave and water levels at the shoreline, wave set-up, run-up and overtopping; and how climate change and sea level rise affect the Cook Islands. The CICC scenarios were compared against historic cyclone events, and events that the communities could remember. These included a 1944 cyclone; 1987 cyclone Sally, and 2005 cyclone Meena. A situation analysis confirmed that coastal inundations occur during tropical cyclones, or large swells.

The Oneroa villagers' recollection of water run-ups was recorded on a satellite image of the village frontage, using a geographic information system (GIS). Community facilities were also mapped and calculations from the CICC were calibrated against this information. Decisions about which criteria to use for identifying adaptation pathways and measures were based on timeframes set by the communities. The Oneroa communities based a planning horizon on 1–2 generations (or 25 and 50 years). These reflected the design lives of some Mangaia community facilities, such as residential homes, village halls, schools and hospitals, administration buildings and design codes for government structures. Community members decided on the following criteria for scientists to use, when considering effects of possible climate events:

- for a 25-year timeframe, a severity of cyclone event with an average recurrence interval of 50 years (a 40% possible chance of occurring over this period)
- for a 50-year timeframe, a severity of cyclone event with an average recurrence interval of 100 years (a 39% possible chance of occurring over this period).

Community-based discussions and scientific considerations led to decisions about possible scenarios for sea level rise under different timeframes. These parameters were fed into the CICC, to identify present and future run-up levels. Figure 3.3 provides a GIS map summarising the physical location of buildings under different scenarios. Based on the modeled and historic run-up levels, the Oneroa community identified those facilities at risk along the Oneroa frontage. Other drivers of cyclone inundation risk included:

- increase in width of the channel at the wharf (or other channels over the fringing reefs)
- roads that ran from the village through the makatea (raised coral atoll) to the shoreline
- removal of vegetation between the road and the shoreline.

**FIGURE 3.3** Coastal area near Oneroa village (Cook Islands) showing key community facilities at risk under different scenarios for coastal inundation, using the Coastal Calculator.



## PHASE 4 – Solution analysis

The Oneroa community identified two climate adaptation strategies:

- prevent further infrastructure in areas prone to cyclone run-up over the next two generations
- implement risk reduction and adaptation options identified in the Mangaia Island Administration's annual planning and operational activities

These two strategies, and the coastal inundation scenarios, helped the community to identify an adaptation pathway with short, medium and long-term measures.

### **In the short term – risk reduction options:**

- Improve evacuation routes inland from the village.
- Limit new roads down to the shoreline along the village frontage.
- Encourage landowners not to build new residential property on the seaward side of the road.
- Encourage planting natural vegetation between road and shoreline.

### **In the medium to longer term – occasional risk reduction options:**

- Re-build houses with raised floors during any renovation in areas that could be inundated.
- Progressively move essential infrastructures inland.

### **Rarely required risk reduction options:**

- If structural measures such as seawalls are necessary, locate these close to the level of the first makatea bench rather than at the shoreline.

## In conclusion

Early consultation with the local community can help to frame the climate change risks, as compared to what a national government may consider important. Framing climate change risks early in the process allows the community to discuss 'impacts' early on ('Impact First') approach. Experts helped to identify, develop and implement coastal risk reduction and climate change adaptation measures. Scientists and community members worked together to identify criteria for community solutions. This case study also shows how robust technical analysis and knowledge complement each other, and inform the selection of measures that suit the local context and community risk preferences.

## CASE STUDY 2 – PACC Nauru’s mainstreaming process for enhancing resilience to drought – assessment of vulnerability and identification of conjunctive water supply in Aiwo district

The PACC-Nauru ‘on-the-ground’ initiative uses the integrated climate risk management and project cycle-based process. It draws on government information (Government of Nauru 2012a, 2012c), other literature, and discussions with Ms Mavis Depaune, PACC Nauru Project Coordinator and Mr Hazelton Buraman, IWRM Project Coordinator. The following issues are raised:

- Phase 1: Relevance of establishing a high-level steering group and middle management technical and interagency working groups to support the adaptation project.
- Phases 2 and 3: Relevance of:
  - undertaking a national vulnerability assessment followed by selection of priority hazard-prone sectors and communities to target
  - deciding to address disaster risks as a starting point for adapting to projected changes
- Phases 2 to 4: Using detailed information about current water demand, supply risks, climate and other drivers of risks to inform adaptation choices. They include the use of:
  - historical climate and weather records, and household survey data, to inform climate risks at the community and household levels (phase 2)
  - other drivers of change, such as population and economic growth, and capacity to inform climate risk assessments and adaptation strategies (phases 2 to 3).
- Phases 3 to 4: Relevance of:
  - identifying criteria for adaptation measures
  - vulnerability indicators (phase 3)
  - analysis for stakeholders to select a preferred on-the-ground initiative (phase 4).
- Phase 4: Using analysis to rank local adaptation responses, then deciding on the preferred option.

### Background

Water and Sanitation is listed in Nauru’s NSDS as a development goal, to “provide a reliable, safe, secure and sustainable water supply to meet socio-economic needs” (Government of Nauru 2005, 2009 revision). Nauru’s MDG report states that it is either ‘off-track’ or ‘mixed’ in its social sectors, such as water security, sanitation and human health (PIFS 2011). Nauru’s water sector is highly vulnerable to weather and climate variability. Much of the population depends on rainwater harvesting, groundwater and costly desalination to meet daily needs. Freshwater resources are vulnerable to fluctuations in rainfall that limits recharge into the few groundwater aquifers. There is potential for over-harvesting and saline intrusion from the rising sea water levels and storm surges. Ground water is also under threat from pollution due to inappropriate sanitation options and unlined waste disposal sites. This makes water security a development as well as a climate change issue. Another driver of risk is the unreliable supply of electricity to operate pumps that draw groundwater. A regular supply of electricity depends on imported fossil fuel, which itself depends on shipping frequency. Nauru identified water security as its highest priority under the PACC project.

## Process used

The PACC Nauru project team used a climate vulnerability assessment approach (CV&A: see Nakalevu 2006) to identify adaptation strategies. The PACC team analysed existing literature and information, and assessed vulnerability to weather and climate hazards, to identify adaptation measures. Steps closely mirrored those in the seven-phase process (Table 3.2).

**TABLE 3.2** Comparison of the Nauru V&A steps followed in identifying and designing community-based adaptation measures to address water security issues

Nauru V&A steps	Seven-phase process
Based on literature review, community workshops, technical workings and assessments	Based on literature review, stakeholder workshops, technical working groups, scientific analysis and knowledge
<i>Establish PACC team, technical working group and community consultation group</i>	<p><b>Phase 1: Preparatory</b> <i>Establish steering committee, technical working group, and stakeholder consultation group</i></p> <p>Identification of relevant stakeholders directly associated with national water management</p> <p>Identification and sourcing of technical water experts</p>
Key themes covered	Key technical aspects covered during different phases of the project cycle
<i>Diagnostic: vulnerability assessment</i>	
<i>Environmental sphere:</i> Identify natural hazards, and human activities likely to affect water availability and quality	<p><b>Phase 2: Situation analysis</b> Current development context, weather and climate hazards, sensitivity of people and adaptive capacity</p> <p>Understand the local social, economic, and environmental context</p> <p>Understand past and current weather and climate conditions and disaster impacts</p> <p>Identify climate change scenarios</p>
<i>Environmental and socio-economic:</i> Identify socio-economic factors affecting water demand, access to water, water storage and usage	<p><b>Phase 3: Problem analysis – current/projected risk</b></p> <p>Climate risk analysis and criteria for adaptation</p> <p>Analyse current weather and climate risks, other drivers of risks, including root causes</p> <p>Assess projected weather and climate risks, and other drivers of risks</p> <p>Identify decision-making criteria and adaptation pathway</p>
<i>Socio-economic and governance sphere:</i> Identify capacity to cope, including institutional, legislation, and knowledge	<p>Assess gaps in DRM and development needs</p> <p>Identify current adaptive capacity</p>

Nauru V&A steps	Seven-phase process
<i>Prognostic – identification of adaptation measures</i>	
Prioritise risks at community level	<b>Phase 4: Risk reduction measures</b> Identify priority risks Identify adaptation options Select priority adaptation measures using CBA
Demonstration project design	<b>Phase 5: Design</b> Design of the solar-powered ground water distillation plant
	<b>Phase 6: Implementation, monitoring and evaluation</b> Installation of the solar-powered distillation plant M&E of the demonstration project, including quality of distilled water

## PHASE 1 – Getting started

The PACC project team was established within the Department of Commerce, Industry and Environment (CIE). This was supported by the Water Steering Committee, comprising CEOs of Government agencies and State-Owned Enterprises (SOEs), and a technical working committee. Village-based stakeholder consultation groups were formed for two sites considered to be highly vulnerable and prone to drought conditions.

## PHASES 2 AND 3 – Situation and problem analysis

This assessment was based on the analysis of national-level data, and information collected at the household level across the island, as summarised in Table 3.3.

**TABLE 3.3** Sources of data and other information used in the PACC project in Nauru.

Existing data	Source of additional data
PCCSP climate change report for Nauru NAPA PACC reports Water, sanitation and climate outlook Water policy IWRM diagnostic report Groundwater vulnerability report Rainfall data Census 2006 data	Household survey: data on socio-economic status, water demand, water sources and supply (Nauru Housing Water Project) Community workshops Meetings with community leaders Technical working group sessions

The national-level information provided an overview of hazards, risks and coping capacity, based on key indicators identified by the PACC team and community members. These included:

- availability and quality of water resources
- storage and supply infrastructure
- access to water

- population density and water demand
- water use and usages
- income and livelihood
- sector reform and adaptive capacity (governance).

The national-level supply and demand analysis was used to inform decisions, to formulate water policy, and identify adaptation strategies to strengthen national water management. The PACC team and stakeholders identified priority communities, as well as adaptation measures to improve household water security and resilience to projected climate change. The analysis covered:

- climatic conditions, such as temperature and rainfall, and their effects on rainwater availability
- interactions of weather conditions, hydrology and hydrogeology, and their impacts on groundwater recharge and quality
- threats to water security related to climate variability and climate change
- socio-economic features likely to increase risks to the water sector
- national-level water governance and adaptation capacity

A scientific approach identified a possible supply situation, including water quality and demand, in view of a changing population. This was compared with the current supply, including water quality and sensitivity to climate change. Box 3.1 summarises the findings for the Aiwo community.

### BOX 3.1 AVAILABILITY AND QUALITY OF WATER RESOURCES ASSESSED FOR THE PACC DEMONSTRATION PROJECT AT AIWO (NAURU)

**CURRENT:** The availability and quality of water in Nauru is highly dependent on rainfall and influenced by climate patterns. Rainwater is virtually the sole source of freshwater in Nauru with very limited use of water produced from a few reverse osmosis ‘plants’. As a result, droughts are the most threatening climate hazard to the water sector. Droughts also threaten the groundwater quality and water-dependent ecosystems, especially non-coastal and exotic fruit trees.

**FUTURE:** While climate change modeling suggests droughts could become less frequent, they will always remain a threat to Nauru. Sea level rise is likely to threaten groundwater quality by lifting the groundwater level, allowing more contaminants from the surface to reach the groundwater. The following table summarises water resources in Nauru. Possible effects of climate change are signaled between brackets: (–) for a reduction, (o) for no significant change, (+) for an increase.

Water source	Availability	Quality
Rainwater	Inconsistent (o) Frequent drought (–) Heavy rainfall (+)	Fresh (o)
Groundwater	Permanent (o)	Brackish / contaminated (+) <ul style="list-style-type: none"> <li>▪ Mostly brackish but varies depending on rainfall and locations</li> <li>▪ High level of faecal contamination</li> </ul>
Seawater	Permanent (o)	Saline (o)

Source: Government of Nauru (2012a)

Demand and water deficit was based on detailed analysis. It includes the demand-per-person-per-day for potable and non-potable water; supply of and access to different sources of water; and the vulnerability of the current water infrastructure. To understand the country's water needs, the team also considered economics. There is limited scope of increased economic development on Nauru which has implications for development into an improved public water infrastructure. Nauru's reliance on fossil fuel for the production of desalinated water increases the vulnerability of the community to future climatic conditions. The team assessed organisations in the water sector, their roles, and their capacity to manage water. The team concluded that, in the absence of an overarching water policy, water sector plan and water management governance arrangements, there is little scope for the government adopting a coordinated approach. The overall assessment of the adaptive capacity of Nauru is low.

## PHASE 4 – Solution analysis

The PACC team, technical working committee and community groups, identified national-level responses. These included developing a water sector policy and water sector plan, and establishing a Water Unit within CIE. The team also identified the need to formalise the PACC and IWRM-based inter-agency steering committee. This would facilitate better oversight of water management in the country, and improve coordination between the Utilities Corporation and CIE, and other agencies.

## PHASE 5 – Design

The National Water, Sanitation and Health Policy was developed, as summarised in Box 3.2.

### BOX 3.2 KEY ELEMENTS OF WATER, SANITATION AND HEALTH POLICY DESIGN (NAURU)

- Policy vision
- Policy goals
- Policy objectives
- Organisational implications of the policy
- Resource and financial implications of the policy
- Legislative and regulatory implications of the policy
- Policy implementation, monitoring and evaluation
- Responsibility for implementing the policy
- Review of policy and implementation plan

## Local-level V&A (PHASES 2 TO 4)

The PACC project adopted a similar process to the national-level assessment, but focused on the local situation in the communities. It looked at environmental and socio-economic vulnerability. The latter was based on a household survey that included:

- housing infrastructure, water asset and supply
- demography, water demand and water uses
- livelihood and income.

For each district, the information highlighted the water threats, and factors affecting the availability of freshwater and coping capacity. These were discussed with the community to identify a set of vulnerability criteria. The assessment is summarised in Table 3.4.

**TABLE 3.4** Summary of household (HH) survey-based vulnerability assessment, Aiwo (Nauru) and location communities.

Vulnerability indicator	Parameter	Location	Aiwo
<b>VI-1. Availability and quality of water resources</b>		<b>Moderate</b>	<b>Moderate to High</b>
	Water availability	Rainwater (frequent drought) Groundwater (no access) Seawater (coastal access)	Rainwater (frequent drought) Groundwater Seawater (coastal access)
	Water quality	No data on groundwater quality in location. Likely to be brackish. Sea level rise likely to increase the risk of groundwater contamination	Rainwater in Lower Aiwo is often carrying dust from roofs Pollution from oil (petroleum) can be found in several wells in lower Aiwo High rate of contamination from faecal bacteria Sea level rise likely to increase the risk of groundwater contamination
<b>VI-2. Storage and supply infrastructure</b>		<b>High</b>	<b>Moderate</b>
	Public asset	3 freshwater tanks (6000L), only 2 in use	3 freshwater tanks (6000L), 1 leaking 1 groundwater tank with solar powered pump
	Private asset	Storage tanks – average 5000L (95% of HH) Rainwater harvesting facilities (98% of HH)	Storage tanks- average 5000–9000L (90% of HH) Rainwater harvesting facilities (80% of HH) Groundwater wells (25% of HH)

Vulnerability indicator	Parameter	Location	Aiwo
<b>VI-3. Access to water</b>		<b>High</b>	<b>High</b>
	Primary source of freshwater	Desalinated water (70%)	Rainwater (50%) and desalinated water (50%)
	Secondary source of freshwater	Rainwater (30%)	Rainwater (50%) and desalinated water (50%)
	Access to a secondary source of water (non potable)	0% of the population access to groundwater	25% of the population access to groundwater
	Water scarcity	30.5% of HH often lack water	37.6% of HH often lack water
<b>VI-2. Density of population and water demand</b>		<b>High</b>	<b>Moderate to High</b>
	Population density	5710 population / km <sup>2</sup>	1196 population / km <sup>2</sup> (100% of land area) 3988 population / km <sup>2</sup> (30% of land area)
	Growth rate (2006--2011)	3,85%	2,09%
	Average population	Per HH: 6 Per dwelling: 11	Per HH: 6 Per dwelling: 11
	Average water demand	Per capita: 170L Per HH: 1000L	Per capita: 170L Per HH: 1000L
	Total daily water demand	214,000L	218,000L



Vulnerability indicator	Parameter	Location	Aiwo
<b>VI-5. Water uses and usages</b>		<b>High</b>	<b>Moderate to High</b>
	Water use	100% urban (100% domestic)	100% urban (breakdown)
	HH using flush toilet	90%	90%
	Daily freshwater use per capita	Average: 169L During drought: 156L	Average: 130L During drought: 91L
	Daily groundwater use per capita	Average: negligible During drought: negligible	Average: 65L During drought: 104L
<b>VI-5. Water uses and usages</b>		<b>High</b>	<b>Moderate to High</b>
	Water use	100% urban (100% domestic)	100% urban (breakdown)
	HH using flush toilet	90%	90%
	Daily freshwater use per capita	Average: 169L During drought: 156L	Average: 130L During drought: 91L
	Daily groundwater use per capita	Average: negligible During drought: negligible	Average: 65L During drought: 104L
<b>VI-6. Income</b>		<b>Moderate to high</b>	<b>Moderate</b>
	Average income per HH <\$3,200	27%	5%
	Average income per HH >\$7,800	32%	52%
<b>VI-7. Sector reform and adaptive capacity</b>		<b>Moderate to high</b>	
	Sector reform	In progress	
	Current adaptive capacity	Low	

The PACC team and communities decided access was needed to a variety of water sources during periods of above-average and low rainfall, and extended drought. This is summarised in Table 3.5.

**TABLE 3.5** Combined water uses for an average household with groundwater access in Nauru.

Water sources	Above average rainfall	Low rainfall	Extended drought
Rainwater	All uses	Drinking only	Not used (storage empty)
Seawater (desalinated)	Not used (no need)	Drinking only	Drinking only
Groundwater	Outdoor Laundry	Outdoor Laundry Personal bathing*	Outdoor Laundry Personal bathing* Cooking

\* Subsequent assessment has suggested that the use of groundwater is not recommended for personal bathing, laundry and cooking because of the high contamination from faecal bacteria.

The team decided that the Aiwo district needed a water supply system based on rainwater and groundwater. Without this, residents would have difficulty meeting their water needs, let alone develop adaptive capacity for projected climate conditions. Based on the V&A assessments and expert knowledge, the PACC team suggested five technical solutions for the community to choose from (Table 3.6). Each adaptation measure was ranked against vulnerability indicators identified by the PACC team, and other indicators considered relevant by the local community. MCA scoring was from 0 to 3 (0 being the lowest benefit and 3 the highest). The solution with the highest score – household-based solar purifiers – was selected (see Table 3.6). However, the selection was made without considering the costs associated with alternative measures.

## PHASE 5 – Project design

Household-based solar purifiers were installed on the roofs of 19 households and one community catchment roof. The system receives impure water (groundwater) through the solar-powered pump and disperses it evenly across the distilling units. Solar purification is where solar energy heats the water. This vaporises then condenses on the inside of the plastic enclosure, and is collected and stored in water tanks. Distilled water is free of any dissolved materials: those remain in the unvaporised liquid. Distilled water is potable and meets WHO drinking water standards. However, communities were initially reluctant to use the water because of their fear of oil contamination, which they experienced in earlier use of ground water.

**TABLE 3.6** Water security adaption options and their relative assessments based on multi-criteria analysis of each option against each indicator.

Parameter	Reticulated groundwater wells for upper Aiwo	Reticulated groundwater wells for lower Aiwo	Improved rainwater harvesting system for selected HH (roofing and gutter)	Improved rainwater harvesting system for selected HH (filters)	Solar purifier for selected HH
<b>Environmental</b>					
<b>VI-1</b>					
Water source available during drought	3	3	0	0	3
Potential Environmental impact	1	1	3	3	2
<b>Socio-economic</b>					
<b>VI-2</b>					
Amount of water provided per capita	3	3	2	2	1
<b>VI-3</b>					
Improve access to a secondary source of water	0	0	0	0	3
		3	0	0	2
<b>VI-4</b>					
Health risk related to use	2	2	3	3	3
		0	2	2	3
<b>VI-5</b>					
Expected lifespan	1	1	3	2	3
		2	1		1
<b>VI-6</b>					
Economic benefit to the water sector	3	3	3	3	3
		3	2	2	1
Landowners acceptance	2	2	3	3	3
<b>TOTAL</b>	<b>24</b>	<b>23</b>	<b>23</b>	<b>22</b>	<b>28</b>
Source: Government of Nauru (2012a)					

The PACC team has a monitoring programme to test the water quality. The solar purifiers are affordable, if the panels can withstand local conditions (Government of Nauru 2012c). This should provide information to help decide whether to replicate the measure. The lifespan of a solar purifier is 15 years. Maintenance is expected to be very low because there is no complex filter system or chemical involved, and no electronics or moving parts. Before solar purifiers are rolled out, a life-cycle analysis is needed to identify maintenance costs, and additional capital investment. A cost-benefit analysis could identify the long-term economic viability of the proposed technology.

## In conclusion

This case study demonstrates the importance of a systematic approach, similar to the integrated climate risk management and process based on a project cycle. Water security vulnerability, their drivers at both national and local levels, and adaptation solutions were identified at both strategic and 'on-the-ground' levels. The case study highlights the role that a high-level government steering group and technical and interagency committees can play, together with a stakeholder-based working group, to support local adaptation measures. It is important to bring in specialists from the beginning. The study also demonstrates the importance of collecting data to complement existing information in support of decision-making.

## CASE STUDY 3 – Food security: assessing the social and economic value of germplasm and crop improvement as a climate change adaptation strategy in Samoan and Vanuatu

This case study draws on McGregor et al (2011) and Lal (2011), and shows an 'on-the-ground' initiative on germplasm conservation and crop improvement, as a climate change adaptation strategy in the Pacific:

- Phases 3, 4 and 5 show the use of a programmatic approach to inform the initiative
- Phase 4 shows the relevance of:
  - a 'no-regrets' adaptation measure that uses climate risks to adapt to projected changes in climate and their effect on food security
  - an adaptation pathway that emphasises investing in institutional flexibility and capacity
- Phases 2 to 7 show the relevance of partnerships, especially when no single agency has the technical, human and financial resources required to address such complex problems
- Phase 7 highlights the usefulness of an ex-post cost-benefit analysis to inform the replication of specific adaptation measures

## Background

Traditional Pacific island crops are particularly vulnerable to disease, because of their narrow genetic base. Root crops are especially susceptible to the impact of diseases brought about by climate change, such as taro leaf blight (TLB). This case study builds on years of scientific research that has added to the knowledge of TLB and its vulnerability to specific climatic conditions.

## PHASE 2 – Situation analysis

TLB had a devastating impact on Samoan taro production, with an annual loss in production valued at [Western] Samoan Tala (WST) 25 million (about AU\$ 11 million) between 1994 and 1999. For five to six years after the arrival of TLB, little taro was consumed in Samoa: a distinct difference from 1989 census records that showed almost 96% of agricultural households growing and consuming taro. Putting these two together, Samoa suffered an annual loss in domestic taro consumption valued at WST 11 million and taro exports valued at WST 9 million.

## PHASE 3 – Problem analysis

TLB is a fungal disease that prefers high night-time temperatures and high relative humidity. TLB significantly reduces the number of functional leaves, and can reduce yield by more than 50%. The disease was first detected in Samoa in 1993 when it rapidly spread across the two main islands, Upolu and Savai'i. Various factors contributed to the rapid spread of the disease in Samoa. One factor was planting the same highly susceptible variety of taro in large areas after Cyclone Val. Weather conditions at the time were conducive to the rapid spread of the disease and it reached epidemic proportions: strong winds, high relative humidity, and high night-time temperatures created ideal conditions for the spread of the fungal spores. Given the projected changes in climate across the region that match preferred conditions of TLB, scientists suggest an increase in the likelihood of the TLB spreading to locations that are currently free of the disease. Fiji, Tonga, Vanuatu, the Cook Islands and higher-elevation areas of Papua New Guinea are currently free of TLB – but all are susceptible and seen to be at high risk. TLB could become established in these countries with projected average warmer conditions combined with wetter conditions.

## PHASE 4 – Solution analysis

Initial disease management of TLB trialled different options. Standard farm management practices, including spraying fungicides on infected planting material, proved ineffective. Farmers were reluctant to incur the extra costs involved, even with a government subsidy towards the cost of the fungicide. Quarantine measures were put in place to restrict the movement of planting material, supported by awareness campaigns, but TLB could not be contained. When traditional methods for TLB control did not provide positive results, attention focused on introducing exotic varieties resistant to TLB (in particular from Asia and Palau). These TLB-resistant taro plants enabled Samoan farmers to cultivate taro once again. However, there was consensus that the new varieties were not ideal because of the strong variance in taste. Attention shifted towards longer-term taro breeding: the challenge was not only to find resistant varieties, but also to meet the demanding taste requirements of Samoan communities at home and abroad, and to provide for a shelf life that would allow export by sea.

## PHASE 5 – Project design

The breeding programme was informed by specialist scientific knowledge of genetics and crop breeding techniques, and by farmers' knowledge. A classic plant breeding approach was adopted: it involved a partnership between breeders across SPC and the University of the South Pacific (USP) Alafua campus, and high-level grower participation. Farmer trials were conducted, together with community preference trials in Samoa (Samoans living abroad were not initially included). Farmer participation ensured field trials across many locations and a quick uptake.

Partnerships with development partners were critical. The initial breeding programme involved USP plant breeders and the Ministry of Agriculture staff in Samoa, using their own funds. External funds from partners of about WST 18 million (AU\$ 8 million) were obtained between 1994 and 2010, for:

- the TAROGEN project, from the Australian Agency for International Development (AusAID)
- DNA finger printing and virus testing protocol development projects, from the Australian Centre for International Agricultural Research (ACIAR)
- assessment of TLB resistance, from the NZ Ministry of Foreign Affairs and Trade (MFAT)

These projects supported the breeding programme that eventually led to the introduction of TLB-resistant taro varieties in Samoa. AusAID also contributed towards the establishment of regional germplasm conservation at the Centre for Pacific Crops and Trees (CePaCT).

## PHASE 6 – Implementation

The TLB-resistant breeding programme took several years to get started, due to delays in funding and the time it took to identify and access genetic material from other countries. After Samoa's TLB disease outbreak, several years were spent developing a cohesive crop improvement programme. It was based on genetic material sourced initially from Palau, and later from the Federated States of Micronesia, the Philippines, and other south-east Asian genetic material maintained in CePaCT. Such delays, with costs to local communities and loss in the export markets, could have been avoided if investment in regional ex-situ<sup>6</sup> germplasm banks had been made.

### 'NO-REGRETS' STRATEGY

While reactive responses to risks as above helps meet immediate needs, countries must also adopt proactive 'no-regrets' strategies to minimise future risks, as has recently been adopted by Vanuatu. To safeguard against the loss in genetic diversity in crop genetic material collections, Vanuatu undertook to establish 'collections' in farmers' fields. The Vanuatu Agricultural and Technical Centre (VARTC) developed a pilot project to test and evaluate on-farm conservation by introducing new genetic material in Vanuatu's traditional cropping system. Part of the project was to allow 'natural' distribution of new genetic material through traditional cultural practices of exchanging planting material. The objective was to broaden the genetic diversity in village farmers' fields, by including some resistant varieties, thus providing protection against future epidemics and biological disasters. The trials also addressed desired eating and agronomic qualities.

McGregor et al (2011) notes that a social and economic assessment of the 'no-regrets' strategy of establishing 'reservoirs' of genetic diversity in farmers' fields is difficult, as the benefits do not become obvious until pest and disease outbreaks occur. Benefits will also depend on the maintenance of the genetic diversity in farmers' fields. Yet the project demonstrates the potential for risk minimisation by building on the traditional practices in the Pacific, of maintaining crop diversity in family gardens. That diversity can be called upon in times of need. This is an example of combining Melanesian cultural practice of openly sharing crop varieties, with a proactive 'no-regrets' approach to maintaining genetic material in regional and national germplasm collections, as well as reservoirs in farmer's fields. This ensures genetic diversity to help meet food and nutrition security in the face of climate change.

6 Ex-situ refers to off site (off farmers field) conservation, usually in germplasm banks that hold crop genetic material.

## PHASE 7 – Ex-post cost benefit analysis

To learn from adaptation measures, it is important to undertake an ex-post evaluation, based on actual results rather than on forecasts. An ex-post evaluation of the TLB-resistant crop improvement and the value of investing in a regional germplasm bank was undertaken by Lal (2011) under a project funded by the Australian Department of Climate Change and Energy Efficiency (DCCEE). Adopting a cost-benefit analysis 'with-and-without', McGregor et al (2011) show that although TLB-resistant crop breeding activities were developed over time, the benefit of the largely publicly funded TLB-resistant crop improvement programme far outweighs the costs. The study shows that the genetic breeding and crop improvement programme led to significant benefits, both for domestic consumption and for export.

Production of *Colocasia* taro for the domestic market increased from virtually zero in mid 1994, to 9000 tonnes in 2010: some 500 tonnes were sold in the Fugalei Market in Apia, Samoa. Local consumption was valued at WST 21 million (AU\$ 9.3 million) and the value of exported taro was estimated to be WST 1.1 million (AU\$ 0.5 million). The export value of taro for sale and subsistence between 1994 and 2010 was 10 times the cost of the breeding and germplasm conservation programme (estimated as a pro-rated cost of the regional CePaCT germplasm programme). The net benefit of the TLB-resistant crop breeding programme shows significant value. Yet the economic and social benefits could have been much greater if Samoa, or the regional germplasm banks, had already contained taro genetic material from the region and from Asia. Such an ex-post analysis requires the technical capacity to conduct CBA; good baseline data on subsistence and commercial production, domestic and export market prices, and costs; and knowledge of the effects of TLB on taro productivity (Lal 2011; McGregor et al. 2011).

## In conclusion

This case study illustrates the:

- usefulness of a programmatic approach, involving reactive and proactive projects. Reactive projects respond to current challenges, including pests and diseases; proactive projects prepare for future pests and diseases and other effects of changing climate. Such mainstreaming exercises involve scientists, communities, governments and development partners over a long period of time. The pay-offs can be quite significant when compared to traditional approaches to tackling pests and diseases (phases 3 to 5)
- relevance of using a 'no-regrets' adaptation measure that addresses climate risks as a starting point for adaptation and its effects of food security (phase 4)
- relevance of choosing an adaptation pathway that emphasises response measures that strengthen institutional flexibility and capacity (phase 4)
- relevance of partnerships when tackling common climate change hazards, especially when no single agency has the technical, human and financial resources required to address such complex problems (phase 2 to 7), such as the capacity to breed new plant hybrids
- usefulness of an ex-post CBA to replicate a specific adaptation approach and measures. Information on costs and benefits provide powerful messages when calling for increased investment: these require long periods of engagement, but the pay-offs can be significant when compared to traditional adaptation approaches (phase 7).

## CASE STUDY 4 – Investing in improved farm management as a ‘no-regrets’ climate change adaptation strategy in Ontong Java

This case study draws on reports produced by UNDP (2006), Government of Solomon Islands (2012a, 2012b) and McGregor & Supa (2012). It shows the steps in designing a ‘no-regrets’ adaptation strategy in Ontong Java.

This case study highlights:

- how community-based vulnerability and adaptation (V&A) assessment can build local capacity and encourage local ownership of externally funded investments. Such an assessment needs to be supported by robust scientific knowledge to inform key decisions, such as selecting local adaptation measures, if practical benefits are to be realised from limited resources.
- the relevance of engaging technical experts to inform problem-solution analysis, and the detailed design of an ‘on-the-ground’ adaptation measure, particularly during phases 4 and 5.
- the relevance of a systematic analysis of options, including cost-benefit and feasibility analysis, to inform the adaptation choice (phase 4), and the design.

### Background

Ontong Java is a densely populated set of low-lying atolls in the Solomon Islands. The residents are highly vulnerable to climate extremes, such as extended dry periods due to El Niño-Southern Oscillation (ENSO) events. The islands are also highly vulnerable to the effects of cyclone-induced flooding and sea level rise. The intensity, if not the frequency, of such extreme climatic events are expected to increase with climate change. The impact of extreme weather and climate conditions on food security is a major concern on the islands, especially given a recent decline in subsistence crops, and an increasing population. A recent sharp decline in income-earning opportunities has further added to food security concerns. The ban on *bêche-de-mer* (sea cucumber) harvesting has reduced cash incomes for purchasing rice and other staple foods. Initial consultation for support, under the UNDP-GEF funded PACC project, identified the need to focus on food security, particularly for the Ontong Java communities.

### PHASE 1 – Preparatory

Preparatory work identified the climate change adaptation focus for Solomon Islands under the PACC project. The decision to focus on agriculture, in particular on Ontong Java, was based on a systematic assessment that involved:

- a review of government documents and reports on development, disaster and climate change, including reports prepared for First National Communication, NAPA, and NAP
- in-country consultation with government and non-government stakeholders to identify their interests, and their role in the PACC project when implemented
- stakeholder workshops to select priority sector and community to target.

The agricultural sector, and in particular Ontong Java, was selected for the PACC project, as this closely aligned with the Solomon Island Government’s development policy. The consultation helped to identify the institutional arrangement for the PACC project, and the higher-level support to be provided by

the Solomon Islands Advisory Committee on Climate Change (SIACCC). The V&A report notes that “the church-organised group has a lot of influence in the community and there is a need to do a wider range of consultation with them before different adaptation activity can be carried out on the island” (Government of Solomon Islands 2012a: p 72). It also noted the local chiefly system is strong and future consultation needs to be in line with the current structure. The V&A team recommended that the first step towards developing capacity is to establish a community-based adaptation committee: this should recognise the role of church-based and community-based institutions, such as women chiefs.

## **PHASE 2 – Situation analysis;**

## **PHASE 3 – Current and projected risk assessment**

IPCC Common Methodology (CM) was used in project assessments that highlighted three areas: global climate change, including sea level rise; socio-economic development; and response options.

A vulnerability and adaption assessment (V&A) was completed using a detailed household survey. This provided community perceptions of trends in weather conditions and the frequency and impacts from key hazards. The effects of hazards were noted (saltwater intrusion, drought, cyclones, coastal erosion) on livelihood: water, food gardens, fishing grounds, transportation and communication. Loss of property and cultural sites, and hazard areas, were also mapped. Knowledge about vulnerability to climate change on Ontong Java was synthesised by analysing:

- past and projected weather and climate patterns (rainfall, temperature), climate change and associated hazards (cyclones and droughts, sea level rise and storm surges)
- vulnerability to past weather and climate events, based on past experiences in the agricultural sector, environment (forestry and biological diversity), freshwater resources, coastal zone and marine resources, human settlements and health, and water resources.

Hydro-meteorological analysis provided an overview of climate change trends. The PACC Project V&A Assessment Report (2011) for Ontong Java identified the following areas of importance:

- subsistence agriculture and nutrition
- human health
- coastal environments and systems
- water resources
- marine resources.

The problem analysis identified adaptation strategies adopted by the communities. Gaps in the capacity of households and communities to respond adequately to current weather and climate related hazards were highlighted. Constraints included the lack of area-specific information; a traditional tenure system affecting agricultural expansion, and the absence of public policy and clear strategies to guide sector-level responses. In relation to food security, the PACC V&A Assessment Report (2011) identified several factors:

- land availability to produce sufficient quantities of nutritional food for the family
- availability of giant swamp-taro to sustain families during droughts and disasters
- accessibility of marine resources to exploit and earn income for buying imported foods to supplement locally available food
- access to markets for their goods, and to earn income

- availability of transport to take goods to market and to buy food.

Another factor is the loss of an alternative source of livelihood, with the 2011 ban of bêche-de-mer sales affecting the ability of local communities to purchase rice and flour, etc.

## PHASE 4 – Solution analysis

For each of the hazards and their projected impacts on livelihoods, problems were identified by community members, supported by input from government agencies. They also identified gaps in disaster risk management, and sector-level strategies to address the problems. Adaptation responses were assessed using the following criteria:

- effectiveness with regard to the hazard
- expected costs
- technical feasibility
- social and cultural feasibility
- how quickly the adaptation option could be implemented.

Priority needs of the community identified in the V&A report included:

- financial literacy programme
- climate change awareness
- education and training
- capacity development in agriculture, sustainable environmental stewardship, resource management training and planning, and phased relocation options, plans and strategies.

The V&A report concluded that improving domestic food production showed the best prospects for enhancing food security on Ontong Java in the short to medium term. The PACC team made introducing salt-tolerant crop varieties the major focus. McGregor & Supa (2012) note that other possible measures included addressing the adequacy of food supply (being able to grow their own food), access to food (having income to buy food), better utilisation of foods (knowledge of nutrition, storage and preservation), and safety.

## Assessment and selection of adaptation measures cost-benefit analysis

In mid-2012, a cost-benefit analysis of the proposed adaptation responses helped to inform the selection of preferred adaptation measures. Of the options suggested in the V&A report, the economics team focused on two causes of reduced food production in Ontong Java:

- coastal salt contamination of swamp taro due to storm surges and coastal flooding
- poor soil due to limited humus.

The team then identified three broad responses for improving food production on Ontong Java:

- establishing protective measures to reduce saltwater contamination in food production areas
- introducing root crop varieties and cultivars that have tolerance to salinity
- modifying the soil and food production environment.

## PROTECTIVE MEASURES TO REDUCE THE RISKS OF SALT CONTAMINATION

The team noted coastal barriers were used to protect farmland from salt contamination in Palau. However, substantial and expensive hydrological and engineering studies were required. The team decided against including a coastal barrier in Ontong Java as an adaptation measure in the CBA.

## SALT-TOLERANT ROOT CROPS

Three of the Pacific region's root crop experts were asked about the effectiveness of introducing salt-tolerant root crop germplasm. They agreed that before introducing such crops, extensive breeding for acceptable taste would be needed. This required a long-term investment, which was overly optimistic for the PACC project in its short project-based funding. One expert noted potential gains from accessing *Cyrtosperma* taro suckers from the Federated States of Micronesia (FSM), which has over 50 swamp taro varieties. Other considerations were noted:

- the salinity level in the coastal farms on Ontong Java compared with the tolerance of the plants
- *Cyrtosperma* taro is a relatively minor aroid plant in the region and globally, for which there are no known breeding programmes. If attempted, such a breeding programme for salt tolerance is a long process with an uncertain outcome.

Given the expert judgements and capacity issues on Ontong Java and in the region, it was decided not to focus the PACC project on the introduction of salt-tolerant planting material. This then left the third response measure to consider: improving soil condition for improved food production.

## PHASE 4 – Selecting adaptation measure; PHASE 5 – Design

McGregor & Supa (2012) refer to the historical knowledge of people on Ontong Java and other atoll islands, of organic matter composting. They note “the challenge is to take existing scientific knowledge on sustainable organic production systems, together with experiences in food production from other atoll situations, and apply them in an effective way to the Ontong Java context.” This approach, and other activities by a local church-based organisation, led to a design for the ‘on-the-ground’ PACC pilot project. The economics team, in consultation with other farming experts, agreed that the PACC initiative will be “to modify the organic environment in which food is grown on Ontong Java through an integrated set of measures”. This included the following activities:

- improving composting techniques that increases the volume and quality of available compost
- using agroforestry that involves the use of nitrogen-fixing trees and legumes
- growing vegetables in raised beds and containers (including hydroponics), and improved home gardening techniques
- establishing small nurseries for vegetable seedlings and agro-forestry planting material;
- introducing a ‘soils school’ extension process, so people understand their soil and how best to utilise it for sustainable food production.

## WITH-AND-WITHOUT CBA ANALYSIS

The CBA identified key inputs required for the activities and their costs, assuming the 'on-the-ground' PACC initiative was completed in a three-year period. This gave the costs 'with' the PACC project. For assessing activity 'without' the PACC project, the team assumed no further reduction in taro production over the next decade – although with climate change, taro production could be expected to fall further. The team also determined the benefits from increased nutrition of the people, one of the expected outcomes of the food security project. The analysts found that the proposed 'on-the-ground' initiative was both economically viable and operationally feasible, even with the most conservative assumptions about improvements in nutrition.

## In conclusion

The case study demonstrates the importance of following integrated climate risk management based on a project-cycle, to designing a 'no-regrets' adaptation strategy in Ontong Java. In addition to a community-based V&A assessment, it is critical to identify and engage with technical experts at the earliest stage possible. Such technical inputs are required throughout the entire project cycle.

## 3.4 'On-the-Ground' Process for Climate Proofing

Climate proofing incorporates issues of climate change in development planning. Pacific island countries generally have formal decision-making processes, supported by legislation, under which large private sector-led projects are subject to environment impact assessment (EIA). An EIA evaluates the impacts (including ecological, economic and social aspects) of a proposed project<sup>7</sup>. Through an EIA, government encourages developers to minimise any negative environmental, social and other economic impacts. An EIA is also used to decide if a project should be approved given its environmental and social footprint.

Where risks are involved, the use of an environment risk assessment (ERA) is suggested (Hyett 2010). In the context of climate change, an ERA is an EIA with integrated climate risk assessment. It considers projected changes in climate conditions; their effects on ecosystem services; and their economic and social impacts. The ERA can also assess the effect of climate change during the life of the project, as this may alter the project and its outcome. The ERA can inform changes in project design, such as 'climate proofing' development projects to minimise climate risks. This could change standards of approval, such as building codes and standards in hazard-prone areas. The case study below gives an example of how climate proofing has been factored into an 'on-the-ground' initiative.

## 3.5 CASE STUDY 5 – Climate Proofing of 'On-the-Ground' Initiatives – Example of a Road Improvement Project in Solomon Islands

The Solomon Islands Road Improvement Project (SIRIP) in Western Guadalcanal, has been implemented. The case study draws on a report prepared for the Australian Department of Climate Change and Energy efficiency (Lal & Thurairajah 2011). This highlights the usefulness of:

<sup>7</sup> The terms project, activity and development are used interchangeably.

- adopting the EIA process to identify climate risks, even if the project may not be subject to it
- adopting a combined EIA and risk management based process to 'climate proof' an existing road, supported by technical analysis despite data and information constraints
- undertaking a cost-benefit analysis to choose engineering measures. This included consideration of climate change-related flooding risks and the use of sensitivity analysis

## Background

The Solomon Islands regularly experiences climate-related extreme events, including heavy rainfall, cyclones and coastal storm surges. These cause flooding-related hazards and significant economic losses as well as loss in lives. In response to regular flooding and its impact on vital infrastructure, the Solomon Islands Government, with the assistance of the Asian Development Bank (ADB), the Australian International Aid Agency (AusAID), the New Zealand Aid Programme (NZAID) and the European Union (EU), undertook the Solomon Islands Road Improvement Project (SIRIP). The goal is to rehabilitate the roads to withstand a higher category of weather event. Major flooding in north-western Guadalcanal in 2009 and 2010 influenced the design and climate proofing of the project.

### PHASE 1 – Preparatory

The tender for the road improvement project was won by an international engineering firm, Cardno Acil Ltd. Climate change expertise was included in the project team.

### PHASE 2 – Situation analysis

The initial assessments included:

- review of historical climatic data for Solomon Islands and relevant Global Climate Models (GCM)
- field studies to identify and map areas vulnerable to climatic change, along the sampled roads
- focus-group assessment with local communities, to seek inputs on existing climate changes.

The analysis covered the impact of rainfall and flooding on existing roads, on road usage and on economic well-being. A poverty and social assessment was conducted of the communities and their dependence on the road for economic activities, education and health. An environmental assessment of the Guadalcanal plains and catchments was also completed.

### PHASE 3 – Scoping of issues –Assessing the original SIRIP2 project design

The vulnerability assessment was used to identify engineering and non-engineering adaptation responses. Non-engineering solutions included increasing land cover or coastal buffers and adding carbon storage capacity. Although considered to be inexpensive and flexible, these non-engineering solutions were not pursued. Instead, an engineering solution was chosen. The original designs of roads, bridges, culverts and other structures were reviewed for their ability to tolerate increased flood risks. Expected benefits were combined to create an 'adaptation matrix' (Table 3.7). For each physical structure, engineers decided on the:

- level of risk threshold that could be tolerated, taking into account the magnitude of flooding events and serviceability of the roads, “as far as economically feasible” (Cardno Acil 2010a: p.11)
- three project designs, plus the ‘do nothing’ option, took into account design standards for structures required for different magnitudes of rainfall events, and acceptable threshold levels.

**TABLE 3.7** Adaptation issues identified for the SIRIP2 subproject, using a problem-solution analysis that integrates the climate risk of surface flood

<b>Hazard impact</b>	<b>More run-off water</b>
<b>Likelihood of occurrence in project site, timing</b>	High
<b>Vulnerability ground truthing</b>	High at climate-sensitive hotspots such as low-lying coastal bridges and road sections and river flood plains
<b>Consequences – possible problems and damage, timing</b>	<ul style="list-style-type: none"> <li>▪ Gully erosion</li> <li>▪ More severe floods</li> <li>▪ Water build-up</li> <li>▪ Overflow and mud/debris deposits making roads impassable and destroying bridges (wash-out)</li> </ul> <p>Also:</p> <ul style="list-style-type: none"> <li>▪ Landslides and slips of the slopes</li> </ul>
<b>Proposed preventative measures</b>	<ul style="list-style-type: none"> <li>▪ Apply a safety factor in bridge and road level</li> <li>▪ Increase size and number of engineering structures (hydraulic structures, high bridges)</li> <li>▪ River training</li> <li>▪ Increase land cover in upper water catchment</li> <li>▪ Raise pavement and add drainage</li> </ul> <p>Also:</p> <ul style="list-style-type: none"> <li>▪ Increase land cover</li> <li>▪ Surface drainage and its maintenance</li> </ul>
<b>Risks/benefit</b>	<ul style="list-style-type: none"> <li>▪ Engineering options: Additional culverts and higher bridges are effective but expensive. The effectiveness of bio-remediation systems to reduce runoff will be limited to specific locations</li> <li>▪ For engineering solutions to be effective, adequate routine maintenance must be performed continuously</li> <li>▪ Re-vegetation in upper catchment can be a community-based activity that provides income to villages affected by floods</li> </ul>

Source: Adapted from Cardno Acil (2010b)

## CONSIDERATIONS OF OTHER HAZARDS

Landslides are a serious concern in Guadalcanal but a risk assessment was not undertaken as it was beyond the scope of the project. The adaptation matrix does however identify possible measures that communities could adopt.

## PHASE 4 – Selection of preferred solution: mitigation steps and changes in project design

Cost-benefit analysis was the primary analytical tool. The team first identified ‘with-and-without’ climate change scenarios. The ‘without’ scenario assumed the current weather and climate pattern where at least 1-in-2-year flows could be tolerated; during 1-in-10-year events, some flooding of the structures may occur but vehicles with higher clearance could still pass through. The ‘with’ scenario was based on the IPCC’s Fourth Assessment projections.

Four design options were identified. This involved determining for both ‘with and without’ scenarios:

- financial costs, including the capital costs of the structures, operation costs and respective regular maintenance costs
- benefits of the road infrastructure repairs and improvement for communities. Maintaining access and avoiding loss in earnings when structures are under floodwater, and when breaks in the river crossings prevent movement of vehicles and people.

Option B, incorporating climate proofing changes, was then accepted and implemented.

## Relevance of Environment Impact Assessment

The road project was undertaken without the use of the Solomon Islands EIA-based approval process, despite the National Transport Plan stating that all infrastructure development projects require an EIA. (Note: the Act does not refer to climate change in its scope of risks to be considered). The project was not subject to the ADB’s EIA process either, because it was regarded as a Category B project where the overall risk was considered low: any negative impacts would already have been experienced when the road was originally established.

Nonetheless, the project design was based on assessments that included:

- Initial Environmental Examination Report, Repair and Rehabilitation of Main Road: Guadalcanal Province (July 2009), Report No: 40 Cardno/ACIL
- Initial Poverty and Social Assessment, North West Guadalcanal Roads, Poha to Naro Hill, Guadalcanal Province, Feasibility Study (June 2009) Cardno/ACIL
- Economic Assessment, Guadalcanal Flood Damage Restoration Subproject (July 2010), Report No: 40A.

These reports were approved by the then Ministry of Environment, Climate Change and Meteorology (MCEM) under its Environment Act. An Environmental Management and Monitoring plan was then developed. MECM had limited manpower to provide significant inputs into the project design across different sectors.

## In conclusion

This case study demonstrates several issues regarding ‘climate proofing’ development:

- The EIA process can include climate risks even if it is not a criteria, or is not legally required.
- The Environment Risk Assessment (ERA) process requires:
  - integrated scientific, social and economic information and traditional knowledge
  - expert judgements about risks, particularly when baseline information is unavailable.

Ideally, such an effort would include:

- government policies and decision-making processes that reflect an understanding of the dynamics of weather and climate systems, and social and economic systems affected by weather and climate hazards
- data sets collected by different agencies, and knowledge from the local communities on DRM
- institutional and human capacity in risk assessments and risk management decisions, as well as the ability to review project design documents within an EIA/ERA context
- knowledge of perception of risks, and a country's risk tolerance threshold.

Ultimately, national governance systems need to be strengthened if such an approach is to become an integral part of decision-making. Priority could be given to:

- reviewing the Environment Act, with EIA procedures to be considered during approval processes
- institutional capacity to assess development projects for climate risks
- reviewing development governance mechanisms to strengthen the national development approval process and development partner's project development processes. This will ensure the mandatory use of climate risk criteria in any project selection, together with economic, environmental and social selection criteria.

## Concluding Remarks

Efforts to mainstream climate risk into national development planning are still at an early stage in many PICTs. The sharing of experiences and lessons learned shows there are significant social, economic and environmental benefits from mainstreaming climate change considerations into development planning.



## PART 4

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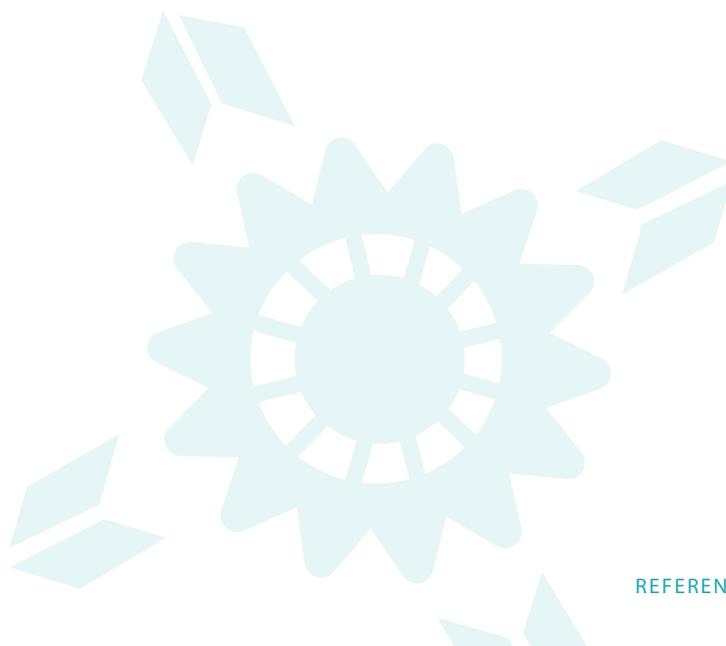
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