



Community-Based Climate Vulnerability Assessment and Adaptation Planning

A Cook Islands Pilot Project

Asian Development Bank

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Abbreviations

ADB	–	Asian Development Bank
GIS	–	geographic information system
GPS	–	global positioning system
IPCC	–	Intergovernmental Panel on Climate Change

All photos and maps, except for the one in page 22, were provided by Te Rito Enua. The photo on page 22 was from the Cook Islands News.

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Note: In this publication, “\$” refers to US dollars.

Foreword

Building a safe, secure, and resilient community is one of the strategic goals of the Cook Islands' National Development Plan. The Asian Development Bank (ADB) directly supports the attainment of this goal by providing loans and technical assistance grants to improve economic and social infrastructure and public sector service delivery. Under its Pacific Climate Change Program, ADB also assists in enhancing country and subregional initiatives on climate change. The program focuses on three key areas: (i) fast-tracking and scaling up climate change adaptation and mitigation, (ii) building capacity to enable the integration of climate change into national development plans and programs, and (iii) promoting more effective development partner responses.

This publication documents the experience from a pilot adaptation project, Protecting Island Biodiversity and Traditional Culture in the Cook Islands through Community-Based Risk Management. The project was funded under the ADB regional technical assistance, Promoting Climate Change Adaptation in Asia and the Pacific (RETA 6420). The RETA focuses on developing and pilot-testing innovative, low-cost adaptation interventions in line with ADB's conscious effort to synthesize and disseminate lessons on effective climate change adaptation responses. This publication is part of a series of knowledge products designed to document ADB adaptation projects and outcomes, and to provide a better understanding of what makes adaptation actions effective.

ADB's support for the project highlights its commitment to put in place climate change solutions that are adapted to local contexts and guided by the interests of local communities, including the poor and vulnerable. ADB views local adaptation and community participation as crucial in addressing the diverse range of physical and human geographic circumstances in the region, which express themselves in differing patterns of vulnerability and in the varying levels, timing, and nature of climate change risks.

We hope that this publication will provide insights into how climate change adaptation may be strengthened and accelerated through community-based risk assessment and participatory planning. The process and tools used in the project were designed in consultation with the communities, local experts, relevant government agencies, and other development organizations. ADB encourages replication of the process and tools in ways that are best suited to local conditions and the needs of vulnerable communities.

The pilot adaptation project as well as this publication would not have been possible without the support of the Japan Special Fund and the Government of the United Kingdom for RETA 6420. The project was supervised by Edy Brotoisworo, principal environment specialist, Pacific Department, and implemented by the consulting team of Mona Matepi, George de Romilly, and John Waugh.

James Roop, senior environment specialist, Pacific Department, finalized the project, and drafted this report with consultant Jean Laguerder. Charles Rodgers, senior environment specialist, Regional and Sustainable Development Department, gave invaluable technical advice. Joe Mark Ganaban did the layout, and Teri Temple edited this report. Cecilia Caparas and Lorie Rufo provided technical support and coordinated the publishing process. Linel Ann Reyes provided administrative assistance.

ADB is grateful for the effective partnership with the Cook Islands communities of Arutanga, Matavera, Rua'au, and Ureia; the Government of the Cook Islands through its National Environment Agency; local nongovernment organization, Te Rito Enua; and the World Wide Fund for Nature, which provided both technical support and counterpart funds for the project. Finally, the community vulnerability assessments conducted by the Red Cross and other nongovernment organizations in the Cook Islands laid the foundation for this work, and their contributions are greatly appreciated.



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Introduction

The Cook Islands, like some of its neighboring small island developing states in the Pacific, has been endeavoring to build greater climate resilience. Since 2003, the government, in partnership with the Red Cross and other organizations, has undertaken vulnerability assessments and adaptation planning in several communities. Building on these initiatives, the government partnered with the Asian Development Bank (ADB) and the World Wide Fund for Nature to undertake a pilot adaptation activity that could be replicated across the country's inhabited islands.

The basic idea was to field-test a participatory approach that integrates local knowledge and engages vulnerable communities in the formulation of adaptation plans that will be operable and most relevant to their circumstances. Integral to this idea was the development of practical tools, along with information and education, to ensure that the communities will have the necessary capacity to analyze climate risk and decide on adaptation strategies.

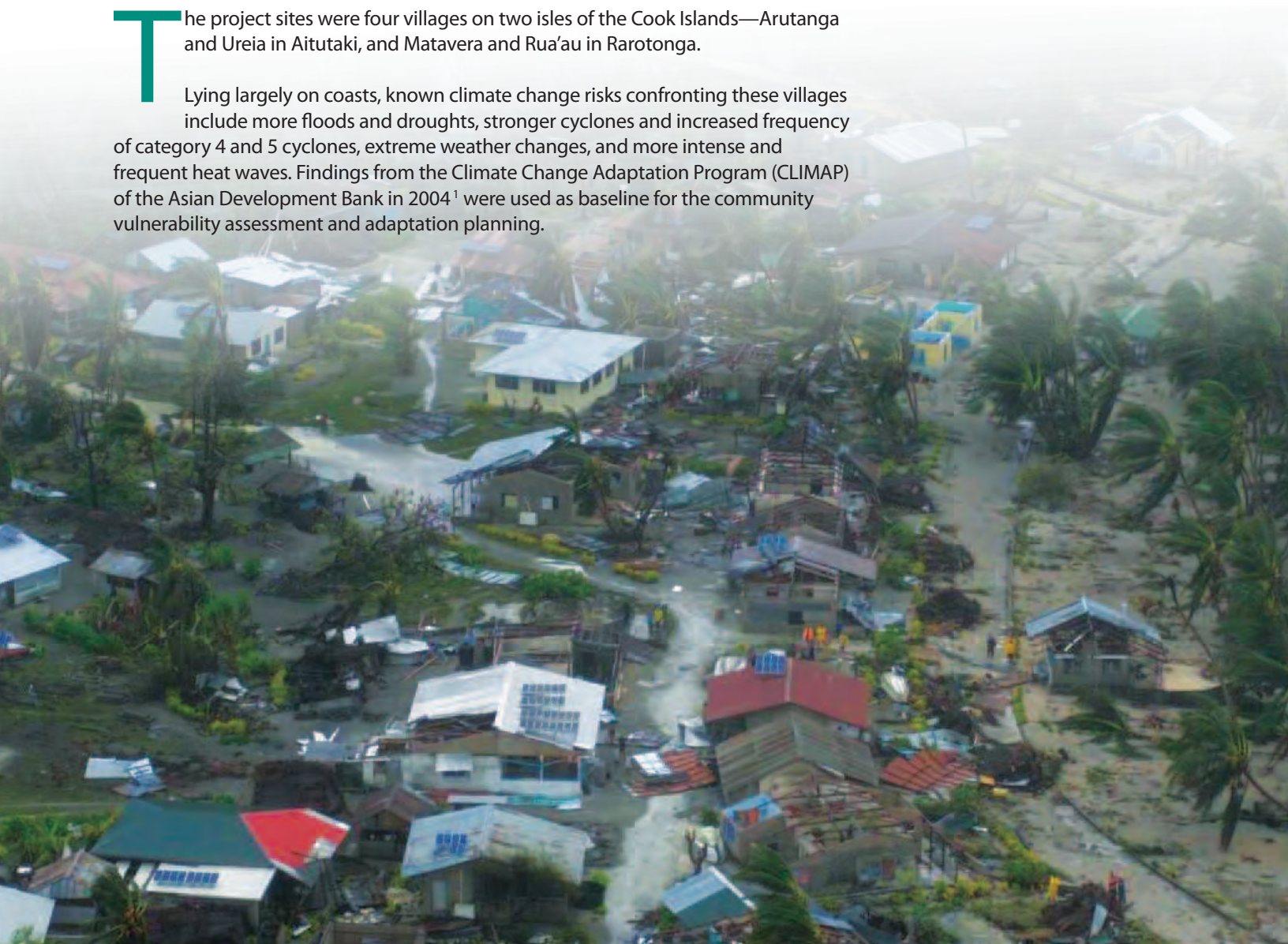
The community risk profiles and adaptation plans that came out of the project have enhanced the vulnerability assessment and risk reduction efforts in the pilot sites in two distinct ways. First, they have brought into focus a number of important risks previously not considered in government vulnerability and risk assessments. Second, they have triggered direct actions at the individual, household, and community levels that can augment limited public resources and capability for adaptation. The community vulnerability and risk atlases have been turned over to the national geographic information systems (GIS) office of the Ministry of Infrastructure and Planning, and are now informing government planning and decision-making processes. The incorporation of the community priority adaptation actions into government policies and programs is gaining momentum.

This publication captures and shares the process, tools, and lessons from the project. It shows how community-based risk assessment and participatory planning can be implemented and used to strengthen and speed up local adaptation. With this, we hope to contribute to the growing knowledge base on adaptation, as well as to advance ADB's interest in developing and scaling up innovative, low-cost adaptation interventions.

A Participatory Approach to Adaptation Planning

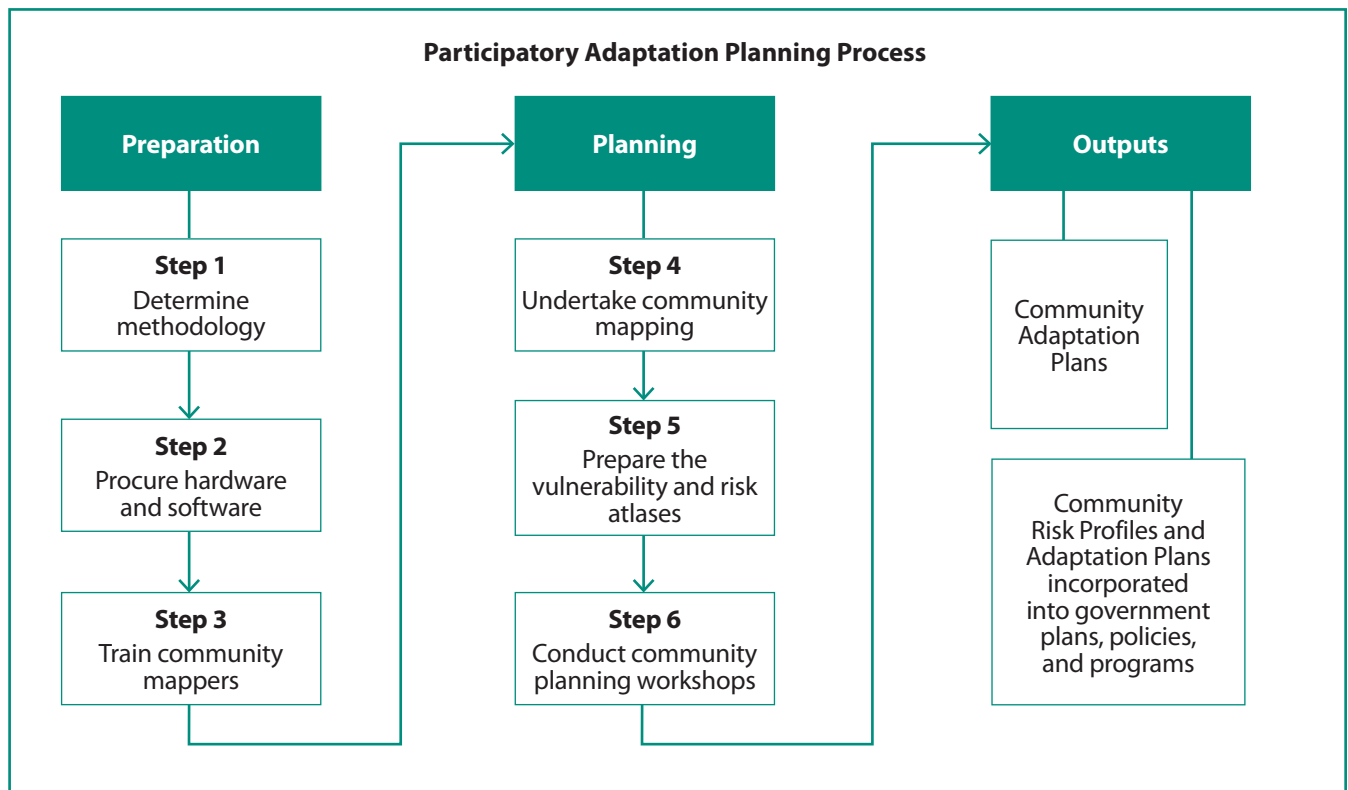
The project sites were four villages on two isles of the Cook Islands—Arutanga and Ureia in Aitutaki, and Matavera and Rua’au in Rarotonga.

Lying largely on coasts, known climate change risks confronting these villages include more floods and droughts, stronger cyclones and increased frequency of category 4 and 5 cyclones, extreme weather changes, and more intense and frequent heat waves. Findings from the Climate Change Adaptation Program (CLIMAP) of the Asian Development Bank in 2004¹ were used as baseline for the community vulnerability assessment and adaptation planning.



¹ Climate modeling exercises under CLIMAP projected that the Cook Islands, by 2060, will face (i) a rise in sea level of 0.5–0.8 meter (m); (ii) more heavy rainfall events, with daily total precipitation reaching more than 200 millimeters and hourly total precipitation above 50 millimeters; (iii) more than 80% decline in the average monthly precipitation in certain areas, from their 1960–1991 records; (iv) an increase in significant wave height from 10.8 m to 12.0 m due to stronger cyclones; and (v) more intense cyclones, with peak winds reaching more than 47.8 m per second.

The project was implemented in phases, following the steps shown in the diagram below.



Step 1. Determine the Methodology for Preparing a Geographic Information System-Based Climate Vulnerability and Risk Atlas

1. A set of indicators for mapping community vulnerability was developed in consultation with government agencies. These indicators addressed the geophysical and socioeconomic factors affecting vulnerability, including adaptive capacity. The development of these indicators drew from a number of authoritative sources that include the Cook Islands' initial national communication to the United Nations Framework Convention on Climate Change and a project financed by the Global Environment Facility, the Special Program on Adaptation to Climate Change for vulnerable marine and terrestrial biodiversity in the eastern Caribbean.
2. A system was designed for capturing the information in the form of a contextually relevant set of fields, symbols, and tags that will enable economic, social, and other information inputs from the communities to be incorporated.
3. Hardware and software requirements and specifications were determined. By ensuring that these were compatible with the government's geographic information system (GIS), the mapping activities were made much more expedient. However, the cost and complexity of a GIS can also impede working on a larger scale.

Step 2. Acquire and Configure Required Software and Hardware

Hardware and software compatible with the government's GIS platform were procured and configured based on the areas of value and concern to the communities.

Step 3. Conduct the Training of Community Mappers

A total of 25 community members, representing a cross section of the populations in Aitutaki and Rarotonga, including community leaders, resource users, and professional resource managers, were trained on community vulnerability mapping using preconfigured global positioning system (GPS) equipment. They were selected by the communities and embodied a wide range of interests, including technological (interest in GPS among the youth), thematic (natural resource management, and disaster preparedness and prevention among the working population), and staying abreast of the changing world (community elders).

The training included introductory courses in (i) participatory mapping, (ii) vulnerability and risk assessment and climate models, (iii) use of GPS in mapping, (iv) GIS and mapping assets, and (v) map interpretation. Two training activities were held, each taking 4 days: 2 days of classroom instruction and a 2-day field practicum.

A valuable insight into the prevailing community value system surfaced in the training. Working in teams without guidance from the trainers, participants were asked to map community features of particular interest or concern. Invariably, the first items mapped by the different groups were the *marae*, ritual platforms central to Polynesian culture and history. Aside from this, the initial results ranged from recreation (football pitches) to economically important sites (*pa'i*, or taro swamps, and tourism sites), and social sites (churches, schools, and community centers). Such other important sites as water infrastructure and areas of pollution were added only after further reflection.

Discussions during the training went beyond climate change and climate adaptation to deeper social issues, such as cultural erosion,



Participatory mapping in Aitutaki

loss of language, unsustainable resource use, invasive species, and out-migration. This provides an example of how adaptation planning may be framed within a broader suite of development issues.

Step 4. Undertake Community Mapping

1. Project-trained community facilitators led the actual conduct of community mapping. Using handheld GPS units, they worked with the communities to establish control points, determine and collect data points, and take photographs for a visual baseline. Where resources permitted, household surveys were also undertaken to evaluate and map household-level vulnerabilities.

2. GPS data were converted into GIS layers and integrated, as necessary, with government GIS maps to produce working drafts for the adaptation planning workshops. Government base maps provided data on elevation, infrastructure, land use and land cover, and geology. Community data layers added sociocultural data, primarily of significant cultural sites. Other relevant data layers were also incorporated, including remote sensing imagery; downscaled global climate models; and available GIS layers on the hydrology, physical features, and biotic communities of the project sites.

3. Short community profiles were developed for all four project sites based on the community mapping and household survey results. These profiles set the context for the community-based adaptation planning.

4. Fieldwork was done to validate the results of the participatory mapping exercises. The activity led to a significant new observation: the watersheds of both Aitutaki and Rarotonga are infested with invasive species—the balloon vine and the mile-a-minute weed. These infestations have yet unknown implications on the resilience of the community water resources.



Community mapping with the use of hand-held GPS units

Step 5. Prepare the Geographic Information System-Based Community Climate Change Vulnerability and Risk Atlases

1. A map series was produced for each community, addressing the issues raised by the participants in the training and mapping exercises.

2. Data from these maps were analyzed and compiled into community vulnerability atlases. Paper map versions of the atlases were initially used and aided the adaptation planning workshops.

3. The map files were shared with the government and incorporated into the government GIS database. This has updated the national GIS database of assets vulnerable to climate and disaster risks, with inputs from the communities.

Step 6. Conduct Community Workshops to Review Climate Change Risks and Develop Adaptation Strategies

Workshops were convened to develop the adaptation framework for the communities. The Arutanga and Ureia communities in Aitutaki decided to come under a single framework because of their significant geographic and social overlaps. Each adaptation framework was formulated following an assessment of the risks recorded in the



Paper map developed during the training in Rarotonga

community climate vulnerability and risk atlas. In accordance with what is most important to the community, adaptation plans were fleshed out and priority adaptation options were specified. Village councils, island councils, interested members of the site communities, and representatives of several government agencies participated in the workshops.

Notably, many traditional practices were confirmed during the workshops as having considerable value in adaptation. For example, the traditional system of resource allocation under the *ra'ui*, a protected area under customary law, can be harnessed to improve the resilience of vulnerable water resources. Traditional housing and building designs, as compared with modern architecture, are more suited to the anticipated increase in extreme heat events. The positioning of the *marae* by customary leaders in pre-missionary times is also instructive. A *marae* is a communal sacred place that serves religious and social purposes. In Matavera, all *marae* are located along the upper boundary of the village, making them less vulnerable to sea-level rise and storm surge. The wisdom that went with the site selection for the *marae* could be revived in contemporary infrastructure and settlement planning.

Outputs

The community risk profiles and adaptation plans that resulted from the project have enhanced the vulnerability assessment and risk reduction efforts in the pilot areas in two distinct ways.

First, they have brought into focus important risks previously not considered in government vulnerability and risk assessments. Examples are (i) probable runoff due to intense rains from landfills situated near the communities, which could adversely affect drinking water supply and the adjoining aquatic and coastal ecosystems; (ii) the location of community disaster response shelters in areas vulnerable to sea-level rise and storm surge inundation; and (iii) the prolific spread of invasive alien vines, which can lead to changes in vegetation and forest cover with resulting impacts on biodiversity and water resources.

Second, they have triggered direct actions at the individual, household, and community levels. While many of the priorities identified by the communities would require support from national government, the donor community, and in some cases, the private sector (e.g., insurance), the inclusion of self-reliant measures in the community adaptation plans will augment limited public resources and capability for adaptation.

The community vulnerability and risk atlases are now with the national GIS office of the Ministry of Infrastructure and Planning, where they are used to inform government planning and policy making. Incorporation of the community priority adaptation actions into government policies and programs is ongoing and gaining momentum. All the priority adaptation actions are scheduled to be implemented in the short term.



Community consultation
utilizing vulnerability maps

Tools for Participatory Adaptation Planning

The project developed and used a number of practical tools to facilitate vulnerability and risk assessment and adaptation planning processes. These tools also supported community capacity building, and may be drawn upon as a continuing source of data and information or a guide for future similar actions.

Adaptive Capacity Assessment Checklist

Adaptive capacity is a key variable that could increase or decrease vulnerability. Defined by the Intergovernmental Panel on Climate Change (IPCC) as “the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences,” it is basically dependent on the availability of human, technical, and financial resources. Adaptive capacity varies from community to community and is influenced by a host of factors, including knowledge, social networks, and the presence of predetermined or prepositioned response measures. While not a precise science, a community’s level of adaptive capacity may be gauged by looking at the availability of the various relevant resources at the time the assessment is made.

For this project, an adaptive capacity assessment checklist was used to assist communities in determining their adaptive capacity levels. Adaptive capacity assessments were backed by the results of a household vulnerability survey that quantified access to resources, revealed the condition of homes and buildings, and provided indications of the existing level of awareness of climate change risks and response measures, among other data. Prior review by the project implementers of all relevant political, social, economic, and environmental action plans that could impact the risk management process also supported the adaptive capacity assessments.

Adaptive Capacity Assessment Checklist

Process: Determine the resources and thereafter the availability of these resources to the communities to evaluate their adaptive capacity to climate change.

Data sources: Participants’ knowledge/awareness, household vulnerability survey, government action plans, and expert judgment.

Does the community have...	Yes/No	Remarks
Knowledge (including indigenous knowledge) and awareness of climate change risks?		
Awareness of appropriate mechanisms (including indigenous coping mechanisms) to address climate change risks?		
Ability to implement appropriate climate change risk management mechanisms as measured by access to resources (human, technical, financial, social capital, government or social support, natural resources, etc.) and ability to deploy such resources ?		

Household Vulnerability Survey

A survey was conducted to get a picture of the vulnerability of individual households. The survey encompassed a range of issues, including the structural soundness and condition of homes and buildings; access to food, water, cooking fuel, and energy supplies; waste disposal practices; farming and livestock activities; disaster experiences and response mechanisms; and susceptibility to climate-related illnesses. It also gathered perceptions about changes in climate, vegetation, and shoreline. The survey results were incorporated into the vulnerability and risk assessments.

Household Vulnerability Survey Form (Sample from Aitutaki)

Questionnaire administrator: _____

Questionnaire completed by: _____

Date: _____

House number/address: _____

Questions about household

Name of informant/s: _____

Number of occupants: _____

Household data (start with eldest):

Name	Gender (Male/Female)	Age: 60+, 16–60, 5–15, up to 5	Occupation

How many years have you lived in Aitutaki? _____ years or whole life ☐

Questions about building/house

Do you own or rent the house? _____

Age of building/structure (in years) _____

Current condition of building and roof: (tick box)

	Excellent	Good	Fair	Bad
Roof condition				
Building condition				

Prone to flooding? Yes ☐ No ☐

Is the house raised above ground? Yes ☐ No ☐

Approximately how many meters above the ground is it raised? _____ (meters)

What method has been used to raise the house above the ground? (tick box)

Piles ☐ Raised foundation ☐ Other methods ☐

Describe other methods used: _____

What is the house made of?

	Concrete (%)	Concrete Block (%)	Wood (%)	Plywood (%)	Metal/Tin (%)	Thatch (%)	Coral/ Lime (%)	Others (%)
Roof type								
Outside walls								
Main dwelling (inside walls, ceiling, etc.)								
Floor/foundation type								

Who built the house (building): (tick box)

Professional builders ☐ Amateur builders ☐ Informal builders ☐ Others ☐ Specify _____

Number of rooms: _____

Size of main building (dwelling): _____ (in square meters)

Estimated value of the main building: \$ _____

Is your house (building) insured? Yes ☐ No ☐ By how much? \$ _____

Size of other buildings on land: 1) _____ (in square meters) 2) _____ (in square meters)

Use of other buildings on land: 1) _____ 2) _____

Value of other buildings on land: 1) \$ _____ 2) \$ _____

Questions about food

What are your main foods? (list) _____

What percentage are imported foods? _____ or purchased locally? _____ or grown by yourself? _____

List foods grown by yourself _____

Have you ever had a food shortage or shortage of certain types of food? Yes ☐ No ☐

Fill in the table below the required data for the three (3) most recent food shortages

	Shortage 1	Shortage 2	Shortage 3
Date (month and year)			
Caused by (e.g., no ship, cyclone destroyed crops)			
Length of shortage			
Type of food that was in short supply			
Action taken to deal with shortage			

Do you preserve any foods? Yes ☐ No ☐

If yes, what foods? (list) _____

How do you preserve them? (e.g., traditional, modern, drying, salting, recovery and preserving before and after cyclone damage to crops)

Do you store food or maintain food stocks in your home? Yes ☐ No ☐

If yes, how do you store food?

Food Storage	Estimated Number of Days Supply Would Last	Number of Appliances
Refrigerator		
Freezer		
Dried/canned		Not applicable
Others		Not applicable

What fuel do you use for cooking?

Main Cooking Fuel	%
Firewood	
Gas	
Electric	
Others	

Questions about water supply

Do you have piped water? Yes ☐ No ☐

Do you have water tank/s? Yes ☐ No ☐

If yes, what material is it made from? Plastic ☐ Metal ☐ Others ☐ Specify _____

What is the size of the water storage tank? _____ liters

Is it in good working condition? Yes ☐ No ☐

Does your roof catch rain? Yes ☐ No ☐

If yes, how extensive is the guttering to catch rain?

All around the house ☐ Half of the house ☐

A single spout (guttering-piece) ☐ Pump from tank to house ☐

Main source of drinking water :

Public system only ☐ Community system only ☐

Public and community system ☐ Bottled ☐

Catchment, tanks, drums ☐ Well/borehole ☐ Springs ☐

Questions About Energy

Energy Source	%
Mains connected	
Own generator	
Other power sources (indicate type)	
None	Not applicable

Do you have water heating? (tick box)

Solar ☐ Gas ☐ Electric ☐ None ☐Does your house have natural ventilation and/or shade on the north side? Yes ☐ No ☐Do you have air-conditioning or fans for cooling the house? Yes ☐ No ☐**Questions about waste**

What type of toilet do you have?

Type	How Many	Location (Inside or Outside)
Pour flush		
Flush		
Long drop		
Composting		

What happens to wastewater?

Wastewater disposal ☐ Septic tank ☐Wastewater treatment ☐ Type: _____ None ☐Do you have separate soak pit for gray water? Yes ☐ No ☐

How do you get rid of your rubbish?

Waste Disposal	%
Hole	
Collected	
Open burning	
Others	

Questions about farming and livestock

Farming/Agriculture Type	%
Subsistence/domestic	
Commercial	
Others	
Crops: (List)	
None	

Livestock Activity	Estimated Number
Poultry	
Piggery	
Goat	
Others	

Value of farm (if applicable): \$ _____

Where is your growing activity? Close to household ☐ Away from household ☐Where is your livestock activity? Close to household ☐ Away from household ☐**Questions about storm surges and rain floods**

Fill in the table below with the required data for the three (3) most recent floods:

	Flood 1	Flood 2	Flood 3
Date (month and year)			
Caused by (e.g., cyclone rain, cyclone waves)			
Floodwater depth in house (meter)			
Depth on compound (meter)			
Duration of floods in main house (minutes or hours)			
Damage to building/house structure or electrical system (\$)			
Damage to building/house contents (e.g., food, clothes) (\$)			
Damage to crops (\$)			
Damage to livestock (\$)			
Damage to other possessions (e.g., cars) (\$)			

What actions have been taken by the household to prevent flooding? _____

Have you ever considered moving your house to a place less vulnerable to flooding, or building up on pillars? Yes ☐ No ☐

Have you actually done so? Yes ☐ No ☐

If no, why have you not moved or built on pillars? _____

If yes, where is this place you have moved to? _____

Questions about climate and vegetation

Do you think the climate has changed over time? Yes ☐ No ☐

If yes, what changes have you noticed? _____

What do you think caused these changes? _____

Has the vegetation changed over time? Yes ☐ No ☐

If yes, has it increased or decreased than 10 or 20 years back? Increased ☐ Decreased ☐

Have there been bushfires in your area? Yes ☐ No ☐

If yes, what was the main cause of these fires? _____

Questions about shoreline changes

How has the shoreline, lagoon, or coral reef changed over the years? _____

What caused these changes? _____

Have you noticed any changes to your livelihood as a result of changes in the shoreline, lagoon, or coral reef? Yes ☐ No ☐

What are these changes? _____

Questions about health and climate change

Do you have any areas of standing water around your house (e.g., plastic or metal containers that collect water, broken or blocked drainpipes, and unused boats)? Yes ☐ No ☐

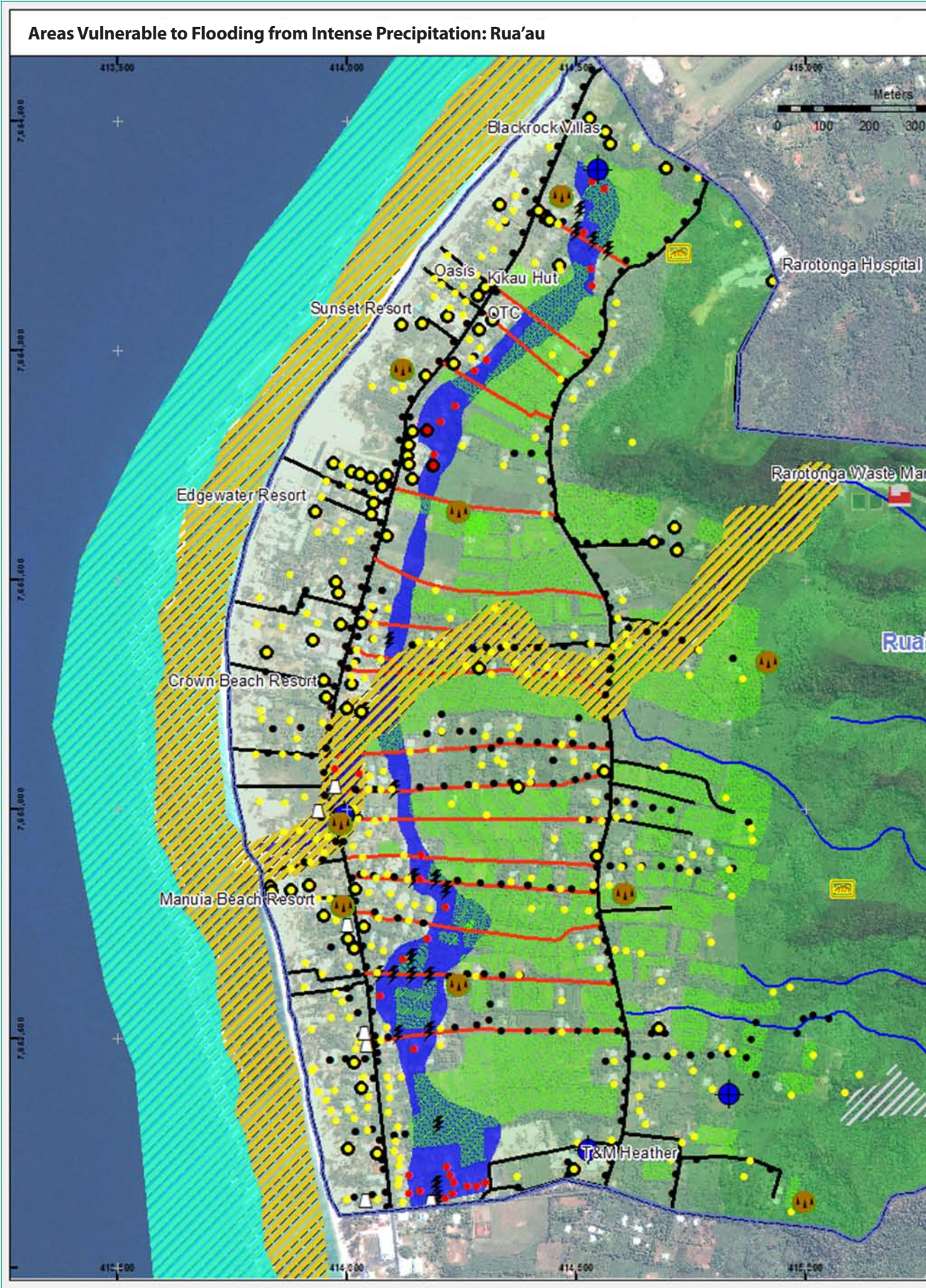
Does anyone in your house have asthma or other respiratory ailments? Yes ☐ No ☐

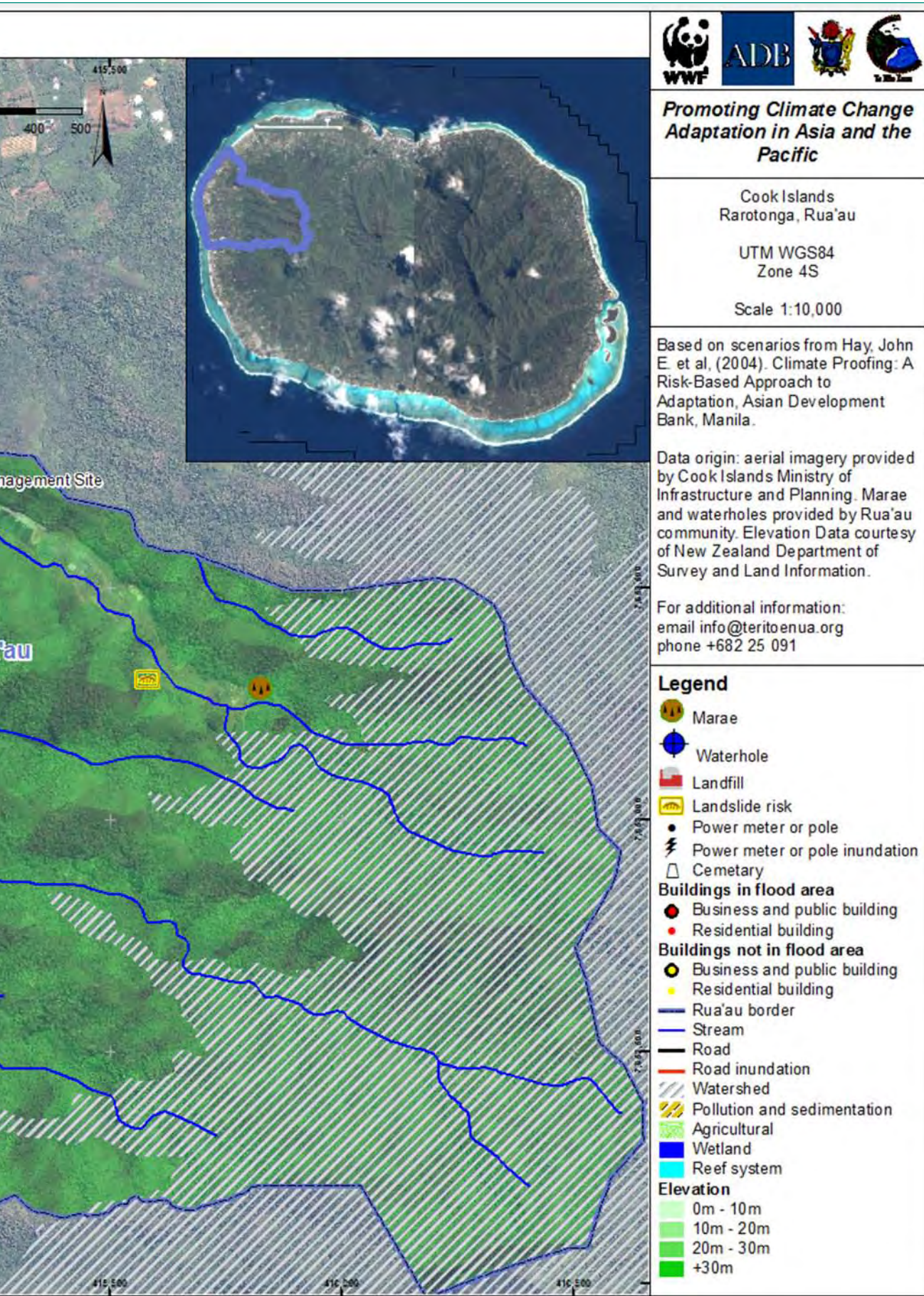
Has anyone in your house ever suffered from dengue fever or malaria? Yes ☐ No ☐

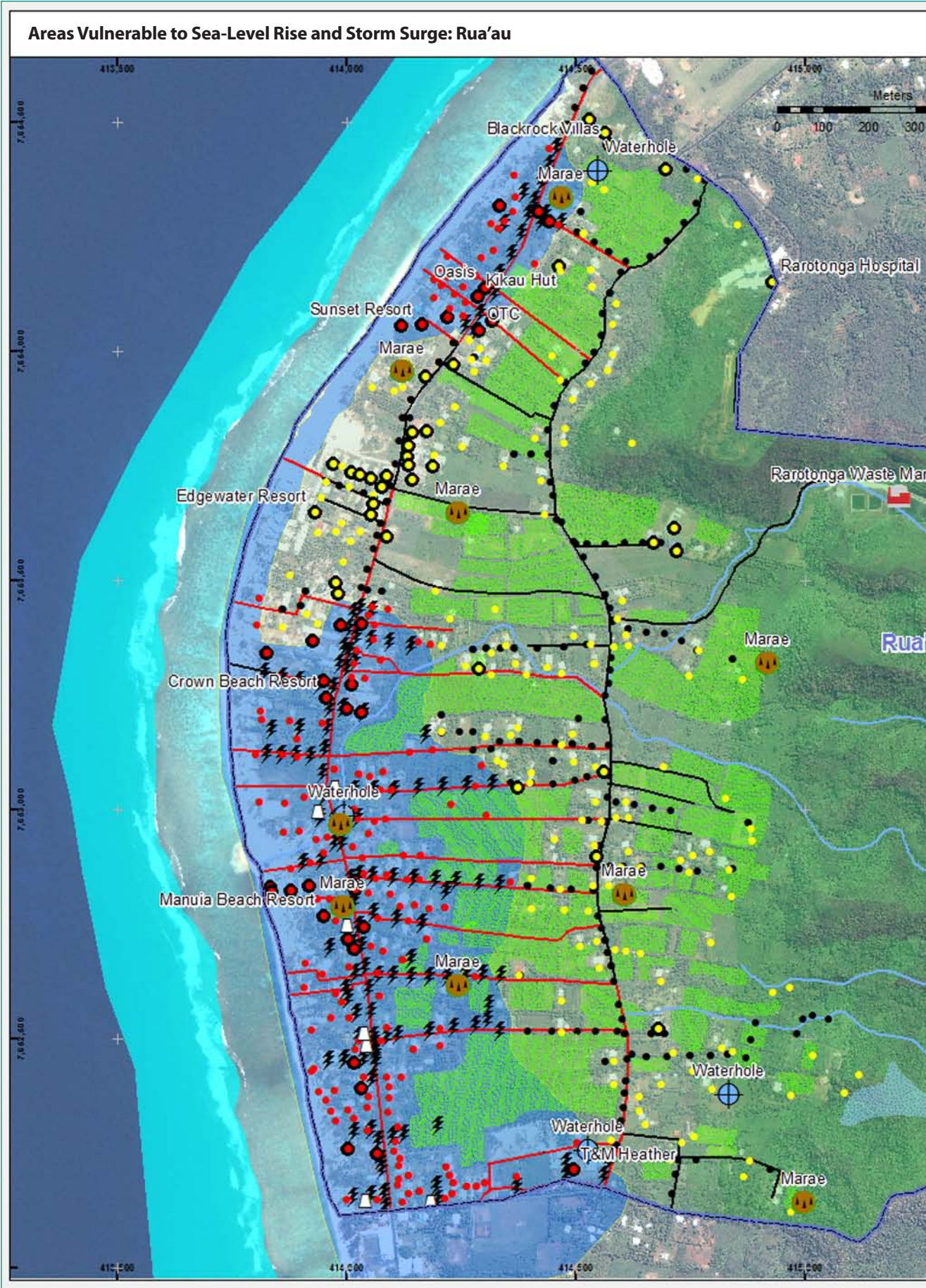
Do you have anyone in your house who is infirm or needs assistance to undertake daily chores? Yes ☐ No ☐

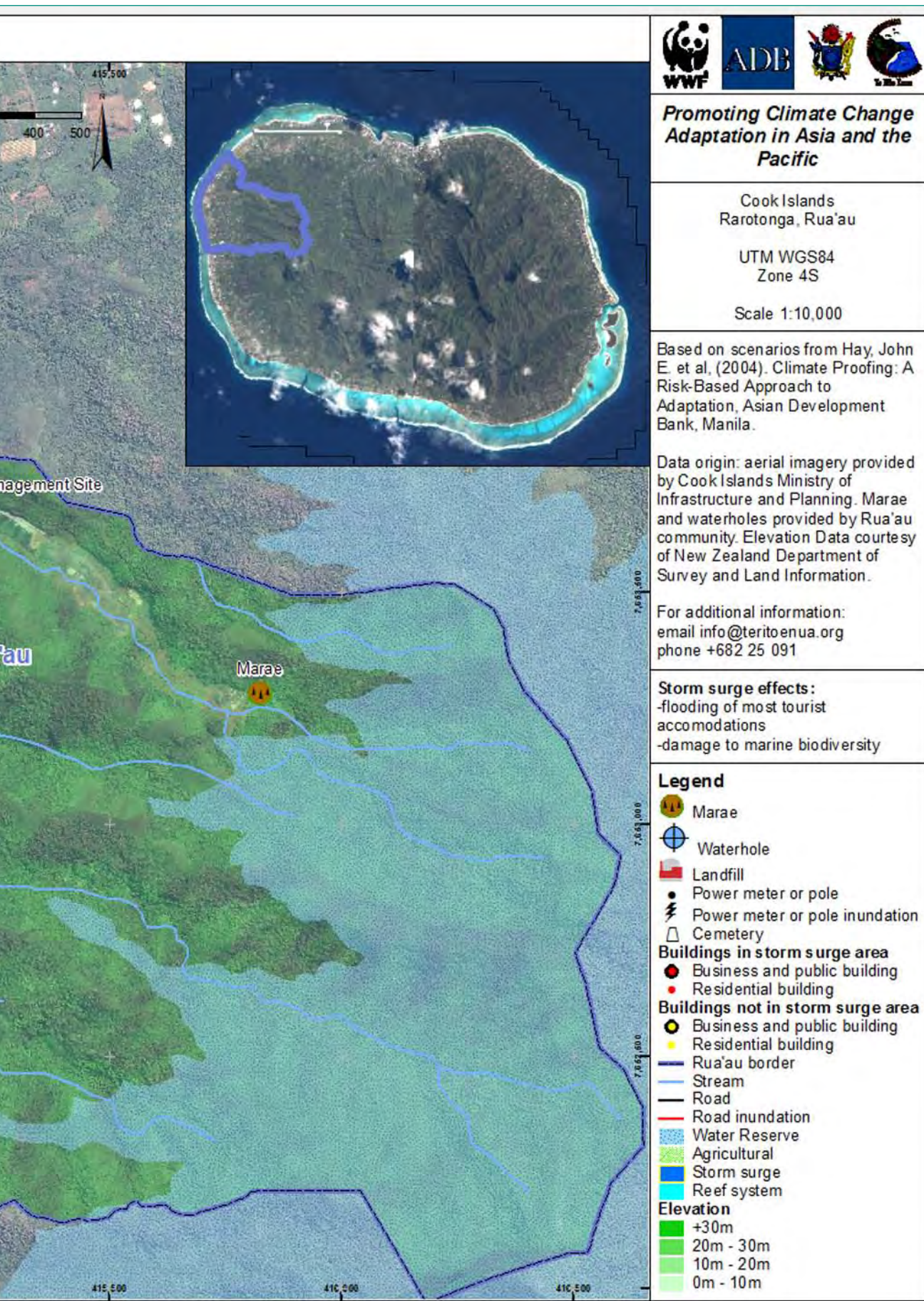
Community Climate Vulnerability and Risk Atlases

Five distinct maps showing the vulnerability of the communities to flooding, drought, intense heat events, cyclone-force winds, and sea-level rise and storm surge comprise the community climate vulnerability and risk atlases (*samples from Rua'au are on pages 14–17*). The maps enabled the communities to see their position in the official geography and how the sites that are important to them may be impacted by climate change. Printed copies of these maps simplified the identification of priority risks during adaptation planning. Poster versions of the maps were displayed in public places, increasing the population's awareness of climate change and engendering support for the implementation of the community adaptation plans. The maps were later turned over to the national GIS office of the Ministry of Infrastructure and Planning to be made available to local authorities and other users.









Priority Risk Identification Tool

Taking off from the Intergovernmental Panel on Climate Change (IPCC) definition of vulnerability,² project implementers used a concept of risk that equates risk with exposure plus sensitivity, plus or minus adaptive capacity.³

Climate Change Risk

Vulnerability (Exposure + Sensitivity) +/- Adaptive Capacity = Risk
(Adapted from the IPCC Fourth Assessment Report, Working Group II, 2007)

Work was undertaken to ensure that the relevant elements in each aspect of the risk equation were identified and considered in the preparation of the community vulnerability and risk atlases, as well as in adaptation planning. In the process, communities came up with two categories of risks associated with climate change: event risks and outcome risks. The risks were streamlined, using a priority risk identification tool that enabled the communities to determine the focus of their adaptation efforts.

Use of the tool involved community assessment of the levels of risk and severity of impacts posed by each event and outcome. Taking into account the uncertainty underlying the process of climate change, communities rated the risk levels from minimal to high, and severity of impacts in a decreasing scale of 1 to 5. Frequency of occurrence of each risk was also deliberated by the communities. Triggering lively debates and discussions, the priority risk identification process captured local observations and perceptions of the key climate change risks now unfolding at the local level.

² According to the IPCC, vulnerability is “the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.” Exposure is “the nature and degree to which a system is exposed to significant climatic variations.” Sensitivity is “the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli...” (IPCC. Contributions of Working Group II to the third [2001] and fourth [2007] assessment reports. Cambridge.)

³ While it varies from the concept of risk commonly used by risk reduction and hazard management specialists, the risk equation introduced by the project implementers facilitated community risk assessment and priority risk identification. The United Nations International Strategy for Disaster Reduction definition of risk, shown in the equation Risk = Hazard × Exposure × Vulnerability, continues to be a frequently applied concept in the disaster risk reduction community. Another concept that may be considered is Risk = Probability of Occurrence × Impact. The IPCC recognizes this concept in the 2007 Fourth Assessment Report, Working Group II.

Priority Risk Identification (Sample from Matavera)				
Event Risk	Outcome Risk	Risk Level	Severity	Frequency
1. Sea-level rise and storm surge	1.1 Damage to cyclone shelter	1	1	F10
	1.2 Damage to homes and properties	1	1	F10
	1.3 Loss of income—out-migration	2	1	F10
	1.4 Displaced families	1	2	F10
	1.5 Pollution of lagoon and marine life	1	1	F2
2. Increased incidence of flooding	2.1 Damage to homes and properties	3	3	F10
	2.2 Damage to crops and agricultural land—staple food shortage	3	2	F2
	2.3 Loss of income—out-migration	3	3	F2
	2.4 Pollution of waterways and lagoon	1	1	F2
	2.5 Displaced families	3	4	F10
3. Increased incidence of drought	3.1 Water shortage	1	1	F2
	3.2 Low yield of agricultural crops	2	3	F2
	3.3 Loss of income—out-migration	4	3	F2
	3.4 Increased spread of invasive plants	1	1	F2
	3.5 Biodiversity loss	1	1	F2
4. Increase in cyclone intensity	4.1 Damage to homes and properties	1	2	F2
	4.2 Damage to infrastructure	1	2	F2
	4.3 Damage to staple food crops	1	2	F2
	4.4 Damage to commercial properties	1	2	F2
	4.5 Loss of income—out-migration	3	3	F2
	4.6 Displaced families	1	3	F2
	4.7 Pollution of waterways and marine life	1	1	F2
	4.8 Water and food shortage	2	2	F10

Notes: Red-filled cells correspond to the priority risks agreed upon by the communities.

Risk Levels: 1 = high, 2 = medium/high, 3 = medium, 4 = low, 5 = minimal

Severity Levels: 1–5 scale (1 is highest) based on economic, social, cultural, and environmental impacts

Frequency: F1 = likely to occur annually, F2 = likely to occur several times per decade, F10 = likely to occur at least once per decade

Sample of Resulting Risk Assessment and Priority Adaptation Actions

The project successfully engaged the vulnerable communities of Arutanga, Matavera, Rua'au, and Ureia in evaluating the risks posed by climate change from their own perspectives and in developing the necessary adaptation plans. Priority risks and adaptation actions were specified, giving a sharp focus to community adaptation efforts within the short term.

Sample of Risk Profile and Priority Adaptation Actions: Arutanga–Ureia in Aitutaki	
Assets and Sectors at Risks	Priority Actions
<ul style="list-style-type: none"> Sea-level rise and storm surge will affect 111 residential, government, and commercial buildings and premises. Flooding will cause pollution of streams, affecting 23 buildings that are either built on or at the periphery of flood-prone areas. Some 49 homes are in low-lying areas of 5–20 meters (m) elevation. The lagoon systems will be affected by storm runoffs, septic overflow, and debris. Intense heat events and prolonged drought will affect water quality and availability, agriculture, livestock, and human health. There will be terrestrial biodiversity loss as invasive plant species resistant to heat and drought will spread. The economy will suffer from an anticipated decline in the number of tourists. Households with inadequate rainwater harvesting and storage facilities are at risk to water shortage. Cyclone winds will affect all buildings and utilities, the health sector, food and water security, social welfare, and tourism. Some 54 buildings are highly exposed (40+ m elevation area), and 32 are moderately exposed (30–40 m elevation range). 	<ul style="list-style-type: none"> Discourage building in vulnerable areas. Establish a community partnering program to provide safe shelter for those with vulnerable homes. Amend building code and upgrade construction standards. Establish community microfinance or insurance to assist homeowners affected by cyclones and/or inundation and to develop a reinsurance scheme for vulnerable businesses. Raise public awareness of the need to build resilient homes. Establish natural defenses along the coast, including through ecological restoration. Install support systems/braces for vulnerable landmark trees. Secure financing to convert household septic systems to a community waste treatment system. Establish community cleanup work details (<i>tutaka</i>) to attend to areas with stagnant water.

A follow-up visit to Aitutaki in August 2011 found that over half of these priority actions are being acted upon by the local government, with support from the national government and nongovernment organizations, such as the Red Cross.

Learning from Experience: Lessons to Guide Replication

The experience demonstrates a number of distinct benefits that only a participatory approach to climate risk management can provide. It also points to areas of weakness that will have to be addressed in efforts to replicate and optimize the benefits that may be derived from participatory adaptation planning.

Key Benefits of a Participatory Approach to Climate Risk Management

A community-based, participatory planning approach fine-tunes adaptation strategies and actions to the needs and priorities of the local populations. When undertaken by the most vulnerable communities, it directs adaptation efforts toward those most in need, thus serving as a potent measure for reducing the adverse impacts of climate change. It also builds ownership and increases a community's stake in adaptation. By doing so, it has the potential of significantly expanding the scope, and enhancing the pursuit and outcomes, of early adaptation work.

The traditional knowledge brought in by direct community participation in adaptation planning highlights another key benefit from the approach. Face-to-face with the realities on the ground, local communities will continue to be a direct and rich source of information about changes and fluctuations in the biophysical environments. This will help fill in the continuing knowledge gaps on climate change impacts. With the level of uncertainty in climate change projections likely to remain significant for several years, communities will play an important role in monitoring the unfolding changes and attendant risks. By actively involving communities in adaptation activities, an incentive is created for them to be involved in monitoring.

Potential for Replication

Many of the barriers identified during the project development and early implementation phases were quickly overcome. These include a regional shortage of geographic information system (GIS) experts, the high costs of GIS software, and the technical and financial constraints in accessing georeferenced data and GIS products where they do exist. Networking and coordination with government agencies and other professional groups were key to overcoming these barriers. Training and capacity building also significantly contributed to the process, especially for the communities that had a key responsibility in seeing the project through.

The activities, process flow, and tools imparted through this publication clearly reveal that the project is replicable. But a few insights and lessons from the experience have to be highlighted to guide replication.

First, a community-based approach will not suffice to effectively advance adaptation. In fact, it could potentially result in an unnecessary geographic division of responsibilities that could deter effective adaptation. For example, to promote ecosystem-wide or landscape-wide sustainability, interventions will have to be unified across community boundaries. Community adaptation efforts cannot exist in isolation of the biophysical requirements to sustain them, and these often go beyond the level of single communities. A clear case is that of strengthening the resilience of critical water resources, which would require effective watershed and



Community cooperation and direct actions are necessary to address the adverse effects of climate change

water management practices all through the communities sharing the resources. The potential disconnect between community-based adaptation and resource management at the ecosystem or landscape level has to be addressed to ensure mutually reinforcing adaptation efforts of various scales.

Second, enabling the communities to participate in adaptation begins with making them aware of environmental and climate change issues. In some communities in the Cook Islands, as in several Pacific island countries, such an awareness can be limited. Outreach, and information and education campaigns adapted to the local contexts, should be made integral to the replication of the model.

Third, suitable adjustments will have to be rigorously studied and pursued to make the model work across varying community conditions and characteristics. Communities are not homogeneous. Within the project communities themselves, there are noticeable differences in community values and practices, administrative structures, and perceptions about climate change risks and priorities. Environmental conditions also differ, and so does the value placed by communities on environmental goods and services.

Fourth, community vulnerability assessments need to be prepared in such a way that their results can be integrated into national or provincial government databases and planning systems. The temporal and technical requirements of government decision-making processes have to be particularly considered to ensure the incorporation of the



assessment results into these processes. For example, because this project successfully uploaded community-identified assets into the government's database of infrastructure assets, it has paved the way for the inclusion of community-valued assets in government adaptation planning. Follow-on actions put forward by the project participants currently include climate-proofing of historical and cultural landmarks and other infrastructure that are highly valuable to the communities.

Fifth, it is important to manage expectations. Sometimes, communities and their leaders inherently expect incoming government, nongovernment organizations, and donor teams to come with financial and technical support for carrying out some or all actions they have identified. It should be made clear at the outset of community engagement whether or not this will be the case. Though substantial financial or technical follow-up support may not be part of the proposed engagement, it is recommended that incoming teams should have, at the minimum, enough follow-up facilitation and monitoring assistance to ensure that communities remain focused on addressing their priority actions. The length of this facilitation and monitoring assistance varies, but often lasts from 6 months to 2 years.

Sixth, it is important to update government and development partners on the progress made by communities in identifying vulnerabilities and prioritizing resilience-building actions. There are many ways to do this, including (i) providing national planning, finance, and/or infrastructure agencies responsible for disaster risk management with updated GIS information on community assets so that these assets can be taken into account in government planning and decision-making processes; (ii) helping national government integrate the results and lessons learned from community assessments into national climate change adaptation and disaster risk management policies and programs; and (iii) sharing action plans with governments, donors, and nongovernment organizations to help identify partners who may be able to provide communities with technical and/or financial assistance for implementing specific action items.



Matavera water source
and invasive vines

Community-Based Climate Vulnerability Assessment and Adaptation Planning: A Cook Islands Pilot Project

In 2010, the Asian Development Bank, the Government of the Cook Islands, and the World Wide Fund for Nature partnered to undertake a pilot adaptation project that could be replicated across the country's inhabited islands. The basic idea was to field-test a participatory approach that incorporates local knowledge and engages vulnerable communities in the formulation of adaptation plans that will be operable and most relevant to their circumstances. This publication captures and shares the process, tools, and lessons from the project. It hopes to provide insights into how climate change adaptation may be strengthened and accelerated through community-based risk assessment and participatory planning.

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ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two-thirds of the world's poor: 1.8 billion people who live on less than \$2 a day, with 903 million struggling on less than \$1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

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