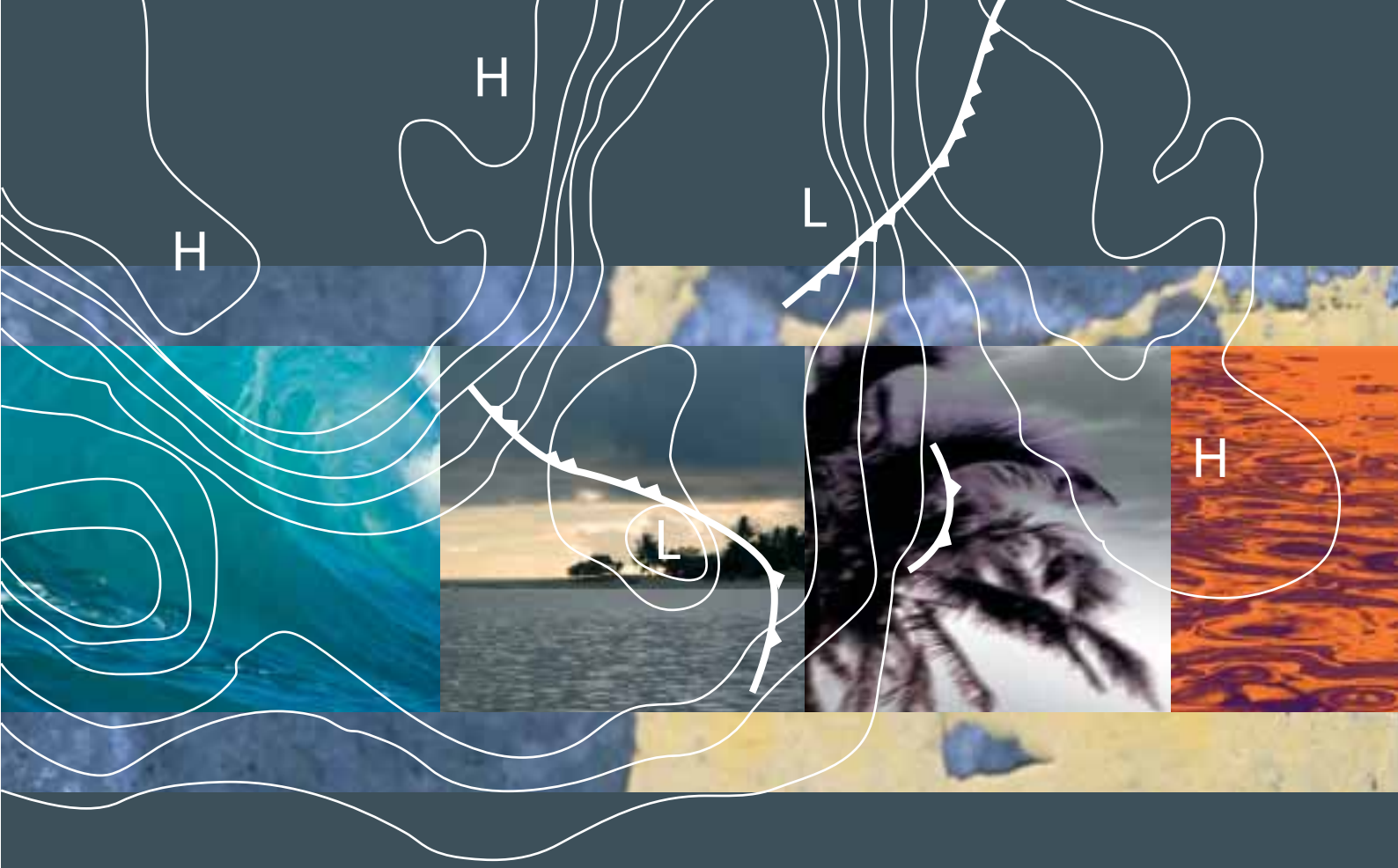


Not if but *when*

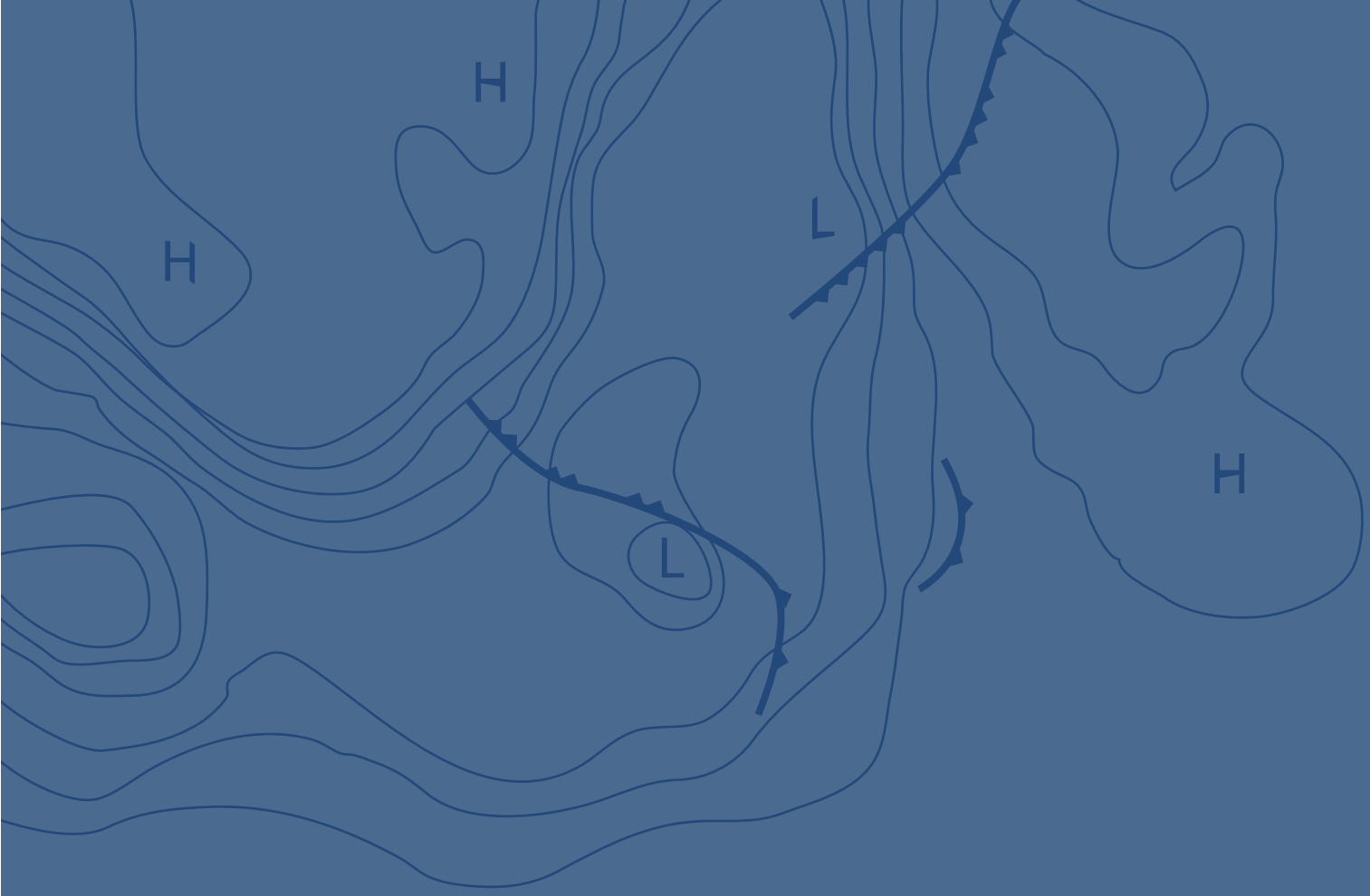
Adapting to natural hazards in the Pacific Islands Region

A policy note

2006

Sofia Bettencourt | Richard Croad | Paul Freeman | John Hay | Roger Jones
Peter King | Padma Lal | Alan Mearns | Geoff Miller | Idah Pswarayi-Riddihough
Alf Simpson | Nakibae Teuatabo | Ulric Trotz | Maarten Van Aalst

The World Bank
East Asia and Pacific Region
Pacific Islands Country Management Unit



This Policy Note is dedicated to the memory of Savenaca Siwatibau for his efforts and vision in mainstreaming hazard risk management into economic planning in the Pacific.

Contents

Acronyms

ADB	Asian Development Bank
AusAID	Australian Agency for International Development
CDMA	Commonwealth Disaster Management Agency
CHARM	Comprehensive Hazard and Risk Management
CLIMAP	Climate Change Adaptation Program for the Pacific
CP	Consumer Price Index
CRED	Center for Research on the Epidemiology of Disasters
CROP	Council for Regional Organizations in the Pacific
EC	European Community
EM-DAT	International Disasters Database of the Office of the United States Foreign Disaster Assistance/Center for Research on Epidemiology of Disasters
ENSO	El Niño Southern Oscillation
FSM	Federated States of Micronesia
GDP	Gross Domestic Product
GEF	Global Environmental Facility
IFRC	International Federation of Red Cross and Red Crescent Societies
IOC	Intergovernmental Oceanographic Commission
MCTTD	Ministry of Communications, Transport and Tourism Development (Kiribati)
MELAD	Ministry of Environment, Lands, and Agriculture Development (Kiribati)
MEYS	Ministry of Education, Youth and Sports (Kiribati)
MISA	Ministry of Internal and Social Affairs (Kiribati)
MPWU	Ministry of Public Works and Utilities (Kiribati)
NGO	Non Governmental Organization
NZAid	New Zealand Aid (Programme)
OAS	Organization of American States
OECD	Organization for Economic Cooperation and Development
OFDA	Office of Foreign Disaster Assistance
PICCAP	Pacific Islands Climate Change Assistance Programme
PICT	Pacific Island Countries and Territories
PNG	Papua New Guinea
RMNH	Risk Management of Natural Hazards
SOPAC	South Pacific Applied Geoscience Commission
SPREP	Secretariat for the Pacific Regional Environment Programme
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO/IOC	United Nations Educational, Scientific and Cultural Organization/ Intergovernmental Oceanographic Commission
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development

Prologue

Pacific Island communities are particularly vulnerable to natural disasters — ranging from tropical cyclones, drought, floods, storm surges and tsunamis. Each year, these events result in significant loss of life, the destruction of homes, public infrastructure and livelihoods and the reversal of hard-won economic gains. Recently, deadly tsunami and earthquake events in the Indian Ocean region have focused the attention of the world community, particularly those living in small islands and coastal regions, to the need for greater vigilance in disaster prevention and preparedness. This is all the more important as evidence mounts that climate change will exacerbate the incidence of extreme events and potential disasters.

For island leaders and their development partners, the lessons are clear. Communities across the region need to counter the negative impacts of extreme climate events and other natural disasters by improving their preparedness and response.

Regional context

In 1995, during the International Decade on Natural Disaster Reduction, Pacific Islands Forum Leaders issued the Madang Vision Statement, which declared that: *'vulnerability to the effects of natural hazards, environmental damage and other threats will be overcome'*. Subsequent efforts focused largely on disaster preparedness, response and relief but these tended to be under-resourced and operated outside mainstream government processes.

In preparation for the Second World Conference on Disaster Reduction (Kobe, Japan, January 2005), Pacific Island representatives adopted a regional position paper which emphasized the need for mainstreaming risk management into national development planning and for strengthening the capacity of Pacific Island states to prepare for, respond to, and recover from disasters. The paper recognized disasters as including not only those resulting from natural hazards, but also social, environmental, and technological hazards. From this paper as well as from the 2005–2015 Hyogo Framework for Action, Pacific Island representatives derived a regional plan of action entitled: *An Investment for Sustainable Development in Pacific Island Countries: Disaster Risk Framework for Action 2005–2015*. The Framework was discussed at a regional meeting in Madang in June 2005 and the revised version, Disaster Risk Reduction and Disaster Management: A Framework for Action 2005–2015, was presented at the Pacific Islands Forum leaders meeting for regional endorsement.

Over the past three years, the region has also seen a renewed interest in climate change adaptation, starting with the Pacific Islands Climate Change Assistance Programme and the Pacific Islands Framework for Action on Climate Change, Climate Variability and Sea Level Rise (2000). This interest was also spurred by two High Level Adaptation Consultations (2003–2004), the momentum built by sustainable development initiatives, and by recent pilot operations in Kiribati, Federated States of Micronesia, Cook Islands, Fiji, Vanuatu, Samoa, and Tonga. The revised Framework for Action on Climate Change, Climate Variability and Sea Level Rise was similarly presented at the 2005 Pacific Islands Forum Leaders meeting.

Adaptation to climate change, and risk management of natural hazards are core development issues for Pacific Island countries. As the required policy and technical responses are not particularly complex, the economic, social and environmental benefits of managing these risks far outweigh their costs. What seems to have been lacking is the political will to mainstream risk management into national development planning and to ensure that policy and program responses to the challenges are sustained, relevant and effective.

In order to address these concerns, this Policy Note advocates practical measures that countries can take to influence their national development policies and strengthen their programs. Importantly, it addresses factors which may constrain or limit collaborative action between communities, island leaders, experts and development partners. It suggests new institutional approaches, incentives, and instruments to promote risk management of natural hazards, including climate proofing capital investments.

Objective and target audience

The goal of this Policy Note is to influence policy makers and development partners in the Pacific Islands region to undertake risk management of natural hazards and minimize the future impacts of natural disasters, climate change and sea level rise. As a short-term objective, the Policy Note aims to review the disaster trends and lessons learned from pilot risk management of natural hazards initiatives, and recommend a strategic way forward. Particular attention is paid to the three 'I's' of risk management of natural hazards: Incentives, Institutions and Instruments.

The Policy Note targets high-level decision makers in the Pacific Islands region, regional organizations and major development partners.

Scope

This Policy Note focuses only on natural hazards. Technological and other hazards are not as relevant in the Pacific at present. While the focus of the analysis is on the Pacific Islands region, comparative experiences from other small island states (particularly the Caribbean) are also provided to illustrate alternative approaches.

The recommendations in this Policy Note are relevant to all Pacific Island Countries and Territories (PICTs). However, Papua New Guinea has been excluded from the analysis of disaster trends (Section 1). Its large size, type and impact of disasters would bias the overall picture experienced in the smaller PICTs.

Definitions

Given the similarity of approaches, the global agendas for disaster risk management and adaptation to climate change are increasingly merging. The Policy Note recognizes this by adopting the term 'risk management of natural hazards' (RMNH) to refer to the management of all natural hazard risks — including climate and other natural hazards such as earthquakes and tsunamis — to minimize the likelihood of them becoming natural disasters (see Glossary).

The term 'adaptation', when used separately from RMNH, refers to the various processes, policies and actions designed to limit the potential impacts of climate change, climate variability, extreme events and sea level rise.

Method

A group of regional and international specialists, with experience relevant to the challenges facing PICTs, collaborated on the Policy Note under the coordination of the World Bank. Over several months, the collaborators contributed individual written papers covering:

- Analysis of the incentives, institutions and instruments affecting RMNH in the Pacific;
- International experience with RMNH (particularly in the Caribbean);
- Regional experience, particularly that of regional organizations;
- Lessons learned from pilot operations in Kiribati, Samoa, Tonga, the Cook Islands and the Federated States of Micronesia;
- Specialized inputs on disaster insurance and disaster trend analysis.

The analysis of disasters was based on the EM-DAT, the OFDA/CRED International Disaster Database, from which most world disaster statistics are derived for the period 1950–2005. For 1994–2005, these data were adjusted by the South Pacific Applied Geoscience Commission statistics which are more complete. The trends between the two periods (1950–2005 and 1994–2005) are similar and the longer period (1950–2005) was selected to illustrate regional trends.

The inputs to the Policy Note were compiled and the resulting drafts discussed with the collaborators and their organizations, and reviewed by peers.

The Policy Note suggestions reflect the experience of the individual contributors and not the official views of their respective organizations. The Policy Note is intended to offer an independent, objective and honest view of the issues concerned and a possible way ahead. The authors believe that the ideas and issues raised will lead to a better informed discussion on risk management of natural hazards, as well as appropriate changes in current development practice and decision making in the Pacific Islands region. A number of country profiles are being prepared to demonstrate how the policy note can be made relevant to specific conditions in some of the Pacific Island countries.

Contributors

(listed alphabetically)

Ms. Sofia Bettencourt was a Senior Natural Resource Economist at the World Bank Office in Australia from 2000–2005. Since 1999, she has been involved in adaptation issues in the Pacific, where she helped coordinate the first and Second High Level Adaptation Consultations in the Pacific. She was task team leader for the World Bank-supported Kiribati Adaptation Program. She is currently Lead Operations Officer for Rural Development, Social and Environment at the World Bank office in Madagascar. She can be contacted at **Sbettencourt@worldbank.org**

Dr. Richard Croad is an Environmental Divisional Manager, with Opus International Consultants (Wellington, New Zealand). Dr. Croad has a background in hydraulic engineering and science, specializing in structures, rivers and coastal issues. Over the past eight years, Dr. Croad has been an advisor on natural hazard risk management projects in New Zealand and the Pacific, where he was a consultant for the World Bank on the Samoa Infrastructure Asset Risk Management Program and the Samoa and Tonga Cyclone Emergency Rehabilitation Projects, aimed at strengthening the capacity of governments to better manage the risk of natural hazards. Dr. Croad can be contacted at **Richard.Croad@opus.co.nz**

Dr. Paul K. Freeman was chief executive of ERIC Companies, an environmental risk management firm, from 1985–1998 and a practicing attorney specializing in international law from 1975–1985. Dr. Freeman holds a juris doctorate degree from Harvard Law School and a doctorate in economics from the University of Vienna. Since 1998, Dr. Freeman has been a consultant to international financial institutions on designing strategies for developing countries to cope with natural disasters. Dr. Freeman served as project leader at the International Institute for Applied Systems Analysis in Vienna and is a lecturer at the University of Vienna. He can be contacted at **Pkfree@dimensional.com**

Prof. John Hay is a Professor at the International Global Change Institute, University of Waikato, New Zealand. Prof. Hay is a well-known advocate and practitioner of a risk-based approach to adaptation to climate variability, extreme events and climate change and recently authored a major review of climate change and adaptation approaches in the Pacific published by the Secretariat for the Pacific Regional Environment Programme (SPREP). He also played a leading role in implementing the Climate Change Adaptation Programme for the Pacific Region (CLIMAP). Prof. Hay can be contacted at **j.hay@waikato.ac.nz**

Mr. Roger Jones has had 30 years of experience in disaster management policy, planning, operations and education in the Australian and south-western Pacific regions. He is a member of the South Pacific Applied Geoscience Commission (SOPAC). He can be contacted at **temcons@netcon.net.au**

Dr. Peter King is a Senior Environmental Specialist who was until recently Advisor to the Director General, Regional and Sustainable Development Department, the Asian Development Bank (ADB). From 2001 to 2004, Dr. King was Director of the Pacific Operations Department for ADB. After 14 years with ADB, Dr. King is currently an environmental consultant for the World Bank, United Nations Environment Programme, and Institute for Global Environmental Strategies. Dr. King can be contacted at **pnking1948@yahoo.com.au**

Dr. Padma N. Lal is the Sustainable Development Adviser at the Pacific Islands Forum Secretariat. With an academic background in ecology, environmental management and resource and environmental economics, she has developed, undertaken and/or managed outcome focused integrated multidisciplinary research and development projects and programs in the Pacific, Australia and Asia. Her work has covered many different topics, including fisheries, agriculture, forestry, waste and protected area management. Since joining the Pacific Islands Forum Secretariat she has also taken up work on disaster risk reduction and disaster management, including climate change. She can be contacted at **Padmal@forumsec.org.fj**

Mr. Alan Mearns has been with SOPAC for more than 5 years. Alan came to SOPAC with over 35 years experience in disaster and risk management having worked for the Melbourne Fire and Emergency Service in Australia and as an international disaster management consultant in the Asia Pacific region. He holds a Graduate Diploma in Management from RMIT Melbourne and is a Member of the Institution of Fire Engineers UK. Alan has held a number of senior management positions including Director of Human Resources, Manager Training and Education and Project Leader for organizational change. His disaster management expertise has been acquired through hands on experience in emergency and risk management and in the delivery of a range of capacity building programs ranging from community level vulnerability projects through to the development of national plans and programs. He can be contacted at **Alan@sopac.org**

Mr. Geoff Miller worked for many years with the Australian Agency for International Development (AusAID) in its Pacific and Indonesia programs as well as Emergency Response. Following the December 2004 Indian Ocean earthquake and tsunami, he was engaged by AusAID to work on a program to strengthen disaster management in Indonesia. He can be contacted at **geoffrey_miller1964@hotmail.com**

Dr. Idah Pswarayi-Riddihough is a Lead Natural Resource Management Specialist at the World Bank and is based in the Manila office. She works on disaster risk management issues particularly in the Philippines, and has carried out analytical work on the Philippines and Cambodia, as well as a regional review of disaster risk management in the region. She can be contacted at **Ipswarayiriddiho@worldbank.org**

Mr. Alfred Simpson is a Fiji national with over 30 years experience working in the Pacific. He worked for 23 years with Fiji's Mineral Resources Department and a further 9 years with the South Pacific Applied Geoscience Commission (SOPAC), where he was Director from 1998 to 2004. He continues to serve as a member of the International Seabed Authority's Legal and Technical Commission, a member of the Global Water Partnership's Steering Committee and as a Director of the Circum-Pacific Minerals and Energy Council.. Based out of Brisbane, Alf Simpson now works as a consultant on Pacific natural resources and disaster management and policy issues. He can be contacted at **asapsimpson@optusnet.com.au**

Mr. Nakibae Teuatabo is a retired Kiribati senior official who has been instrumental in advocating concerns about climate change in Kiribati and the wider Pacific. He is employed by the Government of Kiribati to assist with and support adaptation planning and activities in Kiribati, including the Kiribati Adaptation Program and the National Adaptation Programme of Action. Mr. Teuatabo can be contacted at **piccap.ecd@melad.gov.ki**

Dr. Ulric Trotz is Project Manager of the Global Environmental Facility (GEF) funded regional project: Mainstreaming of Adaptation to Climate Change in the Caribbean. He has been involved in climate change adaptation issues in the Caribbean since 1997 in his capacity as project manager for the GEF funded Caribbean Planning for Adaptation to Climate Change (1997–2001) and the Canadian International Development Agency-funded Adaptation to Climate Change in the Caribbean (2001–2003) projects. Dr. Trotz can be contacted at **Utrotz@yahoo.com**

Dr. Maarten van Aalst is a climate risk management specialist based in Utrecht, the Netherlands. He is a specialist in atmospheric science and has worked extensively on adaptation to climate change and natural hazard risk reduction in development planning for the World Bank, the Organization for Economic Cooperation and Development, and the International Federation of Red Cross and Red Crescent Societies. Dr. van Aalst has worked on adaptation in the Pacific Islands region since 2000 and, more recently, on the Kiribati Adaptation Program. He can be contacted at **maarten.vanaalst@xs4all.nl**

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Executive summary

One of the most vulnerable regions in the world

Pacific Island countries rank among the most vulnerable in the world to natural disasters. Since 1950, natural disasters have directly affected more than 3.4 million people and led to more than 1,700 reported deaths in the region (outside of PNG). In the 1990s alone, reported natural disasters cost the Pacific Islands region US$2.8 billion in real 2004 value.

Between 1950 and 2004, extreme natural disasters, such as cyclones, droughts and tsunamis, accounted for 65 percent of the total economic impact from disasters on the region's economies. Ten of the 15 most extreme events reported over the past half a century occurred in the last 15 years.

There has been a substantial increase in the number of reported natural disasters in the region since the 1950s, with a growing human impact per event. While this may be due to improved reporting, higher populations and increasing environmental degradation, there is no doubt that disasters in the region are becoming more intense and probably more frequent. Certainly, the number of hurricane-strength cyclones has increased in the southwest Pacific in the past 50 years, with an average of four events now occurring each year. Significant wave heights of recent cyclones have exceeded even climate change model projections.

With the climate trend for the Pacific pointing to more extreme conditions and increased climate variability in future, Pacific Island countries have little choice but to develop comprehensive risk management plans for the natural hazards they face.

When risk management of natural hazards works

In 1991, cyclone Val hit Samoa with maximum wind speeds of 140 knots causing massive damage – equivalent to 230 per cent of the country's real 2004 GDP. By contrast, the impact of cyclone Heta in 2004 (with wind speeds of up to 170 knots) translated to just 9 per cent of Samoa's GDP. While the two cyclones were not directly comparable, having different tracks and duration, the effects of cyclone Heta would have been far worse if the country had not invested in risk management for natural hazards through the 1990s. Shoreline protection systems designed to cyclone standards performed well and sustained minor damage compared to adjacent areas with sub-standard coastal protection systems.

Some lessons

Lessons from countries elsewhere exposed to similar natural hazard risks indicate that:

- Efforts to prevent or minimize damage from natural hazards pay off in the long run.
- Risk management efforts have proven far more cost effective than waiting for the impact and then repairing the damage.
- Risk management is most cost effective when it is introduced early in the planning of key investments.
- Adopting 'no regrets' measures, such as planting mangroves to stabilize coastal land and climate-proofing key investments, can go a long way towards reducing vulnerability.

The constraints

Despite growing interest from development partners in financing 'adaptation' initiatives in the Pacific and an increasing awareness in the region of the need for preventive action, three major constraints have limited the adoption of natural hazard risk management:

1. Perverse incentives:

- For many Pacific Island governments, it is a rational decision not to reduce risks as long as donors respond generously to disasters, whether or not preventive efforts have been taken.
- The benefits of prevention may not become visible for years, and may unfavourably compete with other short-term domestic priorities.
- Donors face strong public pressure to respond rapidly to disasters and often mobilize funds outside their normal budgets for this, whereas funding for preventive action is often constrained.

2. Poor institutional arrangements

- Risk management of natural hazards (RMNH) has not been adequately mainstreamed into national economic planning.
- Many RMNH efforts have been undermined because they are located in junior or weak ministries that have proven ineffective in influencing key ministries such as public works, finance or health.

3. Instruments

- There is inadequate emphasis on awareness raising, behavioural change and enforcement – all of which are as important as physical investments.
- There is inadequate support for instruments such as vulnerability mapping which can help communities and government come to agreement on ways to minimize public and private asset risks.
- There is inadequate exposure of people working on national risk management of natural hazards efforts to international mentoring.

Steps towards a safer future

Disasters are essentially a development problem. The appropriate scale for adaptation in the Pacific extends from community (bottom-up) to national (top-down) levels. As risk management of natural hazards is so closely linked to macro-economic planning and it involves multiple sectors — finance, environment, fisheries, agriculture, public works, health — it requires a long-term, programmatic, whole-of-government approach.

This is a long-term process that ideally involves five interactive steps:

1. Enhancing the enabling environment through appropriate initiatives across macro-economic policy, national development planning and institutional strengthening
2. Providing decision support through public awareness raising, targeted information and training
3. Mainstreaming natural hazard risk management into economic and social planning processes
4. Ensuring risk management options are implemented by strengthening regulations, climate-proofing infrastructure, and making informed policy choices, such as where to establish growth centres
5. Incorporating monitoring and evaluation measures into pilot projects and applying lessons learned at the program level.

No single institutional structure will fit all Pacific Island countries. Governments should identify the most appropriate actions to take, as well as who is best equipped to implement them. This requires strong leadership and coordination from an influential central ministry.

Support provided by regional Pacific agencies must reflect current and emerging national needs and be led, preferably, by a single regional agency. Risk management and adaptation should also be merged and form an integral component of the Pacific Plan.

The use of risk transfer options — including disaster insurance — needs to be further explored, although a regional insurance program is hampered by the ready availability of donor-funded disaster relief.

A way forward for the Pacific

We suggest to Pacific Island leaders, communities, and their development partners that:

- The traditional approach of 'wait and mitigate' is a far worse strategy than proactively managing risks. There is no benefit in waiting to see if global warming will affect the region. Natural hazards already take an annual toll that destroys valuable property, threatens and takes lives and disrupts national economies. Any additional disasters arising from climate change will only make matters worse.
- Managing the risks associated with natural hazards is affordable and does not need to depend on donor generosity. The cost of reconstructing damaged infrastructure after a natural disaster often approaches 20–40 percent of the original infrastructure cost, much more than taking preventive measures at the design stage.
- Decision-makers in government and donor agencies need to address the three 'I's': Incentives, Institutions, and Instruments. Current incentives make it rational to wait for a disaster and allow others to pay for the recovery and rehabilitation. Institutions are neither well prepared nor sufficiently accountable and there is a lack of support for instruments that could help countries to better prepare for and adapt to natural hazards.
- Responding to disasters is highly visible and widely praised, but preventive actions are generally small, low-key steps. Donors, often responsible for much of the development budget of Pacific Island countries, need to factor risk management of natural hazards into development funding and reward countries taking proactive action.
- Risk management of natural hazards is neither an environmental nor a disaster response function. Rather, it is a cross-cutting process that demands leadership and coordination at the highest levels of government. The coordinating agency needs a mandate to influence key sectoral ministries.
- While many institutions in the Pacific do not have an adequate enabling environment for a comprehensive risk management approach to natural hazards, they can still begin the process. Even small steps can begin within institutions prepared to take a leadership role. Civil society organizations prepared to work with responsive governments can take a lead at the community level and the private sector can demonstrate leadership by adapting high profile investments to natural hazards.
- Experience shows that top-down and bottom-up approaches are needed and must coincide. Community participation is a traditional strength in the Pacific that can form the foundation for hazard risk management. For example, communities can agree to set back houses from high water levels without waiting for governments to impose zoning restrictions. The private sector can also play a part by ensuring that structures along coastlines demonstrate effective risk management practices.
- The most effective instruments for risk management of natural hazards are those that address current risks. The adverse consequences of storm surges, king tides, tsunamis and cyclones need to be addressed now through hazard mapping, vulnerability assessments and assets-at-risk inventories. Coastal assets and infrastructure can be protected now rather than repaired after damage from extreme events.
- Mainstreaming risk management into policies, plans, programs and projects is of the highest priority. Governments, donors and other stakeholders can ensure that all major development activities take risk management of natural hazards into account.

Adaptation is not surrender. It is wise, pragmatic leadership which needs to be implemented urgently and effectively.


Merry Christmas
& Happy New Year

1 : High vulnerability

1.1 Fifty years of disasters

In 1962, Guam was devastated by a cyclone of terrifying force. Typhoon Karen hit the northern Pacific island directly with 135-knot sustained winds, killing 11 people and destroying most temporary buildings. The resulting losses were estimated at US$250 million — equivalent in 2004 terms to US$1.6 billion.[1] In damage terms, Karen was the worst recorded disaster in the Pacific Islands region.

A disaster of this magnitude could have been repeated in 1997 when Typhoon Paka approached the same area with 130-knot winds. Fortunately, the typhoon passed 300 miles to the west of Guam, causing only modest damage.[2] In this context, natural hazards are akin to time bombs: they occur at irregular intervals and can be devastating if there is a highly populated area. Pacific Island Governments ignore these risks at their peril.

Pacific Islands are highly vulnerable to natural disasters

Since 1950, natural disasters have affected more than 3.4 million people[3] and caused 1,747 reported fatalities in the Pacific Islands region, excluding PNG (Table 1). In the 1990s alone, reported natural disasters cost the region US$2.8 billion in real 2004 value (EM-DAT database and SOPAC 2005).

Cyclones are the most common disaster

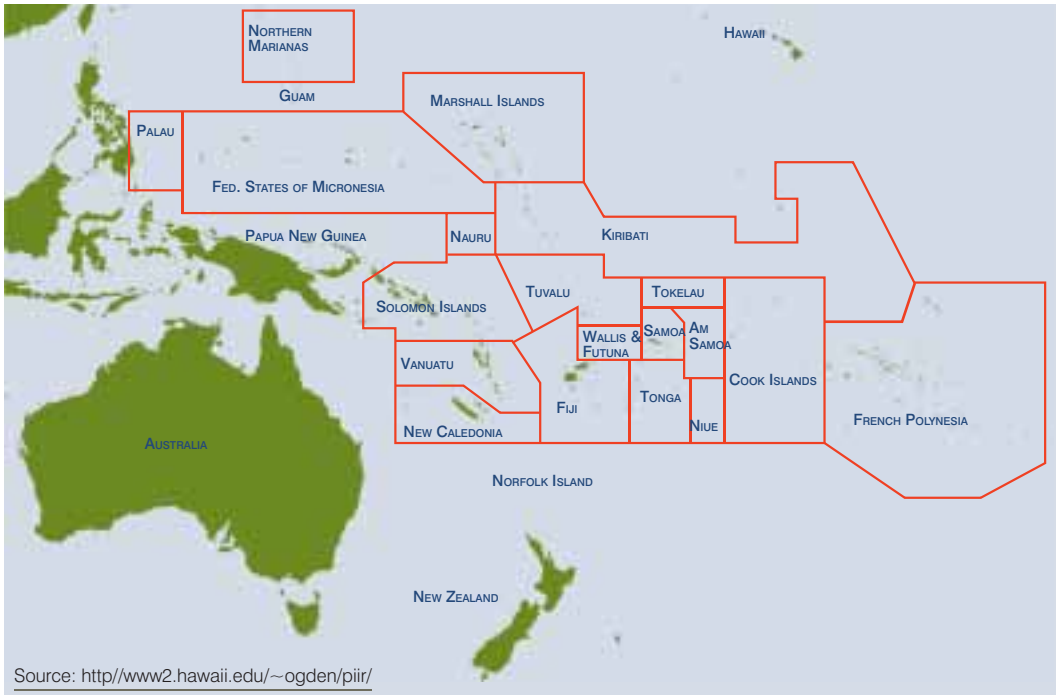
Cyclones accounted for 76 percent of the reported disasters from 1950–2004, followed by earthquakes, droughts and floods. The average cyclone damage during this period was US$75.7 million in real 2004 value. Droughts affected the highest number of people per event, while tsunamis caused the highest number of fatalities per event.

Melanesia reports the highest frequency of disasters

During 1950–2004, Melanesia reported the highest recorded number of disasters, while Micronesia reported the lowest (Table 1). Fiji and Vanuatu reported the highest number of disasters (38 and 37 respectively), while Guam — with its well developed infrastructure and strong cyclones — suffered the highest cumulative economic losses.

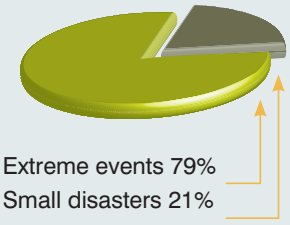
[1] USNFWC/JTWC (1962); EM-DAT; SOPAC (1995); and Australiasevereweather.com/cyclones/1998/summ9712.txt.
[2] EM-DAT; SOPAC (1995); and Australiasevereweather.com/cyclones/1998/summ9712.txt.
[3] Includes people affected by more than one disaster.

Figure 1. Map of the Pacific



Source: http//www2.hawaii.edu/~ogden/piir/

Figure 2. Comparative losses caused by extreme events vs. smaller disasters in the Pacific Islands region (1950-2004, in 2004 US$ million)



Sources: EM-DAT: the OFDA/CRED International Disaster Database, adjusted by SOPAC (2005) for 1994-2004 data. Economic losses adjusted by CPI to 2004 values.

Table 1. Reported disasters in the Pacific Islands (1950–2004)

	Number	Reported Fatalities	Population Affected[1]	Reported Losses (in 2004 US$ M)
Windstorms[2]	157	1,380	2,496,808	$5,903.90
Droughts	10	0	629,580	$137.00
Floods	8	40	246,644	$94.80
Earthquakes	17	53	22,254	$330.60
Others[3]	15	274	21,520+	$60.00
Melanesia	110	1,130	2,115,332	$1,654.90
Polynesia	71	494	1,041,012	$1,797.40
Micronesia[4]	26	123	260,662	$3,074.04
Total Pacific	**207**	**1,747**	**3,417,006**	**$6,526.30**

Notes:

1 Fatalities plus total population affected. All data excludes PNG.

2 Cyclones, tidal surges and storms.

3 Landslides, tsunamis, volcano eruptions, wild fires and epidemics.

4 Data for Micronesia is distorted by Guam, which is prone to costly cyclones.EM-DAT considers disasters which are 'situations or events which overwhelm local capacity, necessitating a request to national or international level for external assistance.'

Sources: EM-DAT : the OFDA/CRED International Disaster Database for 1950–2004 data, adjusted by SOPAC (2005) for 1994–2005 data.

Table 2. Estimated economic and social impact of disasters in selected Pacific Island countries (1950-2004)

Country	No. Disasters reported	Total reported losses in 2004 (US$m)	Average population affected (%)		Average impact on GDP (%)	
			In disaster years	In all years	In disaster years	In all years
Fiji	38	$1,174.6	10.8%	5.1%	7.7%	2.7%
Samoa	12	$743.4	42.2%	6.1%	45.6%	6.6%
Vanuatu	37	$384.4	15.5%	4.5%	30.0%	4.4%
Tonga	16	$171.1	42.0%	5.3%	14.2%	1.8%
Guam	11	$3,056.3	3.7%	0.5%	N/a	N/a

Sources: EM-DAT : the OFDA/CRED International Disaster Database for 1950-2004 data, adjusted by SOPAC (2005) for 1994-2005 data. GDP and population estimates from World Development Indicators, IMF and US Census Bureau. All economic data are converted to 2004 values.

Table 3. Predicted cyclone losses

Cyclone Return Period	Average Capital City Predicted Losses (as % of GDP)
25-year	3%
100-year	60%
500-year	150%

Notes: Capital cities modelled include Suva, Honiara, Apia, Nuku'alofa and Port Vila.
Source: Shorten (2003).

Disasters lead to high economic and social shocks

Despite less frequent disasters, Samoa and Tonga experience high degrees of economic and social shock during disaster years, joining Vanuatu and, to a lesser extent, Guam and Fiji as highly exposed countries. During disaster years, Samoa's economic losses have averaged 46 percent of their Gross Domestic Product (GDP). Vanuatu and Tonga's losses were equivalent to 30 and 14 percent of GDP respectively. Over 40 percent of the population of Tonga and Samoa is affected during a typical disaster year (Table 2). Other Pacific Island Countries and Territories are also highly vulnerable but lack sufficient data to be assessed. Overall, PICTs rank amongst the most vulnerable in the world to natural disasters (Guha-Sapir et al. 2004).

Disasters also result in chronic shocks to Pacific Island economies. Annual damage averages 2–7 percent of GDP, in both disaster and non-disaster years, as the damage effects normally extend beyond the year of the disaster.

The risk of extreme events must be addressed

Hazard management should not neglect to take into account the potential impact of extreme events — large magnitude, and/or relatively infrequent disasters (with losses exceeding US$100 million in real 2004 terms). The 15 largest disasters in the Pacific Islands region inflicted 79 percent of the economic damage reported during the 1950–2004 period, even though they accounted for only 23 percent of the disasters reported (Figure 2). The sheer magnitude of extreme events and their potential impact on small island economies makes it imperative to consider them in disaster preparedness (see page 3). Even without Guam, which accounted for three of the largest disasters during this period, extreme events accounted for 65 percent of the total economic impact of disasters during the period 1950–2004.

Cyclone modelling in the region also supports the need to prepare for extreme events (Shorten 2003). In the capital cities of Fiji Islands, Solomon Islands, Vanuatu, Samoa and Tonga, a cyclone with a 100-year return period — with a 50 percent chance of occurring within the current generation — could inflict damage equivalent to 60 percent of GDP (Table 3).

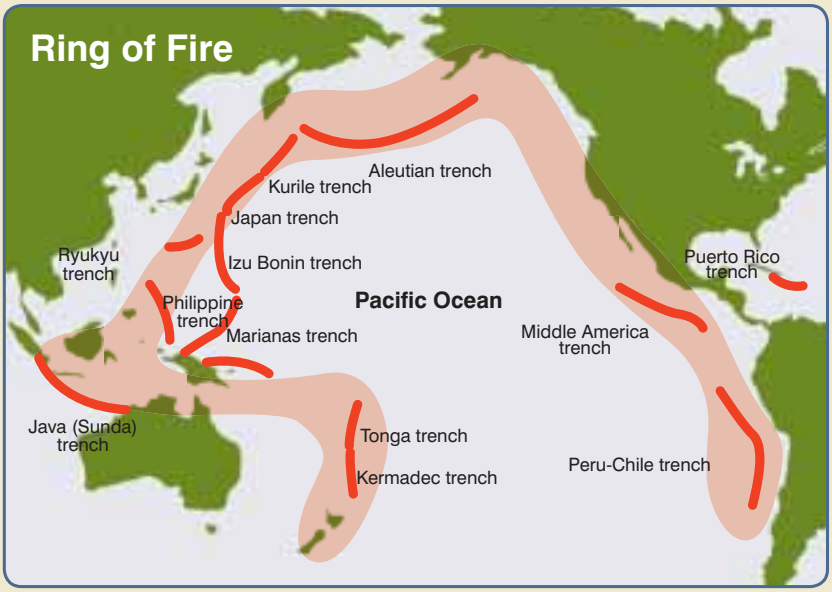
Can a tsunami hit the Pacific too?

All countries bordering the Pacific 'ring of fire' face tsunami risk. This area of high tectonic activity has had 115 tsunamis since 1900, 22 of which led to significant damage (Allport and Blong 1995). Pacific Island countries located in the southwestern region — primarily PNG, Solomon Islands, Vanuatu, Fiji and Tonga — are particularly at risk.

Pacific policy makers should be concerned about tsunamis for three major reasons:

- Tsunamis are high magnitude, low frequency disasters, which can lead to high numbers of fatalities. Most destructive are local tsunamis, which typically reach coastlines 100-200 km from the earthquake that creates it. Given this proximity, local tsunamis can impact the coastline within a few minutes, and usually no early warning is possible. The 1998 Sissano-Aitape tsunami in PNG destroyed a 10 km area of coastline and led to 2,200 deaths (Cummings 2004). By contrast, the tsunami which hit Port Vila, Vanuatu, on January 2, 2004 caused relatively minor damage as it coincided with a spring-low tide. Modeling results, however, suggest that if Port Vila and the Mele Bay peri-urban area were to be reached by a maximum intensity tsunami caused by an earthquake of 8.1 points on the Richter scale, it could suffer waves of 6-7 metres, and damages of US$74-89 million (Shorten 2003).
- Even countries located in low risk areas could be affected by Pacific-wide tsunamis. There have been 12 Pacific-wide tsunamis during the last century, mostly originating in the coast of the Americas. These 'teletsunamis' can travel at speeds of 500-1,000 km per hour in the open ocean. The 1960 Chilean earthquake led to 181 deaths as far away as Hawaii, Philippines and Japan, and caused waves of over 10 metres high in Hawaii (UNESCO/IOC 1999).
- There is no system to warn southwest Pacific countries of local tsunamis. A Tsunami Warning Center has operated in Hawaii for 40 years, but it only extends to Pacific-wide tsunamis — there is at present no local tsunami warning system to warn southwestern Pacific countries. Even if a warning was to be issued and received, there is at present no mechanism to warn remote communities, and it is unlikely that such a system could be afforded.

Figure 3. Location of tsunami-risk areas



Source: http://pubs.usqs.gov/publications/text/fire.html

What is still needed?

Consistent with the current Pacific strategy, tsunami risks need to be managed as part of broader national risk management strategies. Three areas, in particular, need to be considered:

- **Hazard assessment** — this requires estimates of the likely tsunami type and sources (earthquakes, landslides), the likelihood of occurrence, and population and assets at risk.
- **Warning system** — an effective warning system needs to be affordable and sustainable. It needs to be able to rapidly analyze seismic data, as well as sea level and water pressure information to verify whether a tsunami has been generated (Cummings 2004). Most importantly, it needs to be able to rapidly warn coastal populations and emergency officials. This may not always be possible for local tsunamis, due to the very short lead time.
- **Preparedness** — the 2004 Indian Ocean tsunami showed the importance of maintaining natural wave breakers, by managing coral reefs, mangroves, and sand banks. It also showed the importance of public awareness and education, such as teaching children to run uphill or to an elevated structure when the sea retreats. Vulnerable areas should have clearly marked escape routes. Hazard mapping can help identify which areas are most prone to erosion and inundation. And, building codes, coastal zone planning, services and infrastructure also need to take hazard risk into account

1.2 Recent trends

Disaster impacts have been rising

The number of reported disasters in the Pacific Islands region has increased significantly since the 1950s (Figure 4), a trend that may also reflect in part improved reporting in recent years.

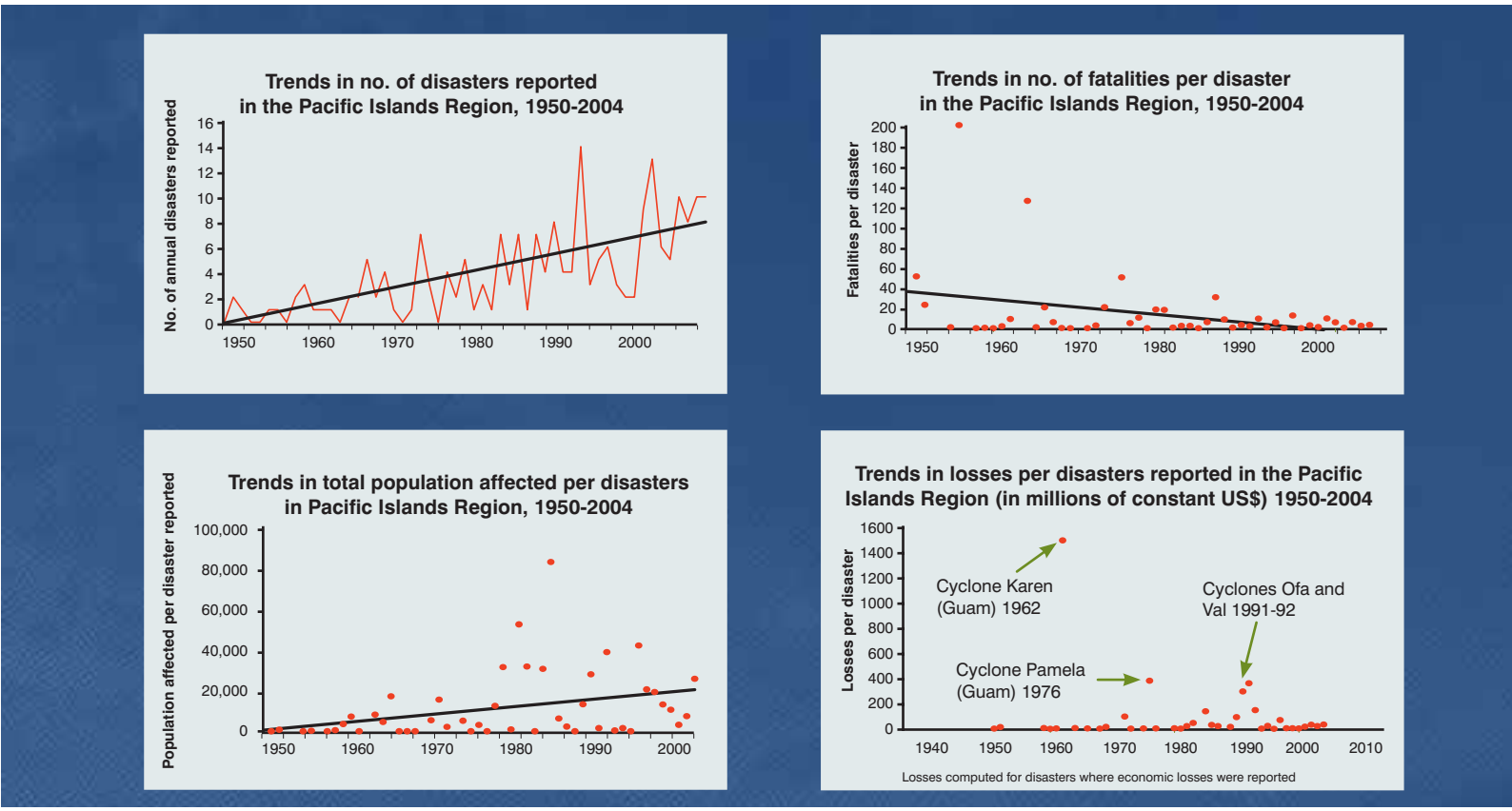
The growing toll of disasters can also be illustrated by relative trends. The total population affected per event has been rising since the 1950s, likely reflecting population growth, rapid urbanization (and consequent concentration of potential victims), and growing environmental degradation in coastal areas — problems which are particularly acute in vulnerable atolls that also face high rates of migration from outer islands. Often, relocation from the outer islands takes place in squatter settlements which are located in more vulnerable zones, with sub-standard housing and no public facilities. Not only are such communities faced with hazardous environmental conditions (such as poor quality water), but they also face increased risks of natural hazards (such as flash floods or cyclone damage). Improved development planning is critical to reducing these risks.

But the number of fatalities has been declining

The number of fatalities per disaster has declined over recent decades (Figure 4), a trend that is also observed at the global level (IFRC 2004). This may reflect improved early warning systems — particularly for cyclones, which have been monitored by satellite since the 1980s.

No significant trends can be detected in the reported economic losses per disaster.

Figure 4. Trends in reported disasters in the Pacific Islands region



Sources: EM-DAT : the OFDA/CRED International Disaster Database for 1950-2004 data, adjusted by SOPAC (2005) for 1994-2005 data. Note: Trend data - particularly reported numbers of disasters and population affected - needs to be interpreted with care, as the accuracy of reporting has improved substantially in recent years. To minimize the bias, relative trends computed only for those disasters where these data were reported.

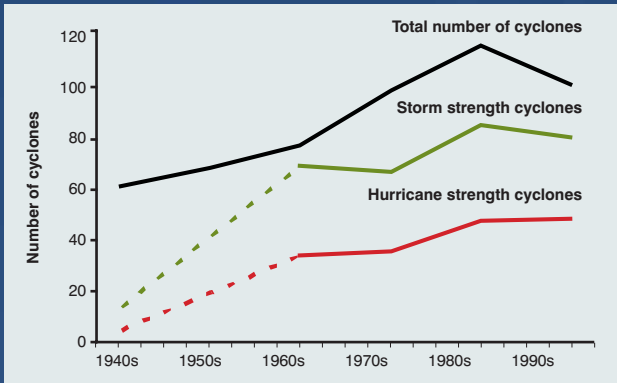
Disasters are becoming more intense

Reported disasters appear to have become more intense and probably more frequent. Ten of the 15 most extreme events reported over the past half a century occurred in the last 15 years. This period also registered 96 (50 percent) of the 192 minor disasters but this trend is more likely to be biased by improved reporting accuracy and should be interpreted with caution.

Hurricane-strength cyclones — those with winds stronger than 63 knots or 117 km/hr — have increased systematically in the south-west Pacific (see Figure 5), a trend that has also been observed at the global level over the past 30 years (Emanuel 2005; Webster et al 2005). The region now experiences on average four hurricane-strength cyclones a year. By contrast, there is no systematic pattern in the total number of cyclones in recent years while the number of weaker cyclones has declined (Kerr 1976; Revell 1981; Thompson et al. 1992, Fiji Meteorological Services 2004). These trends appear to be linked to an increased frequency of El Niño episodes since the 1970s — without alternating La Niña events — which is consistent with climate change projections for the region (Hay et al. 2003).

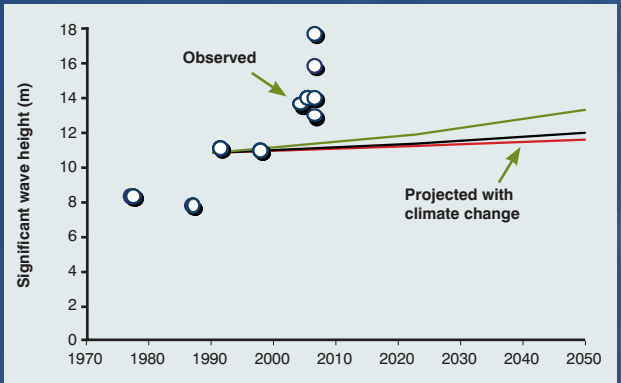
One of the impacts of stronger cyclones has been an increase in significant wave heights — the average of the top 33 percent of open-water wave heights. Significant wave heights of recent cyclones have exceeded even those forecasted by climate change models (see Figure 6). Cyclone Heta, which devastated Niue in 2004, had a significant wave height of 13.7 metres. Cyclone Sally (1987), which registered a significant wave height of 8.1 metres, caused damage equivalent to 66 percent of the Cook Island's GDP. By contrast, all four cyclones affecting the Cook Islands in 2005 had significant wave heights in excess of 12 metres. As for Guam, only a fortunate last minute alteration in the path of these four cyclones prevented more widespread damage.

Figure 5. Reported cyclone trend in southwest Pacific (1940s - 1990s)



Sources: See text. Cyclone numbers for the 1940–50s period are estimates (in dotted line) and these early data should be interpreted with care due to the lack of systematic detection systems.

Figure 6. Significant wave heights for cyclones in southwest Pacific (1978 - 2005)



Source: ADB (2005) and SimClim output, University of Waikato. Projections indicate high, best judgment, and low estimates.

Figure 7. Road damaged by Cyclone Heta, Savaii, Samoa

1.3 The future climate

The normal climate is also changing

In addition to more intense cyclones, the Pacific Islands are already experiencing a change in prevailing climatic conditions: compared to the past, the southern Pacific is now experiencing a significantly drier and warmer climate (by 15 percent and 0.8˚C, respectively). The Central Equatorial Pacific, by contrast, is experiencing more intense rain (representing a change of about 30 percent) and a similarly hotter climate (0.6˚C). Sea surface temperatures in both areas have increased by about 0.4˚C (Hay et al. 2003). These changes are also linked in part to an increased frequency of El Niño events.

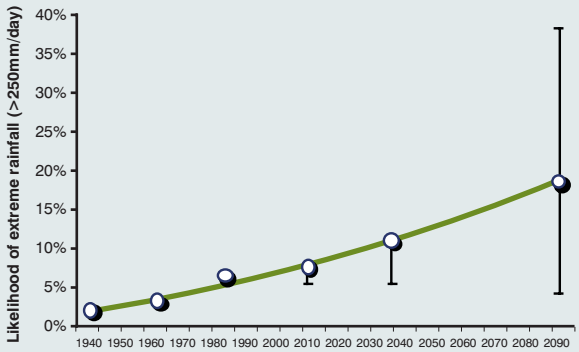
The rate of climate change is likely to intensify in the future

Rates of change are likely to increase in the future, in terms of both average and extreme conditions as well as increasing climate variability. Average temperatures are expected to rise by between 1.0 and 3.1˚C. Sea level is expected to rise by between 9 and 90 centimetres by the end of the century, with the eastern Pacific experiencing the largest rise. Cyclones are expected to increase in intensity by about 5–20 percent. Storm frequency is likely to increase in the equatorial and northern Pacific. And in general, the future climate is expected to become more El-Niño like, resulting in more droughts in the southern Pacific and more rain and consequent floods in the equatorial Pacific.

Without adaptation, high impacts can be expected

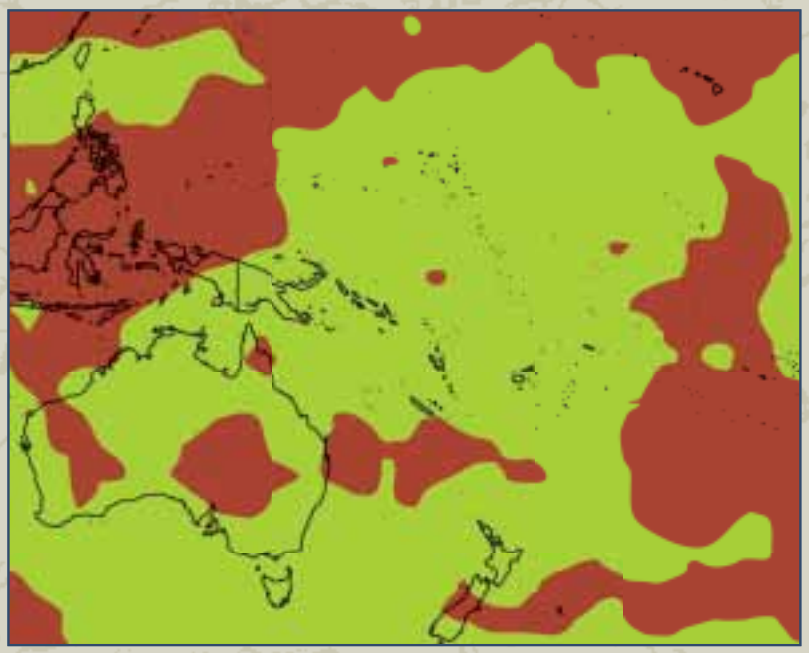
Without adaptation policies and initiatives in place, the impacts of climate change are likely to be significant and pervasive and fall disproportionately on the poor. Sectors as varied as agriculture, water supply, coastal infrastructure, natural ecosystems and health are likely to be affected. Tuna fisheries, the Pacific Islands' most important natural resource, could experience changed migration patterns, favouring countries in the western Pacific.

Figure 8. Likelihood of extreme rainfall in Rarotonga (observed and projected climate change)



Sources: Adapted from ADB (2005). The above graph shows the probability that Rarotonga will experience a daily rainfall of at least 250 mm in a year. In the period 1980–90, this probability was 6 percent. By 2085, it is expected to increase to around 17 percent.

Figure 9. Expected future rainfall change



The map at left shows the areas in the Pacific that are expected to experience up to 10 percent decrease in rainfall for every degree of global warming (in red) and those expected to receive up to 10 percent more rainfall for a 1˚C of global warming (in green). By 2100, average temperatures are expected to rise by 1.6–3.4˚C.

Source: SIMCLIM Output, University of Waikato.

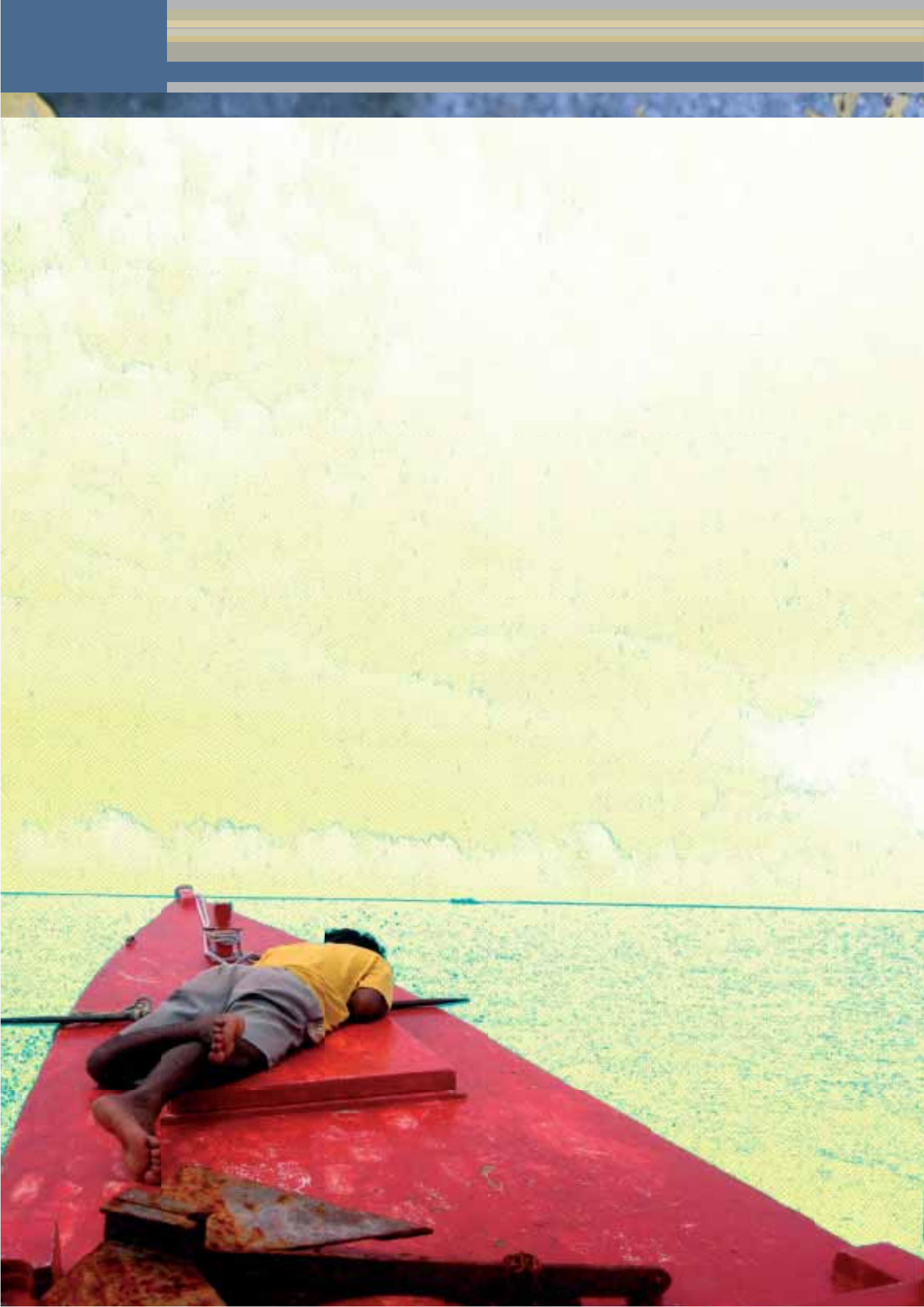
At the national level, the impacts will be particularly severe in low-lying atolls. In the absence of adaptation, Kiribati could experience inundation of 18–80 percent in parts of North Tarawa (Buariki) and up to 54 percent in parts of South Tarawa (Bikenibeu) by 2050. The combined annual damage bill from climate change and sea level rise could be equivalent to 17–34 percent of Kiribati's 1998 GDP.

In a high island such as Viti Levu (Fiji), in the absence of adaptation the economic impact is expected to be much lower (about 2–4 percent of GDP by mid-century). However, climate change could still result in as much as a 100 percent increase in cyclone damage, a 20–30 percent increase in the epidemic potential of dengue fever, and a 9–15 percent decline in the yield of major crops (World Bank 2000).

Historically, Pacific people have built resilience against disasters. But traditional adaptation practices are being lost as people move to the cities and to increasingly fragile coastal areas. With a high and increasing incidence of hurricane-strength cyclones, it is only a matter of time before a major capital receives a direct hit, with severe economic consequences.

Climate change will exacerbate current climate related risks. The key concern is the likely increased frequency and severity of an extreme event, rather than the more gradual change in the average climate. Every effort must be made to ensure adaptation thresholds are not surpassed.

Risk management of natural hazards (RMNH) could significantly reduce the magnitude of future disasters. This is illustrated in the next section, which looks at lessons learned to date in the Pacific and by other small island states. Section 3 highlights the actions required if RMNH efforts are to succeed.



2 : Key lessons learned

2.1 Early action pays

There is solid evidence that prevention pays

In 1991, cyclone Val hit Samoa with maximum wind speeds of 140 knots causing damage equivalent to 230 percent of real 2004 GDP. By contrast, the impact of cyclone Heta in 2004 (with wind speeds of up to 170 knots) translated to only 9 percent of GDP. Although the two cyclones are not directly comparable — as the tracks and duration were different — the effects of cyclone Heta would have been far worse without the investment in RMNH during the 1990s (World Bank 2004). Shoreline protection systems designed to cyclone standards performed well, with relatively minor damage, compared to sub-standard coastal protection systems in adjacent areas.

Risk management of natural hazards is not expensive, repairs are

Typically, RMNH is cost effective when introduced early in the planning of key investments. The costs of RMNH relative to original capital investments tend to be small, not only compared to the investments, but particularly to the damage averted. Table 4 presents estimates of RMNH costs and benefits for two communities in the Cook Islands and the Federated States of Micronesia.

RMNH costs in these sites would be modest relative to the replacement value of the assets yet could lead to a reduction in future impacts of 3 to 84 percent depending on the adaptation option. The incremental costs of climate proofing a major road in Kosrae are estimated at about 27 percent of the initial investment (ADB 2005). In Tonga, the cost of cyclone proofing buildings as a proportion of building cost is approximately 10 percent and somewhat higher if retrofitting is involved. The cost-benefit ratio is estimated at 4.3.

Similar conclusions can be drawn from case studies in four Caribbean countries for particular infrastructure projects that have been damaged by disasters (Table 5). The costs of RMNH, had it been factored into the original design, would be significantly lower than the actual repair costs after the disasters hit. In the case of a deepwater port in Dominica, for example, the costs of RMNH would have increased original construction costs by 12 percent but this represents only 28 percent of what it actually cost to repair the port after it was damaged by tropical storms (USAID/OAS 1998).

Figure 10. No regrets measures

Planting mangroves to stabilize land against erosion and managing water supply systems are examples of 'no regrets' RMNH measures — measures that are beneficial to handling current climate variability but also help adapt to future climate change. Due to the uncertainty of predicting precise site-specific effects, these no regrets measures are generally recommended above structural solutions (eg seawalls) whose benefits depend heavily on the location and specific impact.

The preferred RMNH measures should be 'no regrets' solutions

RMNH measures designed to address future climate change alone are inherently risky strategies because of the uncertainty of climate change impacts at the local level. Many poorly designed seawalls to cope with anticipated sea level rise, for example, end up exacerbating erosion in adjacent unprotected areas. Rather, as the analysis of Table 3 suggests much more can be done to reduce current and future vulnerability to natural hazards by adopting 'no regrets' RMNH measures and climate proofing key investments at relatively low additional costs. These measures are also part of the recommended actions to adapt to future climate change, but are justified on the basis of current benefits and costs and the probability of occurrence. Thus, adding climate change scenarios to 'no regrets' adaptation is simply a way to make an already solid investment more robust in face of increasing uncertainty.

Table 4. Cost benefit analysis of Risk Management of Natural Hazards (RMNH) in two Pacific Island communities (in US$ million)

Scenarios	Aviatu, Cook Islands[1]	Sapwohn, FSM[2]
Population (number of people)	396	776
Replacement Value of Fixed Assets (US$ million)	30	15
HEAVY RAIN		
1. Without RMNH		
2050 Damage costs with climate change	3.34	4.77
2. RMNH Option A (deepen stream bed and divert runoff)		
Costs of RMNH	0.01	0.87
2050 Damage Reduction with climate change	2.81	2.83
% Damage reduction due to RMNH	**84.1%**	**59.3%**
3. RMNH Option B (minimum floor height)		
Costs of RMNH	0.01	0.03
2050 Damage Reduction with climate change	0.11	0.34
% Damage reduction due to RMNH (with climate change)	**3.3%**	**7.1%**

Notes: Costs are integrated over a 50 year period and adjusted using a discount rate of 12%. Source: ADB 2005.

Table 5. Comparing prevention vs. reconstruction in the Caribbean (in US$)

Infrastructure	Deepwater Port (Dominica)	Norman Manley Law School (Jamaica)	Troumasse Bridge (St. Lucia)	Grand Palazzo Hotel (St. Thomas)
Original project cost	5,700,000	685,000	185,000	28,000,000
Reconstruction costs after disaster	2,310,000	28,800	32,000	5,308,000
Reconstruction as % of original construction cost	40.7%	4.2%	17.4%	19%
RMNH costs as % of original construction costs	11.5%	1.9%	10.8%	0.1%
RMNH costs as % of reconstruction costs	**28.0%**	**45.0%**	**62.4%**	**0.5%**

Notes: 1 Reconstruction and adaptation costs deflated to year of original project cost to allow for relative comparisons. All costs in 1975 dollars, except Grand Palazzo (1992 value). Note that the above analysis only takes into consideration major infrastructure damaged by the disasters, and not assets that may have survived unscathed.
Source: USAID–OAS (1998)

Are there instances where it is better to wait?

In places where there is relatively low risk of natural disasters and high uncertainty over future climate change impacts, it may make economic sense to simply monitor the changing conditions now and plan for the future. However, as Section 1 indicates, the most damaging natural disasters tend to come as major events and the risk of these low frequency/high magnitude disasters should never be overlooked.

2.2 Some action but too little impact

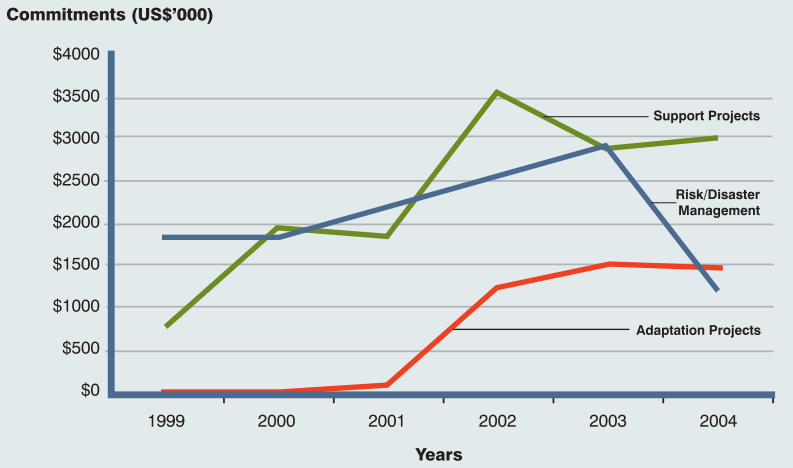
Donor funding for adaptation and hazard risk management has been rising

Pacific Island Countries and Territories and their development partners have made progress in addressing RMNH challenges. From an earlier focus on disaster response and capacity building, donor commitments to adaptation and hazard risk management have been steadily rising over the last five years, to an estimated total of US$5.7 million in 2004 (Figure 10). In part, this reflects a growing interest from key donors in adaptation financing as reflected in the progress of discussions on global adaptation funding. It also reflects the rising number of RMNH initiatives at the national and regional levels and a growing awareness of the need for preventive action in view of the rising costs of disaster reconstruction.

The number of national RMNH projects has increased since 1999, with operations currently under way in Samoa, Tonga, Kiribati, Federated States of Micronesia (FSM), Cook Islands, Fiji, Vanuatu and Niue. Various donors such as the Global Environmental Facility (GEF), World Bank, Asian Development Bank (ADB), the European Union, United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), Australian Agency for International Development (AusAID), New Zealand Agency for International Development (NZAid) and the Government of Japan have started funding RMNH initiatives.

At the regional level, several initiatives are also under way to address disaster management. SOPAC helped establish a High Level Advocacy Team in 2001. This is actively addressing weaknesses on the ground by developing the regional Disaster Risk Reduction and Disaster Management: A Framework for Action 2005–2015. This Framework for Action focuses on proactive disaster risk management.

Figure 11. Donor commitments to adaptation and hazard risk management in the Pacific Islands region



Source: Raw data from 2004 Climate Change Technical Workshop (SOPAC 2004). The recent decline in donor commitments is expected to be temporary, given pending RMNH commitments from NZAid and the EC.

In the field of adaptation, multi-sectoral climate change teams were established in many PICTs through the Pacific Islands Climate Change Assistance Programme (PICCAP). In 2002 and 2003, two High Level Adaptation Consultations helped bring together policy makers from environment, planning and economic ministries. Together with other regional initiatives in preparation for the 2005 Small Islands Developing States meeting in Mauritius, the consultations led to a growing recognition of the need to mainstream adaptation into national economic planning. These principles were applied in the Kiribati, FSM and Cook Islands pilots. A Pacific Islands Framework for Action on Climate Change, Climate Variability and Sea Level Rise was also recently revised.

Despite these efforts and the overwhelming evidence that prevention pays off, the impact of RMNH in the Pacific has been limited — why?

The answer lies largely in the three main constraints of RMNH: perverse incentives, weak institutional arrangements and ineffective instruments. Below, we examine some of the key lessons emerging from the RMNH pilot projects around the region.

Perverse incentives

The Good Samaritan's dilemma. The costs of inaction are rarely borne by those responsible. For many stakeholders, it makes sense to wait for others to come to the rescue or to shift the costs to future generations. For Pacific Island governments, for example, it is a rational decision not to reduce risks as long as donors continue to respond generously to disasters independently of a country's prevention efforts. For donors, the Good Samaritan role is highly visible and warmly praised. This creates a moral hazard against risk reduction. A similar situation is also found in the Caribbean.

Few rewards for early action. While disaster response is highly visible, prevention benefits are not immediate and may, in some cases, not become visible for many years. They often transcend the political life of government decision-makers, while having to compete — usually unfavourably — with such short-term domestic priorities as health and education.

Traditional adaptation practices are losing effectiveness. Traditional adaptation systems, such as drought resistant crops, are breaking down as resource exploitation changes from long-term resource stewardship to short-term resource mining. With increasing urbanization, many householders have no choice but to live in highly vulnerable areas. Following the 1998 tsunami in Sissano (PNG), for example, survivors were told that tsunamis were likely to occur once every generation. Many people chose, nevertheless, to return to the original area because moving inland would have meant greater exposure to malaria and increased difficulties in accessing fisheries. Communities need to be provided with the best available information and involved in making such important decisions.

Uncertain information leads to inertia. Some politicians feel that information about natural hazards and climate change is too uncertain to be used for decision making. Misdirected expenditure can be costly, while inertia may be more politically acceptable. Experts in RMNH often have difficulty providing policy relevant information that decision makers can understand and act upon.

Donors also face strong disincentives. Donors face media and public pressure to respond rapidly and generously to disasters. These funds are often mobilized off-budget and are generally not subject to the same scrutiny or oversight faced by preventive efforts. In addition, RMNH requires long-term financing and complex inter-sectoral implementation mechanisms which can be difficult for donors to finance.

Global adaptation funds are voluntary contributions. Some PICT policy makers still feel that RMNH takes pressure off developed countries to compensate small island developing states for the impacts of greenhouse gas emissions. Yet there is no mechanism to force emitting countries to compensate others for adaptation costs. All three global adaptation funds come from voluntary contributions and these donors want to see clear signs that their funding is matched by national commitments.

Figure 12. Disasters as stimulus for preventive action

Often, it takes a major disaster to spur preventive action. The photos show housing destroyed by Cyclone Heta in Niue, and new government housing rebuilt for victims of the cyclone. After Cyclone Heta, people living in the lower terrace areas were encouraged to move to higher ground. Photos by University of South Pacific and David Poihega, Niue

Counteracting the perverse incentives

It often takes a major disaster to unite the public, governments and donors towards preventive action. Cyclones Ofa and Val, which devastated Samoa in the early 1990s, created the impetus for much of the RMNH measures implemented in subsequent years. Major coastal protection works have now been designed to withstand 10-year cyclones. Similarly, Cyclone Waka in Tonga (which affected mostly buildings and infrastructure) led to the subsequent adoption of a new building code. The code requires buildings to withstand wind speeds of 57 m/s for permissible stresses, and 70 m/s for limit conditions. It also encourages measures such as cyclone nailing of roofs, strapping roof frames to wall frames and bracing walls against horizontal forces.

Awareness raising is vital

Many earlier RMNH programs have focused on scientific and technical information which did not necessarily match the needs of decision makers. RMNH experts need to provide clear, simple and relevant briefings to policy makers in a language that they can relate to and understand. Simple, uncomplicated cost-benefit analyses are important for finance and planning officials (McKenzie et al. 2005). In Kiribati, an extensive national consultation involving key stakeholders from all the outer islands led to a joint awareness that sources of vulnerability were shared across islands (and were not isolated events). It also led to agreement on national adaptation priorities and to the formulation of a new Climate Change Policy and Strategy. As many of the minor adjustments, such as raising floor levels or building on raised pads, require private investment, especially from poorer members of the community living in the most vulnerable areas, participatory approaches are vital.

Policy reforms should be introduced alongside popular investments

The Samoa and Tonga pilots used popular infrastructure works (eg road upgrading, and in Samoa, the airport) as the foundation for comprehensive RMNH institutional and policy reforms. In general, easily implemented, highly visible projects should be introduced early on to strengthen public awareness and help build public confidence that RMNH is cost-effective. High profile private sector investments can also be used to demonstrate the importance of RMNH, for example through inclusion of risk management measures in development permits.

Scaling up

While pilot projects are useful to prove RMNH concepts, they need to include a strategy for scaling up to the national level and to incorporate a long term, programmatic time frame. In FSM and the Cook Islands, for example, the pilot projects demonstrated that climate-related risks have increased in recent times and that retrofitting is considerably more costly than proactive RMNH. However, development in the coastal zones of both countries is still proceeding without adequate RMNH standards. Earlier regional projects (such as PICCAP) were also constrained by scale and timing and lacked the resources and political support to leverage broader national implementation.

The solution lies largely with donors

Donors bear a large responsibility for providing the right incentives for preventive action, not by withdrawing humanitarian funding after disasters but by requiring compliance with RMNH standards under their projects and making assistance conditional upon adoption of sound risk reduction behaviour. Yet this culture change has often proven more difficult amongst donor agencies than within national governments. During 2001–04, for example, the World Bank authorized grants for major national disasters but required credits for RMNH programs (this practice has subsequently been abandoned).

The importance of the right institutions

Many RMNH programs were diluted due to weak institutional set-ups

Past regional projects used traditional focal point agencies as their leading institutions for RMNH. Thus, environment ministries became the leading agencies for PICCAP (executed by the Secretariat of the Pacific Regional Environment Programme (SPREP)), while National Disaster Management Offices became the leading agencies for the Comprehensive Hazard and Risk Management program (CHARM), executed by SOPAC. In most cases, these agencies proved too weak and the national staff were too junior to influence the activities of powerful and vital ministries, such as Public Works, Finance, Agriculture and Fisheries, and Health. In more recent times, there has been an increasing recognition that, to be effective, RMNH needs to be coordinated by the most influential agencies at the highest levels of government. These arrangements should be agreed up front. RMNH needs to be viewed as much as an economic and social priority as an environmental issue.

The most appropriate institutional set-up varies by country

In each country, the most appropriate institutions are those that have the relevant mandates to coordinate, implement and support RMNH efforts. Government agencies must cooperate, each undertaking the role for which they are best suited to ensure a critical mass of staff and technological capacity is developed. In general, the tendency in the Pacific and the Caribbean regions has been to place program coordination at the highest possible decision-making body — generally the Offices of the President (eg Kiribati) or Prime Minister. In Samoa, however, the Ministry of Natural Resources and Environment took the responsibility for readiness, response, recovery and risk reduction. In Tonga, RMNH efforts are led by the Ministry of Lands, Survey and Natural Resources while disaster response is under the Ministry of Public Works. Moving to a stand-alone sectoral agency may not be the best solution.

RMNH should be mainstreamed into national economic planning

Experience has shown that stand-alone RMNH programs or strategies are often undermined by unfavourable national policies or investments. To be effective, RMNH needs to be incorporated into the national processes that are crucial to decision making: the national development plans, budgets, sectoral plans, policies and regulations. Mainstreaming processes also need to be linked to investments on the ground. Field testing them allows the processes and plans to become more robust and gain greater stakeholder acceptance. Thus, RMNH mainstreaming needs to combine top-down and bottom-up approaches and be closely linked to national economic and social planning. The 2004 National Sustainable Development Plan of FSM, for example, emphasizes the need to climate-proof infrastructure, health and environment. Adaptation is also prominent in the Kiribati 2004–07 National Development Strategy and is being incorporated into Ministerial Operational Plans. In reality, however, government departments throughout the Pacific have rarely allocated operational budgets for RMNH initiatives, continuing to depend largely on donor financing.

RMNH requires a favourable enabling national environment

In general, RMNH requires an enabling environment at national level that allows key players — communities, government, and private sector — to engage in risk reduction behaviour. While the enabling environment can be strengthened during the course of RMNH programs, there are three aspects that may need to be in place before RMNH can be effective: (a) accountable performance budgeting; (b) participatory planning; and (c) pre-existing inter-sectoral coordination mechanisms. These aspects are discussed in further detail in section 3.1.

Promoting appropriate instruments

RMNH often involves strengthening existing policies, legislation and enforcement, rather than physical investments

In Kiribati, a full 80 percent of the national adaptation priorities identified by stakeholders were not visible investments, but related to awareness raising, behavioural changes, subtle adjustments and better enforcement of existing policies and regulations — such as limiting removal of aggregate from coastal areas. RMNH programs therefore require measurable performance indicators in these areas. Preferably, these performance targets should be those adopted by sectoral ministries and tied to their budget.

The importance of vulnerability and hazard mapping

Support instruments such as vulnerability and hazard mapping have proven effective in countries like Samoa facilitating agreement between communities and the Government on what is at risk and ways to minimize public and private asset risks. Publicity regarding the most vulnerable and hazardous areas will help to deter the private sector from promoting property development in such areas.

Linking national experts to international mentors

RMNH national experts in FSM, Cook Islands, Kiribati, Tonga and Samoa have benefited considerably from the support of international mentors and trainers, particularly from SOPAC, SPREP, the International Global Change Institute, the New Zealand Ministry of Civil Defence Emergency Management and Emergency Management Australia. National staff are now contributing their RMNH expertise to preparation of national development plans, redesign of major infrastructure, preparing GEF proposals, improving environmental impact assessments, and in community development planning.

External financing should consistently reward action

The Caribbean region is ahead of the Pacific in using innovative instruments to promote RMNH. The Caribbean Development Bank, for example, is expected to adjust its lending policy according to prevention principles and the region is developing environmental impact assessment guidelines which incorporate RMNH principles. In Antigua and Barbuda, after six major hurricanes, the Government formed an alliance with private insurance companies to encourage property owners to retrofit buildings according to hurricane standards. Owners who complied with the standards were eligible for discounted insurance rates, while those who did not, found it difficult to secure insurance. The same principles can be applied for house mortgage applications and by governments when considering budget allocations for different sectors.

Innovative instruments should be used to promote RMNH

PICT governments could consider incentives such as preferential tax codes or subsidies rewarding risk reduction behaviour by the private sector. They could also consider passing hazard disclosure laws for real estate purchases, effectively devaluing infrastructure in high risk areas. The use of these innovative instruments, however, has yet to start throughout the Pacific. In general, the role of the private sector in reducing risks through market mechanisms needs to be recognized and enhanced throughout the Pacific region.

Governments should not rely exclusively on external financing for RMNH

As indicated by the experiences of Samoa, Tonga and Kiribati, the most sustainable financing instruments are likely to be a combination of national budgets with external financing, combined with private sector funding.

The Caribbean experience

Traditionally, donors and governments have focused on disaster response in the Caribbean. Since the 1990s however, the region has implemented several RMNH projects, primarily at the regional level. As in the Pacific, the agendas for adaptation and hazard risk management are starting to merge. Many of the lessons echo those learned in the Pacific:

- Adaptation and hazard risk management, to be effective, need to be integrated into sustainable development policies and plans. With a few exceptions, however, regional efforts have not translated well into mainstreaming hazard risk management at the national level.
- In general, national disaster offices have been too weak to encourage decision makers to favour prevention.
- National focal points have varied from Meteorological Offices, Environmental Management agencies, Ministries of Finance, Planning, and Agriculture and Fisheries. Commonly, inter-sectoral, multi-stakeholder committees were established. The most effective arrangements involved champions at high levels and official, rather than ad-hoc bodies. Commonly, events such as major disasters have triggered national action (Jones et al. 2001).
- Concepts of adaptation and RMNH are not well understood. There is a lack of concrete and clear quantitative information available to convince decision makers to adopt these approaches.
- Adaptation and RMNH need to be supported by innovative economic instruments, such as insurance, housing loan applications and aid conditionality requiring that hazard risk management be considered in all proposals.

3 : Future directions

RMNH is a process

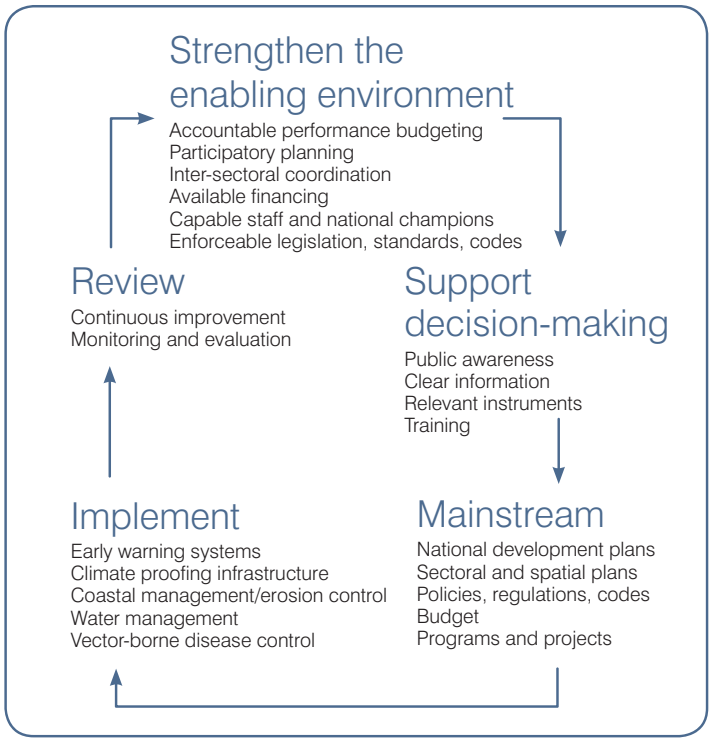
RMNH is a long-term process which ideally should be approached in five interactive steps (Figure 14):

1. An enabling environment, at the macro-economic, planning, institutional and policy levels.
2. Decision support, including public awareness, targeted information, relevant tools and training.
3. Mainstreaming RMNH in key economic and social planning processes, such as national development plans, sectoral and spatial plans, policies, regulations, the budget, programs and projects.
4. Implementation. Once RMNH options are prioritized and budgeted, they must be implemented. Initiatives can range from strengthened regulations (eg better building codes) to investments (eg climate-proofing infrastructure), policy choices (eg where to establish future population growth centres), incentives to finance changes in behaviour, and extension advice (eg promotion of multi-cropping).
5. Review. Given the paucity of RMNH experience worldwide, it is vital that early pilot projects be evaluated periodically, lessons documented and programs modified to reflect experience.

National programs typically start by addressing a few of the above steps, while building capacity to address others. Samoa focused on the enabling environment, mainstreaming and (early) implementation. Kiribati focused early efforts on decision support and is mainstreaming and strengthening the enabling environment. The FSM and Cook Islands pilots focused on mainstreaming and support to decision making.

National governments have a critical role to play in creating an enabling environment for adaptation and mainstreaming risk management into national economic and social planning. Once these key enabling elements are in place, adaptation implementation is largely up to communities, the private sector and sectoral ministries (Figure 13).

Figure 13. The adaptation process



Adaptation should entail five major steps: strengthening the enabling environment, decision support tools, mainstreaming into national economic planning, implementation, and monitoring. These should ideally proceed in parallel, but in practice PICs have typically focused on a few initial steps, while building capacity to address the others.

Some adaptation pilots are only working at the local community level. This may be sufficient for local adaptation solutions, but over the long term, there is a risk that these efforts are undermined by unsupportive national policies and programs. Individual champions may be responsible for success in a particular community, making scaling up to the national level problematic.

The appropriate approach for adaptation in the Pacific combines the community (bottom-up) and the national (top-down) levels. As RMNH is so closely linked to macro-economic planning and it involves multiple sectors — finance, environment, fisheries, agriculture, public works, health — it requires a long-term, programmatic, whole-of-government approach.

3.1 Strengthening the enabling national environment

The enabling environment for RMNH is closely linked to good governance, sound macro-economic planning and sustainable development. Some progress should take place in these areas before a country is 'ready' for RMNH. Among the most important prerequisites are:

Accountable performance budgeting

To monitor progress in risk reduction, sectoral programs should be costed in the budget and tied to performance indicators, measuring not only outputs, but outcomes (such as improved compliance with building codes). Program managers should be accountable for achieving the agreed outcomes. Without performance budgeting, government may find it difficult to assess whether the country as a whole, is embarking on a vulnerability-reduction path, or whether their efforts are being undermined by contradictory sector programs.

Many PICTs have adopted performance budgeting in recent years, supported by AusAID and ADB efforts. Some countries, for example Samoa, Cook Islands, Kiribati, Fiji, have also introduced performance contracts for Chief Executive Officers/Secretaries. For most, however, the economic planning process is not yet sufficiently robust to be fully accountable for program outcomes. Nonetheless, provided that basic elements are in place, RMNH programs can go hand-in-hand with the strengthening of economic planning (such as in Kiribati).

A related aspect is the availability of budget for recurrent costs. Many Pacific governments depend heavily on donors for operating expenses and capital investments, with the budget covering little more than salaries. This poses a major barrier to the sustainability of RMNH investments, as they become dependent on donor timeframes and shifting priorities — a significant constraint that was experienced by the Samoa and Tonga projects.

Participatory planning

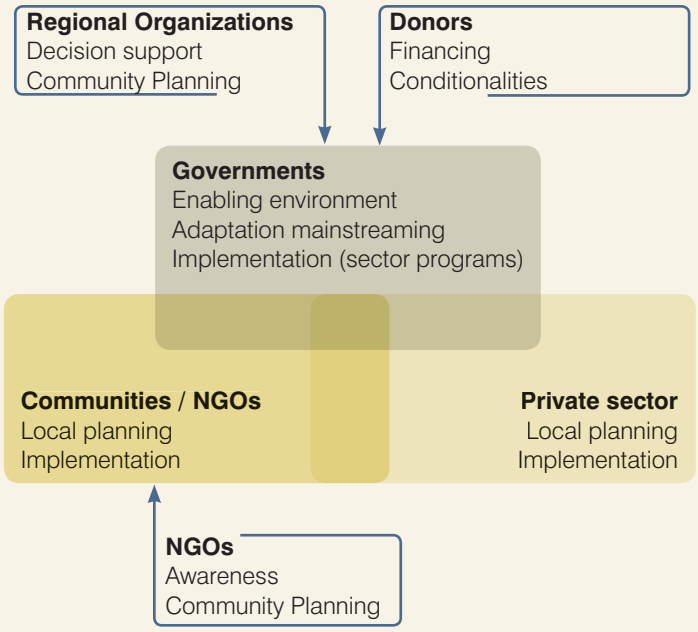
PICTs with a tradition of strong community involvement in the planning process (such as Kiribati or the Cook Islands) have a natural advantage in promoting RMNH. RMNH works best when the various stakeholders (government, communities, private sector, NGOs) are able to agree on priority measures and their respective role in implementation — and subsequently come together at regular intervals to assess joint progress. RMNH thus becomes a part of regular participatory planning.

Inter-sectoral coordination mechanisms

National RMNH can benefit significantly from an established high level inter-sectoral coordination mechanism, such as an inter-Ministerial Development Committee.

The three aspects considered above — accountable performance budgeting, participatory planning and inter-sectoral coordination mechanisms — are considered pre-requisites because they are difficult for RMNH programs to establish in isolation of other governance strengthening initiatives.

Figure 14. The appropriate role of key stakeholders in RMNH



National Governments play key roles in strengthening the enabling environments, mainstreaming, and sector programs' implementation. Communities, NGOs and the private sector play key roles in local planning and implementation. Regional Organizations play a major role in supporting decision-making and promoting the sharing of lessons learned. Donors' roles are primarily in providing financing, and (most importantly) influencing the way the funding is accessed and used.

Other aspects of the enabling environment are more easily influenced by an RMNH program:

Available financing

Ideally, RMNH financing should include a mixture of government, private sector and donor funding. In the Kiribati Adaptation Program, for example, adaptation investments budgeted by the government are envisaged to be matched at 50 percent financing — the higher the allocation in the budget, the higher the external financing, thus providing an incentive for RMNH programs to grow as a proportion of the total budget. Private sector funding is often neglected, yet it can have important demonstration effects. Formal public-private partnerships may be considered where private investments form a significant contribution to RMNH measures.

Appropriate institutional set-up

Choosing the appropriate institutions (ie organizations) is essential to the success of national RMNH programs. By contrast, the wrong choice of institutions can plague a program for years, due to the natural resistance of organizations to let go of their existing mandates. As demonstrated by many RMNH pilots in the Pacific, the appropriate institutional set-up for an RMNH program should be agreed by all key stakeholders from the outset, even if it may take years to establish in practice.[4]

Capable staff and national champions

Many PICTs already have staff familiar with hazard risk management and adaptation, thanks to the support of early regional programs such as CHARM and PICCAP. But these staff tended to be relatively junior within their agencies. In addition, national adaptation programs need high-level advocates or champions who can serve as catalysts and are accountable for a program's progress (such as that promoted by CHARM). Unfortunately individual champions tend to be reassigned to other positions. It is therefore important to broaden the number of high-level advocates to consolidate national support. Skilled policy analysts are also needed to translate technical solutions into pro-active government policy and programs.

Enforceable legislation, standards, and codes

Often, adaptation does not require new laws but better enforcement (and monitoring) of existing laws. It is critical to develop indicators that help measure this progress. The Samoa and Tonga programs, for example, continue to suffer from weak enforcement and lack of consequences for non-compliance; with the Tonga building code not yet legally mandatory. The Caribbean has experienced the same problems with command and control regulations but has started to adopt more effective market-based incentives. In Antigua and Barbuda, insurance premiums increase for property owners who fail to comply with building codes.

While some elements of the enabling environment (those associated with good governance and inter-sectoral planning) should preferably be in place before considering RMNH, others — support to decision making, the choice of institutions and staff, strengthening the regulatory framework — can be undertaken during the course of the program.

[4] Institutional issues are discussed in further detail in Section 3.6 ('Leading the National Efforts').

3.2 Supporting decision-making

In the early stages of an RMNH program, it is important to develop the relevant support tools for decision making. These typically include public awareness, targeted information, appropriate technical instruments and training.

Public awareness

RMNH programs need to raise public awareness to convince key stakeholders that hazard risks are real and present, that damage entails significant costs and that managing risks is considerably less costly than rebuilding after a disaster. Decision makers also need to become familiar with what RMNH means and how they should start to adapt. Once awareness is raised, a few early examples can make a difference in convincing policy makers to act. Easily implemented, highly visible and desirable projects — such as climate-proofing major sea defences in Apia — can help build confidence that adaptation is feasible and not overly costly.

Targeted information

RMNH experts are often ineffectual in communicating with major decision makers, whether they are parliamentarians, communities or finance ministries. Statements that only experts understand, such as 'dangerous anthropogenic interference in the climate system'; as well as stand-alone plans that appear irrelevant to decision makers, should be avoided whenever possible. RMNH programs should engage staff experienced in media communication and in preparing briefings for decision makers. The recent AusAID project on Economic Impact of Natural Disasters on Development in the Pacific (McKenzie et al. 2005) makes the important point that data are often scarce in the Pacific and a simplified cost-benefit analysis approach is needed, 'appropriate to the resource, isolation and other constraints, peculiar to Small Island Developing States.' In addition to providing a useful toolkit, the need for extensive capacity building was underscored by this project.

Vulnerability and climate assessments need to be undertaken at a level which planners and communities can easily relate to: for example, a general climate change assessment for the whole of Fiji may be of little use to Viti Levu when one side of the island is relatively dry and the other distinctly wetter. Information should be context specific and not rely on broad regional or national averages.

Figure 15. Raising public awareness

In Kiribati, two national adaptation consultations (2003) brought together representatives, chief councillors and clerks, and representatives of elders, women and youth groups from each of the major inhabited islands. For the first time, people realized that what was happening to one atoll was also happening to the others. The consultation led to a national consensus on the meaning of 'vulnerability' and a national prioritization of coping strategies.

Relevant instruments and related training

Amongst the most relevant tools that support national decision making are:

1. Hazard and vulnerability mapping
2. Climate change, variability and sea level rise scenarios
3. Risk identification
4. Asset risk assessment (physical assets and livelihood means)
5. Evaluation and prioritization of RMNH options
6. Implementation support tools (such as codes of practice and operational manuals)

Hazard and vulnerability mapping

In Samoa, participatory hazard mapping proved to be a powerful tool for government and coastal communities to reach consensus over adaptation priorities and start viewing public and private infrastructure as a common asset to be protected (Figure 16). Kiribati is also developing vulnerability mapping under SOPAC/European Commission (EC) assistance by comparing post-World War II maps with current satellite photos and assessing the extent and location of coastal erosion in key atolls.

Figure 16. Coastal hazard mapping in Samoa

Participatory hazard mapping in Samoa led to identification of areas subject to erosion, flooding and landslide hazard risks, helping formulate district infrastructure asset management plans. Communities and the Government are jointly responsible for implementation.

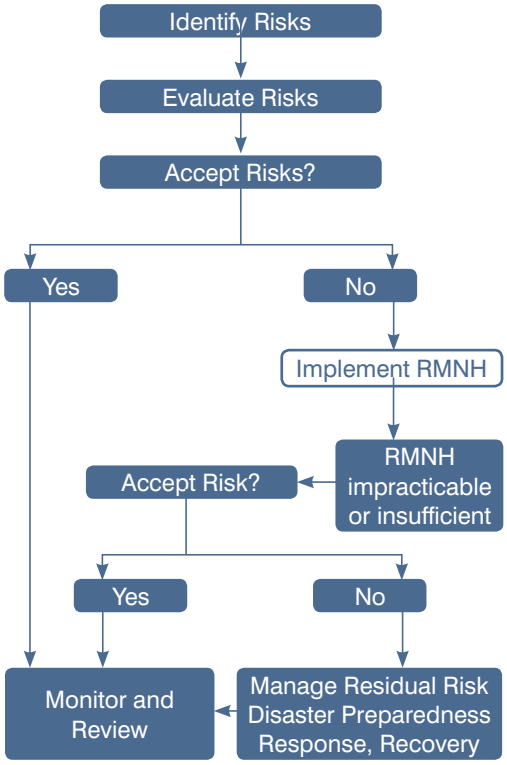
Climate change, climate variability, and sea level rise scenarios

The University of South Pacific and the International Global Change Institute (New Zealand) have developed a simplified software package, called SimCLIM, to generate climate change scenarios and sea level rise at the sub-regional level. SimCLIM incorporates the latest validated models for the region and non-experts can use it relatively easily.

Risk identification

CHARM, developed by SOPAC based on Australian risk management tools promotes close linkages between hazard risk management and other national development programs. It also promotes hazard risk management as a comprehensive, all-of-government process which aims to reduce the probability and the impacts of disasters and encourages risk transfer and avoidance. RMNH strategies are developed for unavoidable risks. Preparedness, response and recovery strategies are developed for risks where adaptation is impracticable (Figure 17). CHARM should also incorporate robust economic risk assessments.

Figure 17. CHARM risk management process (simplified) (Adapted from AS/NZS 4360: 1999)



Adapted from AS/NZS 4360:1999

Asset risk assessments

Exposure risk is best determined by an evaluation of physical assets in terms of their value and their vulnerability to given disasters. Examples of such asset assessments include the surveys used in the Port Vila Catastrophe Insurance Pilot Project (SOPAC 2003) as well as those carried out as part of SOPAC's Pacific Cities dataset for Honiara, Apia, Nuku'alofa, Port Vila and Suva (Table 6) and by ADB. Asset risk assessment is also essential to determine possible risk financing or transfer mechanisms such as disaster insurance. Asset assessment should also encompass natural assets important for livelihoods (such as forest areas, coconut plantations, food gardens and coastal fisheries).

Evaluation and prioritization of RMNH options

To the extent possible, selection of RMNH initiatives should be carried out at the local level. However, some PICTs may need to prioritize adaptation options for preparing National Adaptation Programmes of Action (NAPAs) or incorporating them into national plans. Table 7 summarizes some of the criteria that were considered in the Kiribati program. Ultimately, the criteria used need to fit national priorities. For donor financing, however, it is important that the final adaptation options be subject to three degrees of scrutiny: they should be informed by national consultations; they should be guided by scientific and technical assessments; and they should be politically acceptable (ie fit within the strategic priorities of the implementing ministries and approved at the highest levels).

Implementation support tools

Among the most important RMNH support tools are regulatory codes (eg building codes) and operational manuals for improved engineering designs — such as those being developed in Samoa and Kiribati to climate-proof key infrastructure or address specific coastal erosion problems with 'no regrets solutions'. As these tools are developed and tested at the local levels, it will be important to compile and share them with other PICTs to facilitate the expansion of RMNH practices throughout the region.

Table 6. Example of asset risk assessment in Port Vila, Vanuatu

Building Class	Description	Number of Buildings	Total Replacement Value (AUD$M)	Estimated Cyclone Damage (%)	Estimated Cyclone Damage (AUD$M)
Class A	Well engineered structures: Schools, hospitals	254	49	9%	6
Class B	Concrete or concrete block structures; Moderate quality construction, poor earthquake provisions	2,822	459	14%	64
Class C	Wooden bungalows; poor wind, earthquake provisions	1,629	162	24%	41
Class D	Poor quality: Shacks and sheds	98	5	70%	4
All		**4,803**	**675**	**15%**	**115**

Sources: Shorten et al. 2003. The cyclone used in the model was Uma, which affected Efate in 1987 with maximum winds of 120 knots. Numbers may not add up due to rounding.

Table 7. Possible adaptation selection criteria

Criteria	Rankings
Degree of vulnerability addressed	Very high to Very Low
Level of implementation	General (preferred) Site-specific
Cost Benefit	Very low to Very High
Urgency	Immediate Action; Can Wait
No regrets?	Yes (preferred); No
Participation	Both (preferred); Bottom-up; Top-down.
Environmental impacts?	No; Some; Yes
Culturally acceptable?	Yes; Probably; No
Included in with national strategies/programs?	Yes; No
Capacity to implement	High; Medium; Low
Synergy with poverty reduction	Yes; Some; No
Synergy with international conventions (eg Biodiversity)	Yes; Some; No

Sources: Kiribati Adaptation Project and World Bank (2000).

3.3 Mainstreaming

Why is mainstreaming so important for RMNH? In the Pacific, as elsewhere, stand-alone planning documents which are not tied to national economic and social planning (and therefore to the budget) tend to be ignored or only followed by RMNH practitioners. RMNH can only become effective on a national scale once it is reflected in the key economic and social planning instruments (Figure 18). Mainstreaming efforts should focus on the national documents that have the maximum impact at the national and local levels and are directly tied to budgets.

Mainstreaming needs to take place at three levels: Planning; Policies and Regulations; and Programs and Projects

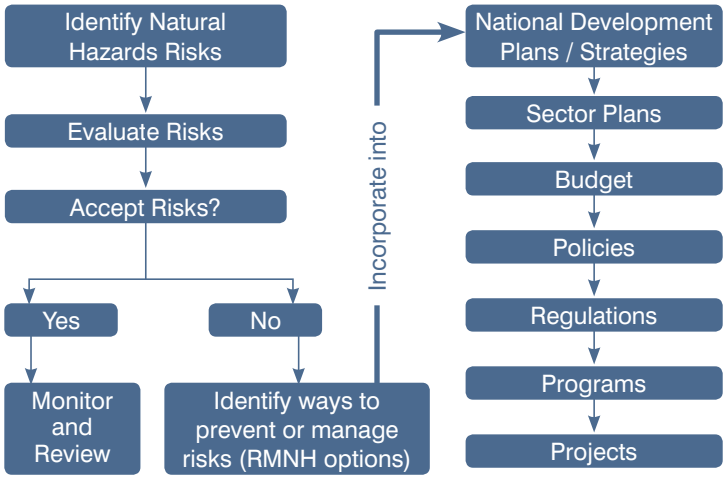
National Development Plans and Strategies. Natural hazards and climate change should be recognized as being capable of generating significant economic, social and environmental risks and reflected in all components of National Development Plans or Strategies where there may be substantial impacts.

Sectoral and Spatial Plans. Sectoral and land use plans (including community-level plans) which are clearly tied to budgets are a key focus for mainstreaming since it is at this level that the detailed design of RMNH options can be included and funded. Ministries' operational plans need to include clear indicators of impact to enable the effectiveness of RMNH measures to be measured over time.

Policies, Regulations and Codes of Practice. Key national policies, legislation, regulations and codes may need to be amended to reflect RMNH principles, for example, requiring all major, new buildings to comply with cyclone-resistant standards. Just as environmental impact assessments are increasingly required, vulnerability screening should become mandatory for all major investments as a key part of impact assessment.[5] As experience has shown, however, the key regulatory weakness is enforcement. Here, it will be important to develop indicators of improved compliance, as well as try innovative market incentives such as linking insurance premiums to RMNH measures.

Programs and Projects. Initially, technical ministries may need technical assistance on how to incorporate hazard risk management into the design of their programs and projects, for example more frequent floods will require return period calculations for engineering structures to be climate-proofed.

Figure 18. Mainstreaming RMNH into national economic planning



[5] See Benson and Twigg (2004), for methodologies to incorporate RMNH into program appraisal.

Similarly, a ministry may need assistance from geomorphologists to determine whether to select a soft adaptation measure (eg mangrove replanting) or a structure (eg seawall) in combating coastal erosion. Once these new specifications and designs become embedded in the ministries' standard operational procedures, the need for specialized technical assistance should diminish. Cost effectiveness of alternative projects and simplified cost-benefit analysis should be used to choose between measures.

Mainstreaming needs to involve the civil society

As the key implementers of RMNH, communities and the private sector (and partner non-governmental organizations) need to be actively involved in the planning process. This can be achieved using simple terms and tools, tied closely to awareness-raising efforts. For example, communities can use an historic event such as an extreme high tide as an analogue from which to assess the extent of coastal erosion and discuss coping strategies. Comparison of historical maps can also be very effective: in the Safata district of Samoa, traditional chiefs prohibited sand mining after realizing that they had lost 50 metres of coastal land in half a century.

Mainstreaming is also needed in donor agencies

Experience from the recent pilot projects undertaken by the World Bank and ADB suggests that agency staff also need encouragement to mainstream RMNH into their own programming and project design. Specific training courses may be needed, along with appropriate guidance documents.

An example of RMNH mainstreaming

Climate-proofing the Strategic Development Plan in the Federated States of Micronesia

Climate-proofing national strategies is a major way to mainstream RMNH. In 2003, the Federated States of Micronesia prepared a new, national Strategic Development Plan, which was approved by the National Congress. This new Plan includes the following provisions:

In the Infrastructure sector:

- Risk exposure to be used as a criterion to rank infrastructure investments nationally across sectors and states.
- Natural hazard risk assessments to be carried out at the state level as the basis of guidelines ensuring that risks to infrastructure are identified and addressed at the design stage.
- Infrastructure must be located, built and maintained in line with codes and practices ensuring that it remains functional for the projected life time and avoids unacceptable risks associated with natural hazards and climate change.

In the Health sector:

- The plan recognizes the mostly adverse health impacts of climate variability and change, including an increase in vector-borne diseases (such as dengue fever and malaria), water-borne diseases (such as diarrhoea), diseases related to toxic algae (such as ciguatera fish poisoning), declining food security, heat stress, air pollution and extreme events.
- It proposes assessments of climate-related health risks, strengthening of early warning systems and environmental health monitoring.
- Public health risks related to climate variability and change to be documented and findings included in relevant public programs.

In the Environment sector:

- The Plan mentions the need for communities to prepare and implement risk reduction strategies to address natural hazards, while preparing for the anticipated impacts of climate change. These strategies should identify structures, infrastructure and ecosystems at risk.
- Climate change and sea-level rise considerations to be incorporated in strategic and land-use planning for infrastructure and buildings, and social services.
- Potential impact of climate change on the tuna industry as a result of changed migration patterns to be determined and the findings to provide the basis for strategies to minimize impacts on the fisheries sector.

Source: Proceedings of the Third Economic Summit of the Federated States of Micronesia.

The process of mainstreaming adaptation in Kiribati

Since 2003, Kiribati has used a participatory approach to mainstream adaptation to climate change into the National Development Strategy and economic planning. The key steps included:

1. Participatory identification of coping strategies.

The Government convened a First National Consultation in the Gilberts and Line Islands, where representatives from each of the major inhabited islands identified recent large hazards and proposed coping strategies.

Hazards	Impact	Coping Strategies
High storm surge	Inundation – water becomes brackish	Construct wood embankment
	Erosion – reduction of land area	Plant mangroves
		Limit removal of aggregates

2. Adaptation prioritization and responsibilities

During the Second National Consultation, island representatives rated the adaptation options and classified them in four categories:

A = Urgent adaptation options which can be done by communities themselves

B = Urgent adaptation options for which communities needed assistance from the Government

C = Adaptation options that were less important/urgent

D = Adaptation options for which there was no need or willingness to implement

Type B adaptation options were then allocated to the responsible ministries.

3. Assessment of type of response required

The adaptation options derived from the national consultation were then divided into five categories according to the nature of the response:

i. Changes to government policies and strategies

ii. Changes to laws and regulations

iii. Interaction of extension and information with communities

iv. Formal adaptation investments and engineering works by government, island councils and contractors

v. Informal adaptation investments by communities

4. Final prioritization

The final prioritization was made by taking into account nine criteria: (1) the results of the national consultation; (2) the extent to which the adaptation option addressed vulnerability (made by expert judgment); (3) the likely cost-benefit; (4) urgency; (5) the likely degree of environmental impact; (6) cultural acceptability; (7) the degree of community participation; and (8) synergies with poverty reduction and with (9) international conventions.

5. Mainstreaming into ministries' operational plans

The adaptation priorities were then circulated to all the relevant ministries. Those judged to be relevant and consistent with ministerial strategies were identified for funding under specific government programs and matched by external funding at 50 percent. Urgent adaptation measures implementable by communities alone are expected to be supported through a small grants program.

Adaptation Option	Type of Response	Priority Category	Lead Ministries	Applicable Program in Ministerial Operational Plans
Awareness				
Awareness raising about climate change	Extension Information	B	MELAD/ MCTTD MEYS	MCTTD – Provision of meteorological information to users MEYS – Curriculum development
Water Resources				
Protect water wells	Formal engineering and construction works	B	MPWU	MPWU – Water Engineering Unit
Assess and locate available water		B	MPWU	Design Rehabilitation and Implementation of Water Systems in the Outer Islands
Water pumps and pipes to link good sources with settlement areas		B	MPWU	
Installation of freshwater tanks		B	MPWU	
Inundation/Coastal Erosion				
Plant mangroves	Extens/Info	B	MELAD	MELAD-Improving Env. Through Conservation and Protection
Limit removal of aggregates	Reg.Changes	B	MISA	
EIA on coastal dev. activities	Reg. Changes	B	MELAD	MISA – Rural planning and coastal erosion
Prohibit types of development that destroy the environment (eg causeways)	Reg. Changes	B	MELAD	
No reef blasting	Reg. Changes	B	MELAD	MELAD – Improving Env.

Sources: Kiribati Adaptation Program documents and background case study to this Policy Note.

3.4 Implementation

RMNH is about investments which reduce vulnerability and promoting changes in public behaviour to take hazard risks into account

As mentioned in 'Lessons Learned', RMNH can include risk reduction investments in key sectors — infrastructure, water, health, agriculture, fisheries and forestry. Yet often, RMNH is about changes in risk behaviour brought about by public awareness, market incentives, better enforcement of existing regulations, or improved policies. These are much more difficult to measure, but are important for long-term success. A well-designed RMNH program should therefore include high visibility investments as well as behaviour changing measures.

Below are examples of RMNH activities at the community, island and national levels.

Community-level RMNH

Coastal erosion control. The Yadua community in Fiji, a settlement in a low-lying coastal flat on the south windward coast of Viti Levu, has for decades been affected by coastal erosion. The initial response was to construct a seawall made from rocks taken from the fringing coral reef but this structure repeatedly collapsed. Since the late 1990s, the Yadua community has replanted mangroves over an area of 1,500 square metres. This was seen as a more sustainable solution even though it may take 25–30 years for a significant mangrove forest to be re-established.

In Niue, the waves generated by cyclone Heta reached cliffs of over 40 metres height. Much of the topsoil and vegetation was washed away and coral reefs were severely damaged. The villages of Alofi North and Mekefu have replanted 150 different types of trees on the cliff tops to try to prevent further soil erosion. Inshore areas along the coast have also been designated as Marine Protected Areas to revive fish breeding stocks.

Figure 19. Implementing RMNH measures

Mangrove replanting in Fiji and a water storage tank in drought affected areas in Aitutaki, Cook Islands. Photos by Patrick Nunn and Pasha Carruthers.

Water and watershed management. In Samoa, members of the Saoluafata community are upgrading their coastal springs to improve water quality and availability, despite the effects of storm surges and flooding. Saluafata and Lano communities have also built native tree nurseries to help reforest upland and coastal areas threatened by erosion and flooding. In Aitutaki (Cook Islands), households and small businesses are using storage tanks as part of a rainwater harvesting system aimed at combating droughts.

Infrastructure management. With a 30-metre recession in the coastline, one of the options contemplated for Saoluafata was relocation. However, this was undesirable for cultural reasons. With the development of a new school and roads further inland, however, the community is voluntarily and progressively moving inland to a less vulnerable area. In Niue, recommendations to relocate the hospital to a safer location after Cyclone Ofa in 1990 were deferred and the hospital was renovated in its original location on the coast. The hospital was subsequently destroyed by Cyclone Heta in 2004 and is now being built on a safer, upper terrace (McKenzie et al. 2005). Public infrastructure that may be needed in an emergency, such as school buildings, hospitals, and emergency services should always be located in the safest areas possible.

Island-level RMNH

In many places in the Pacific, particularly on low-lying atolls, the most appropriate planning scale for RMNH is the island. This ensures that RMNH measures are holistic, integrated and implemented by island governance bodies.

Communities in the Aitutaki atoll (Cook Islands), for example, have identified drinking water as their most pressing concern. Their water is threatened by increasing droughts, saltwater intrusion and rising tourism demands. Addressing this challenge requires practical, small-scale initiatives at the individual household and small business levels. Yet because water is a shared resource, RMNH measures require the support of the entire island. Measures selected included rainwater harvesting, leak reduction, hydroponic farming, bank loan policies to facilitate purchase of rainwater storage tanks, and education and awareness.

In Kiribati, the Government will be implementing an adaptation small grants scheme to be piloted in two outer islands in the Gilberts (North Tarawa and Tamana). The program will provide matching community grants for implementation of RMNH measures selected at the island level.

National-level RMNH

National level RMNH programs are being implemented in Samoa, Tonga, Niue and Kiribati.

Following Cyclone Heta in 2004, Niue is strengthening its national early warning system to include satellite phone back-up, solar-powered radios for outer villages and e-mail communications. The Government is also promoting vanilla as a more resilient cash crop than taro, which suffered heavy damage during the cyclone. All government buildings (including the hospital destroyed by the cyclone) are now being built on the higher terrace areas and communities in the lower terraces are being encouraged to relocate.

The Samoa and Tonga programs focus primarily on infrastructure risk management. In Samoa, this has included capacity building for shoreline defence systems design, participatory risk assessment (covering coastal and inland hazards), standardization of spatial and survey information across government agencies (to facilitate data sharing), community grants to strengthen coastal resilience and rehabilitation of roads and bridges to cyclone standards.

In Tonga, the national program has helped construct cyclone-resistant housing units, reconstruct community facilities and retrofit residential and business buildings to improved hazard standards. It also helped revise the building code and strengthen information systems in support of risk management.

The Kiribati program, scheduled to start its implementation phase in 2006, will address population settlement policies, invest in alternative aggregate sites to reduce sand mining pressures, climate-proof major public infrastructure, promote water management and continue to mainstream RMNH in key sectoral plans and programs.

RMNH measures vary substantially from site to site, depending on the risks and socio-cultural context. However, as the various Pacific Island programs mature, they will be able to provide a platform to share lessons, processes and tools.

3.5 Monitoring and evaluation

RMNH monitoring and evaluation is a discipline in its early stages of development worldwide. First, it is commonly carried out in the course of donor-financed projects which are generally too short to assess outcomes. Second, disaster impacts are highly event and site-specific. Even if a PICT collected long-term cyclone impact data on a systematic basis, it is difficult to know whether declining impacts are due to stronger resilience or simply a different cyclone path or intensity. Third, RMNH is hard to evaluate because of its reverse logic — the success of a program is measured by averting a potential disaster through a planned response, remaining in control, and quickly bouncing back from an extreme event (Benson and Twigg 2004).

Nonetheless, monitoring and evaluation are integral parts of the RMNH process. Since RMNH programs require long-term timeframes (10–15 years), benefit from continuous model improvements and are highly site specific, they require a learning-by-doing adaptive process which relies on periodic evaluations.

Monitoring and evaluation need to take place at the community and national levels and involve hazard trends as well as adaptive capacity.

At the community level, RMNH monitoring could be quite informal, based on trend perceptions by the older members of the community. Ideally, they should consider the impact of their own RMNH measures, such as rainwater harvesting, reforestation, removal of mosquito breeding areas, on previous natural hazard stresses (such as water shortages, erosion and malaria). If communities perceive these impacts to be declining, the result should be used to encourage greater efforts. If impacts are not seen to be declining, program implementers should carefully readjust the RMNH measures.

At the national level, more formal monitoring and evaluation are needed, particularly focusing on impact (rather than output) indicators, and physical hazard trends. To the extent possible, RMNH outcome indicators should be formally adopted as part of a country's performance budgeting system and linked to national development goals and the Millennium Development Goals, to allow them to be measured over the long-term and be independent of project time frames. Table 8 provides examples of possible RMNH indicators. As for community-level interventions, measures that prove ineffective should be discontinued or modified, allowing RMNH to be continuously improved.

Table 8. Examples of possible RMNH impact indicators

Sector	Indicators
National	Trends in annual mortality due to disasters
	Trends in average annual economic impact of disasters relative to previous year's GDP (in real terms)
	Trends in % population affected by disasters
	RMNH principles reflected in National Development Plans and major sector planning documents
	% change in public expenditures dedicated to RMNH
	Adoption of risk management criteria for approval of major investments
	% change in country's vulnerability index (as defined by SOPAC)
Infrastructure	Housing building codes adopted and enforced
	Climate-proof standards applied to all public infrastructure
Water	% change in economic impact of floods (or droughts) in real terms
	% decline in unaccounted-for-water in reticulation systems
Agriculture	Change in yields
	Change in loss value of output
	Changes in availability of local food during scarcity months
Coastal	Change in property values in vulnerable coastal areas (in real terms)
	Change in % coastline mapped and rated for different classes of hazards (eg erosion)
	Change in number of people settled in areas with high hazard ratings
Health	Change in epidemic potential of vector-borne diseases (eg malaria, dengue fever)

3.6 Leading the national process

No single institutional set-up will fit all Pacific Island countries, given their considerable diversity

As a general rule, PICT governments need first to accept RMNH as an integrated whole-of-government responsibility, rather than a token activity for few to implement. Secondly, they need to identify what needs to be done and who can do it best, thereafter allocating responsibilities on a rational basis.

The typical involvement of many institutions in RMNH requires strong central leadership

Leadership. A powerful central agency with a mandate for coordinating the initiatives of sectoral ministries — such as the Office of the President or Prime Minister's Department — should lead the RMNH initiatives. This agency would coordinate implementation by sectoral ministries, review legislation, plans and programs, and hold implementation agencies responsible for results and fund management. Coordination should preferably be done through a pre-existing inter-sectoral mechanism, such as a National Development Committee.

To the extent possible, the lead agency should take responsibility for RMNH — including both adaptation to climate change and hazard risk management. However, disaster response emergency services may need to be carried out by a separate (technical) agency.

Support Services and Technical Expertise. Technical staff working to support decision making (eg climate change modelling) may need to be transferred to the leading agency or provide such information on request from their own technical ministries. If so, a technical inter-sectoral committee may be required.

Responsibilities for implementation should fall to the respective sectoral ministries

Implementation. Ministries of Public Works would typically be responsible for infrastructure and water supply adaptation options; Ministries of Agriculture for food security; Ministries of Fisheries and/or Environment for coastal zone management; Ministries of Lands or Planning for spatial planning. Private sector and community initiatives should be implemented by them directly or through a facilitating body (such as a non-governmental organization). All key implementing ministries and stakeholders should be represented in the coordinating and technical committees.

An honest national debate is needed in the initial stages of RMNH programs to identify the most effective institutional mechanism, recognizing that managing natural hazards and climate change is not only an environmental problem, but a fundamental socio-economic and development challenge, intrinsically linked to sustainable development.

Figure 20. Leading national adaptation

The ideal institutional set-up is the one that makes adaptation happen – where agencies are chosen according to their accepted mandate and are coordinated by a strong central agency. In the Pacific and Caribbean, this has often been the Office of the President or Prime Minister.

3.7 Focusing regional assistance

Regional support should respond to national needs and focus on areas where external assistance to PICTs can be most effective in addressing national priorities.

As PICTs move from RMNH capacity building support to field activities, the correct scale for implementation is at or below the national level. Regional projects (because they are spread across a number of countries) tend to lack sufficient duration, funding and country presence to implement effective national RMNH programs, and are probably best limited to coordination rather than implementation of substantive, on-the-ground activities.

At the same time, regional programs should increasingly support areas where there are clear economies of scale and country demand for regional assistance. These areas include:

Technical support and training, particularly in the following areas:

- Guidelines and specifications for climate-proofing major investments
- Best-practice recommendations for strengthening important regulations and codes
- Climate change and climate variability modelling at the planning scale (national, island basis or key urban areas)
- Hazard and vulnerability mapping
- Evaluation of impacts and of RMNH options
- Tools for participatory planning and prioritization of vulnerabilities and coping strategies
- Establishment of early warning systems
- Regional monitoring (particularly for sea level rise and tsunamis)
- Professional development of national and local government staff

Fostering coordination. The second area where regional organizations should focus is in fostering coordination between national programs:

- Sharing lessons learned across PICTs
- Assistance in accessing international donor financing
- Maintaining a database of regional and international experts

Worldwide advocacy. The final area of focus for regional organizations should be worldwide advocacy on behalf of their member states. This includes preparing regional Pacific strategies as well as joint strategies for international fora such as the UN Framework Convention on Climate Change, Small Island Developing States conferences, or the World Conference on Disaster Reduction. The current Pacific Disaster Risk Reduction and Disaster Management Framework for Action 2005–2015 (prepared by SOPAC) and the Pacific Islands Framework for Action on Climate Change, Climate Variability and Sea Level Rise (prepared by SPREP) constitute examples of this role (although a more coordinated approach would be preferable).

Regional assistance to adaptation and hazard risk management should be led by a single regional agency

For historical and funding reasons, regional support for adaptation and hazard management in the Pacific has been divided amongst two major agencies of the Council for Regional Organizations in the Pacific (CROP) — SPREP and SOPAC. Climate change interest started as a response to global warming. SPREP has traditionally assisted PICTs in UNFCCC discussions. SOPAC's disaster management programs grew out of the International Decade for Natural Disaster Reduction. A similar fragmentation of mandates exists in the Caribbean.

Both programs have progressed to the stage where they should be promoting integrated adaptation and hazard risk management. Instead, by continuing to work through different focal points, they continue to exacerbate effort fragmentation at the national level.

The current roles of SOPAC and SPREP in supporting national adaptation and hazard management efforts should be enhanced by the Pacific Islands Forum Secretariat taking a stronger leadership role in setting policy directions for implementing the regional Framework for Action. This is already partially recognized in the Communiqué of the 2002 High Level Adaptation Consultation and the respective texts of the two regional frameworks. PICTs need this to realise the clear links to national economic and social planning, donor financing and sustainable development.

All CROP agencies should continue to be involved in implementation of the regional Framework for Action in their areas of comparative technical advantage: for example, the University of the South Pacific should remain the leading agency in capacity building, the Secretariat of the Pacific Community in agriculture, fisheries, health and forestry, the Forum Fisheries Agency in tuna fisheries and the South Pacific Tourism Organization in tourism.

RMNH should be seen as an integral part of the Pacific Plan

The Pacific Plan specifically addresses disaster risk reduction and disaster managment and its sustainable development principles are highly consistent with those of RMNH. It follows therefore that RMNH should become one of the major regional themes guiding the implementation of the Pacific Plan.

In particular, given the importance of natural hazards in the Pacific region,RMNH impact indicators should be included in the regional Millennium Development Goals which the Secretariat of the Pacific Community (SPC) is helping to develop. Table 8 gives examples of the types of impact indicators that could be adopted to measure progress in national resilience to disasters. Such indicators could, in time, become part of a country's standard economic development indicators and help guide regional and donor-level assistance.

Should a regional RMNH facility be supported?

In 2002 and 2003, during the course of two regional High Level Adaptation Consultations in Fiji, PICT and CROP agencies debated the possibility of establishing a regional adaptation facility. The facility was intended to help attract donor and private sector financing for adaptation in the Pacific Islands region at a time when global adaptation funds had not yet been released. It was also intended to standardize the eligibility criteria for the funds across all potential contributors and beneficiaries.

Circumstances have changed, however. A regional facility would only be advantageous if it could help PICT governments access additional funds. Currently, particularly in the more proactive countries, PICTs can probably benefit more from the recently mobilized global adaptation funds and direct bilateral assistance than from traditional donors through a regional fund. There is also a case to be made for improving the responsiveness of existing funding mechanisms, rather than creating new ones. In addition, any facility would need very low overhead costs to help PICTs access more funds than they could access directly. This is unlikely to happen in the current socio-political context. Finally, there appears to be insufficient domestic commitment from PICTs to contribute their own funds to the facility. Without this contribution, a regional facility might risk diverting much needed funds for domestic RMNH efforts, rather than help generate new funding. For the moment, at least, the case for a regional adaptation or hazard management facility appears weak.

3.8 The role of donors

Donors need to change the way they do business and create financial and policy incentives to promote RMNH

Donors play major roles in the economic development of Pacific Island countries: aid as a proportion of Gross National Income ranges from 2 percent in Fiji to as much as 52 percent in the Marshall Islands (World Bank 2005). In the past, the ready availability of grant funding for disasters, as compared to prevention funds, has created a substantial moral hazard — there is little incentive to undertake RMNH if donors always come to the rescue when disaster strikes.

This situation should change. Donors need to provide financial and policy incentives that reward countries which chose to take early action on RMNH. Examples of such incentives include:

- Make RMNH financing accessible primarily to countries that have gone some way towards strengthening their enabling environment.
- Tie a minimum proportion of all future disaster reconstruction assistance to RMNH. In addition, all infrastructure reconstruction following disasters should reflect risk reduction design standards.
- Consider a country's adoption of RMNH standards as part of the future eligibility criteria for concessional lending or grants by multilateral institutions.
- Require RMNH as part of the appraisal of all key donor projects.
- Require matching counterpart financing before the approval of RMNH programs. This would help ensure that (a) countries willing to allocate more of their own funding receive the most donor financing; and (b) the funds are targeted to areas where there is genuine national political will to proceed. Full cost financing (at 100 percent) could continue to be provided in limited cases, for unexpected expenses, community programs or pilot innovations which PICT governments might be unable to fund.
- Monitor own contributions towards disaster reconstruction vs. RMNH to ensure a continued emphasis on prevention.
- Support long-term RMNH programs (with 10–15 year horizons) and encourage cross-disciplinary collaboration, including among CROP agencies.

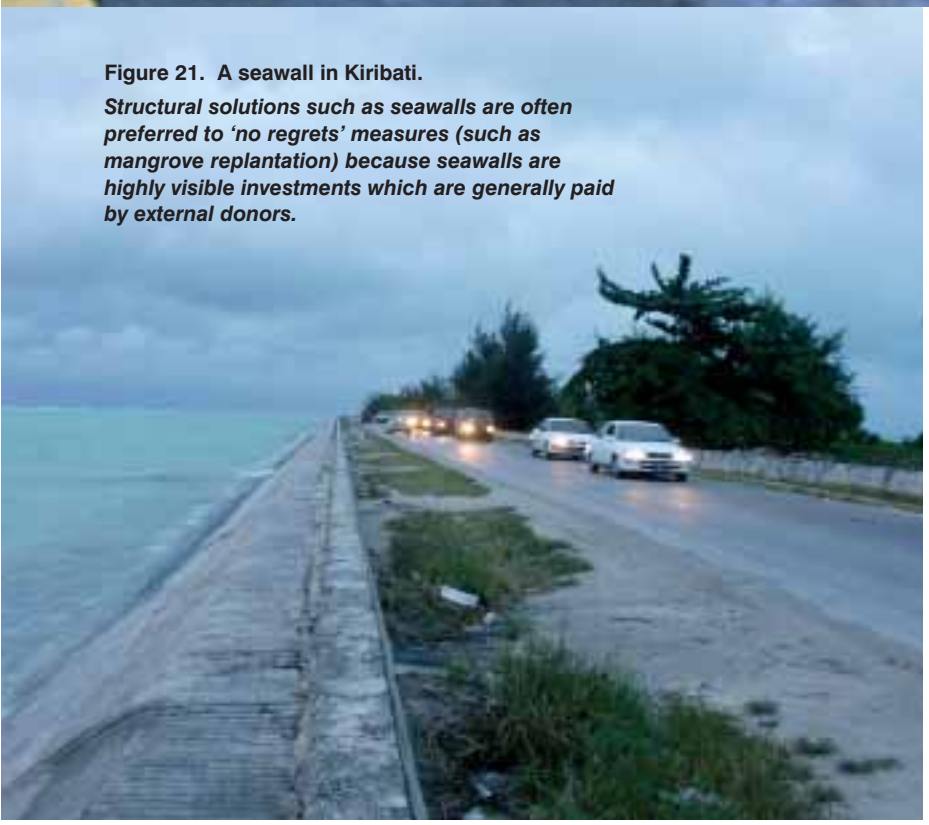


Figure 21. A seawall in Kiribati.

Structural solutions such as seawalls are often preferred to 'no regrets' measures (such as mangrove replantation) because seawalls are highly visible investments which are generally paid by external donors.

What should donors finance?

The conventional view of adaptation funding is that donors should help pay for either full costs or incremental development costs — ie those costs that countries would not normally incur in the absence of climate change or sea level rise. Neither of these practices should be encouraged. It may take 25 years for the effects of climate change to become pronounced, yet most infrastructure assets in the Pacific are built for shorter time frames. As a result, the incremental development costs will tend to be a very small proportion of the investments. Instead, both donors and PICTs should be promoting 'no regrets' measures that protect against current-day vulnerabilities while taking into account potential long-term changes. Donors should not attempt to bias national selections of RMNH measures. Rather, they should agree on well recognized selection criteria and fund RMNH on a flat proportion basis (eg 30 or 50 percent) based on the country's relative vulnerability, with higher levels of financing to the more vulnerable, low-lying atoll countries.

Grants or loans?

In general, RMNH grants are preferred to loans or credits. First, RMNH investments yield long-term benefits and PICT governments are unlikely to consider such activities attractive candidates for accumulating national debt. Second, some countries may feel that as the innocent victims of climate change impacts, they should not be required to borrow to combat it. Nonetheless, credits and/or soft loans may be acceptable in countries subject to high degrees of natural vulnerability. At the very least, access to funds for adaptation should be as easily accessible as funds for recovery and rehabilitation.

3.9 Risk transfer options and disaster insurance

Recently, several studies have investigated the option of establishing a regional insurance program in the Pacific to help PICTs cope with the financial costs of natural disasters (Shorten et al. 2003; CDMA 2005). This was partially inspired by similar initiatives in the Caribbean. The reasons for a regional insurance scheme are clear: private insurance is unaffordable to most Pacific Island people and adding in other PICTs to a regional insurance scheme could decrease costs by combining non-related risks in the same risk pool. However, in the short-term, a regional insurance program in the Pacific does not seem feasible.

The main impediment to disaster insurance is the generous post-disaster financing provided by donors

Currently, there is no strong incentive for PICT governments to participate in a regional insurance program. Their priority is to encourage economic development. Even more importantly, as long as donors stand prepared to pay for relief and reconstruction after disasters, there is little reason for PICTs to purchase insurance. For them, it makes economic sense to rely on uncertain but inexpensive post-disaster financing of disaster losses rather than a more expensive, *ex ante* risk transfer program. Hence, the need for the donor community to make clear its intentions with respect to post-disaster financing is a necessary component of any action seeking to change current behaviour. Until these issues are resolved, it is unlikely that any political support for a regional insurance program will develop.

Even if the incentive structure changed, a regional insurance scheme remains a difficult endeavour

The Pacific regional insurance program is the third such scheme to be proposed, following similar attempts in the Caribbean and Central America. After careful analytical and technical work (and support by the World Bank and Munich Re, respectively), neither of these two proposals was initiated. The main barrier in the Caribbean was the concern of cross-subsidization amongst countries: ie premiums of one country would pay for the losses of another. Despite efforts to minimize this problem, no politically acceptable solution could be found. In the case of Central America,

the problem was related to a lack of information as well as the cost of the program, which was considered prohibitive by the Government of Honduras. It is possible that the Pacific, with a solid history of cooperation and a deep reservoir of insurance expertise, might overcome such barriers, but it would not be easy.

The UN Framework Convention on Climate Change is unlikely to provide financing for regional insurance

Previous reports have suggested that regional insurance might be supported by external financing, particularly through the UNFCCC. However, in the near future, there is little potential that UNFCCC will fund disaster insurance. Unless external financing of this kind is available to make regional insurance almost free, or donors and financial institutions change the incentive structure with respect to post-disaster financing, a regional insurance program does not appear feasible at this stage.

PICT governments can still explore insurance-related avenues to manage disaster risks

Regardless of the regional arrangements, there are useful steps that can be taken at the national level to use insurance to manage the financial risks of natural hazards.

First, PICT governments should analyse the costs and benefits of insurance by identifying the risks to be covered and the resources available to meet those potential obligations.

A rigorous analysis of the costs and benefits of an *ex ante* funded insurance program would be needed. An input to such economic modelling would be the risks the government would assume post-disaster, such as reconstruction of government-owned assets, governmental responsibility for reconstruction of privately owned commercial assets (particularly for critical infrastructure that has been privatized), housing and post-disaster income support for the poor. The next stage is to consider what internal and external resources the government has available to meet these potential obligations, including post-disaster aid and borrowing. At current levels of post-disaster assistance, it may well be economically justifiable not to buy insurance for most of the risks.

A survey of government assets and current insurance coverage could be a basis for more effective insurance arrangements

To the extent that government assets are insured, this is often arranged in an ad-hoc fashion in various parts of the government. Based on a comprehensive survey of government assets and current insurance coverage, a competent insurance broker might be able to develop a program that more effectively addresses disaster risk.

Micro-insurance could assist in post-disaster housing reconstruction

Micro-insurance can be a very effective mechanism to address the need for post-disaster housing reconstruction. A key component of such a program is to design a practical post-disaster lending framework, generally consisting of pre-determined lending amounts sufficient to permit rebuilding of low income housing.

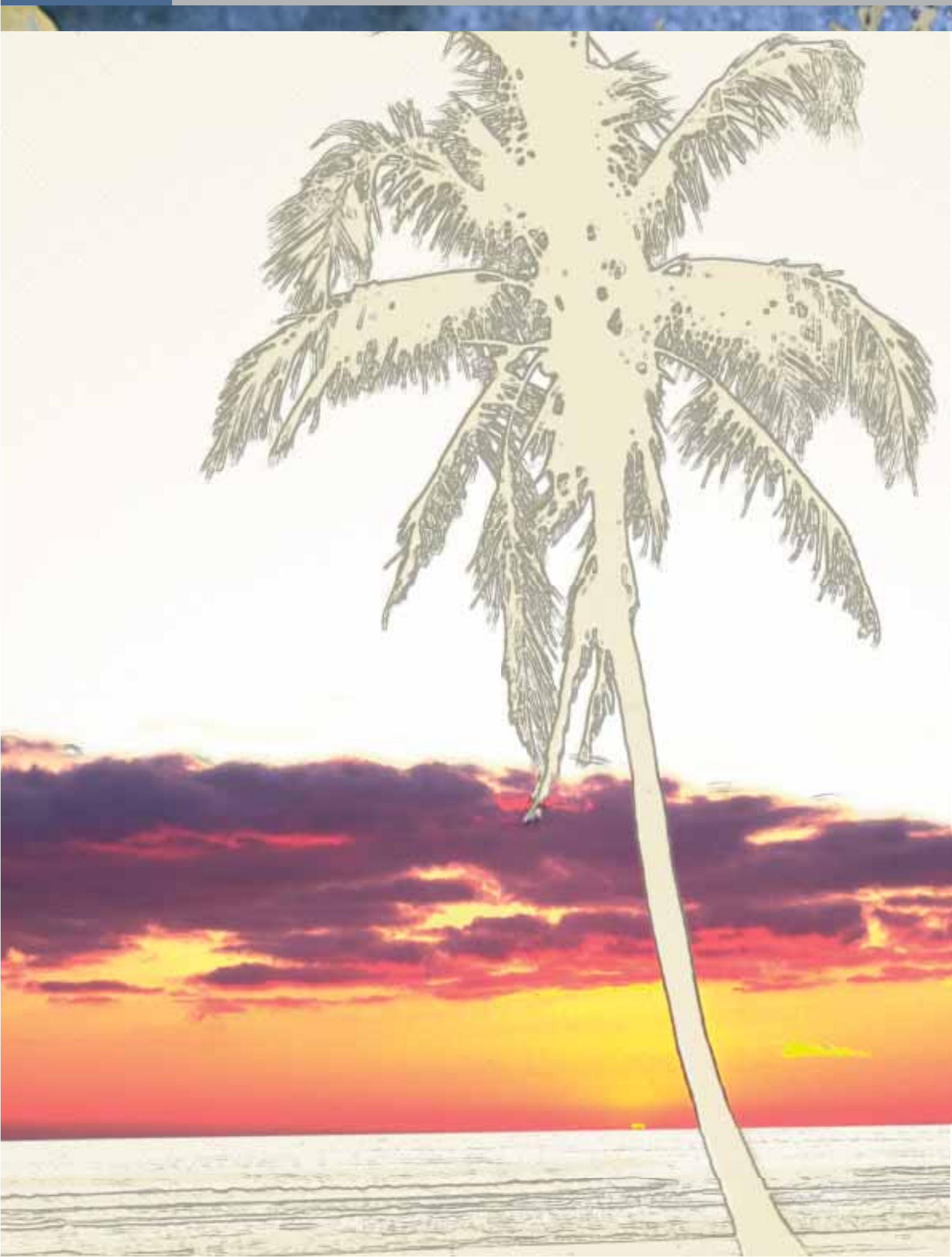
Mind the moral hazard!

The great advantage of (national or regional) government-sponsored insurance programs is the ability to spread the cost of the risk. However, this advantage must be carefully balanced against the disadvantages of government involvement, particularly the lack of instruments to control moral hazard. Unless the insurance scheme provides clear incentives for risk reduction, the availability or insurance might induce risk-taking behaviour, increasing the total risk to PICT societies.

Table 9. Insurance solutions for catastrophe risk

Solution	Moral Hazard	Adverse Selection	Loss Potential	Subsidy	Cost
Government as Insurer	High	Low	High	High	Low
Compulsory Private Insurance (UK)	High	Low	High	Medium	Medium
Compulsory State Reinsurance (France)	High	Low	High	High	Low
Compulsory State Reinsurance with Graduated Premiums (Spain)	Medium	Low	Medium	Medium	Medium
Voluntary State Program with Graduated Premiums (US)	Low	High	Medium	Low	High

Notes: Moral Hazard: changes in individuals' behaviour because their risk is borne by someone else.
Adverse Selection: when only those with high risks actually purchase the insurance.
Reinsurance program: when private insurance markets retain some portion of the risk, with the Government assuming the most expensive risk



Conclusions

While there has been relatively little experience in implementing comprehensive risk management for the range of natural hazards that affect the Pacific Islands region, there is enough evidence to support the following conclusions:

The traditional approach of 'wait and mitigate' is a substantially less desirable strategy than proactively managing risks

PICTs are increasingly exposed to natural hazards. There is no benefit in waiting to see if the projected changes attributed to global warming will affect the region. Natural hazards already take an annual toll that destroys valuable property, threatens and takes lives, and disrupts national economies. Any additional disasters arising from climate change will only make matters worse.

PICTs are not helpless in the face of natural hazards. The forces of nature are often awe inspiring, and many feel powerless to act. Yet hazards and vulnerabilities can be assessed, and actions taken to significantly reduce, if not eliminate the risks.

Managing the risks associated with natural hazards is affordable and does not need to depend solely on donor generosity

Governments and donors alike should view infrastructure and other development activities through a lens of risk management. The incremental costs to protect valuable infrastructure and lives against damage from natural hazards are relatively small, but the returns are high. Limited economic analysis in the Pacific and Caribbean regions shows that 'no regrets' measures cost only a few percent more than traditional engineering approaches while the potential benefits greatly outweigh the costs. The cost of reconstructing damaged infrastructure after a weather related disaster often approaches 20–40 percent of the original infrastructure cost, many times higher than the cost of including preventive measures into the original design.

Decision makers in government and donor agencies need to address the three I's: Incentives, Institutions, and Instruments

The current incentives are perverse, making it rational to wait for a disaster and allow others to incur the recovery and rehabilitation costs. Institutions are neither well prepared nor sufficiently accountable to take a proactive stance. The available instruments remain mired in a worldwide view that denies national ability to prevent, prepare for, and adapt to natural hazards.

Responding to disasters is highly visible and widely praised, while preventive actions are generally small, low-key steps

Few decision makers have the courage to increase the cost of projects so that they may minimize the damage from an uncertain future risk. Donors allocate emergency funds for disasters but often cannot divert them to preventive efforts. Lack of quantifiable and clear information on future impacts of natural hazards provides an added excuse for inertia. This complex set of perverse incentives needs to be changed, so that all the incentives point towards prevention. Donors, often responsible for a large part of the development budget of PICTs, bear particular responsibility for this. They need to require risk management of natural hazards as an integral component of development funding, and adequately reward countries willing to take proactive action.

Risk management of natural hazards is neither an environmental nor a disaster response function. It is a cross-cutting process which demands leadership and coordination at the highest levels of government

It is crucial that PICTs select the appropriate institutional arrangements for RMNH. A one-size-fits-all approach does not apply to all PICTs, but governments should re-examine their current arrangements and recommend appropriate changes. The leading coordinating agency needs to have the mandate to influence powerful sectoral Ministries, and should preferably be a pre-established and permanent inter-sectoral coordinating body.

Many institutions in PICTs have a weak enabling environment for a comprehensive risk management approach of their natural hazards

PICT governments need to improve performance-based fiscal management, participatory planning, and inter-sectoral coordination as priorities for good governance, regardless of how they approach risk management. Absence of such reforms will make RMNH more difficult to implement — but not impossible. There is a need to build on what is already in place. Even small steps can be started within institutions prepared to take a leadership role.

Civil society organizations which are prepared to work with responsive governments can take a lead at the community level. The private sector can demonstrate leadership through high profile investments, such as resort development.

Experience shows that top-down and bottom-up approaches are needed and have to be harmonized

Even the most effective government institutions cannot be expected to successfully implement RMNH without improving their ability to consult with local communities, and involve them in planning and implementation of risk management interventions. Local communities and their leaders will undertake the most important and effective measures, even if individually they appear insignificant. For example, communities can agree to set back houses from high water levels, without waiting for governments to impose zoning restrictions. The key is to provide accurate information in a form that local communities can use as a basis for decision making and action.

The private sector must also play its part by ensuring that privately funded activities along all coastlines, such as coastal resort development, demonstrate best available risk management practices. Most importantly, all stakeholder activities must combine synergistically, so that the whole is greater than the sum of the parts.

Regional institutions should confine their roles to regional support

The 'new regionalism' of the Pacific Islands region demands a clear separation of roles between regional and national levels. Regional institutions should increase their research and monitoring capabilities, upgrade their capacity strengthening support, and provide targeted information that supports national implementation. A key role is to monitor and study innovative approaches, such as risk transfer, that are being adopted in other island regions, and to make sure that the best available practices are disseminated widely. Donors should not confuse matters by expecting regional institutions to execute projects at the national level.

Donors need to review their own internal processes and capabilities

While donors maintain that they respond to country demands, it is indisputable that they exert a powerful influence in the Pacific Islands region. When evaluating projects and programs, donors need to scrutinize them from the point of view of risk management of natural hazards. Do they promote adaptation? Are investments sufficiently risk-proofed to remain viable in the future? Such changes will require staff awareness and training, amendment of internal policies and procedures, and strong managerial leadership.

The most effective instruments for risk management of natural hazards are those that address current risks

The adverse consequences of storm surges, king tides, tsunamis, and cyclones need to be addressed right now. PICTs should carry out hazard mapping, vulnerability assessments, and inventory assets-at-risk inventories for all hazardous areas. Protection of coastal assets and infrastructure should be undertaken as a matter of course, not left to be repaired after the inevitable damage due to extreme events.

While the added risk due to climate change may require amendment of design codes, frequency of extreme events and other standards, many of the anticipated future damages could be avoided by appropriate management of current risks.

Mainstreaming risk management into policies, plans, programs and projects is of the highest priority

All major development plans and activities should be scrutinized through the lens of risk management of natural hazards. There must be a commitment from PIC governments, donors and other stakeholders to genuinely ensure that all major development activities have taken risk management of natural hazards into account. Long term research and development should focus on how to change the behaviour of decision makers, so that they always use the lens of risk management.

Adaptation is not surrender

Dealing with natural hazards in the Pacific Islands region must start with a clear and unambiguous recognition that the region is particularly vulnerable to natural disasters and that all signs point to increasing vulnerability, especially as global warming takes hold. Apart from continuing to argue in international fora that industrialized countries should reduce their emissions, PICTs have no choice but to adapt to these new risks.

Adaptation is not fatalistic surrender to natural forces but rather adopting a sense of realism and proactive decision making that island communities demand from their leaders. The PICTs are not helpless in the face of the increasing threats.

Effective RMNH will reduce but not completely eliminate the damage caused by natural hazards. All human activity in vulnerable areas needs to be analysed to ask if the risks are manageable. If they are, implement 'no regrets' measures first while carefully examining longer-term adaptation measures. If they are not manageable, all stakeholders need to ask whether the benefits of the activities are worth the possible loss of life and property. Those communities most at risk must be given a voice in this decision as well as being appraised of viable options.

The approaches outlined above show how RMNH can be undertaken. PICTs and their partners should make sure these are implemented — urgently and effectively. It should no longer be a question of *if*, but *when* to act.

Table 10. Addressing the three constraints of RMNH – Incentives, Institutions, and Instruments

	Incentives	Institutions	Instruments
Local level	Resist the perverse incentives that allow others to shift their risks onto local communities or future generations. Facilitate greater choice over where to live and when to accept risky occupations by eliminating poverty.	Re-invigorate ancestral institutional arrangements that enabled previous generations to effectively adapt to natural hazards.	Adopt improved building codes. Develop and practice evacuation plans. Relocate critical infrastructure, such as hospitals and schools away from the most vulnerable locations.
National level	Shift donor development assistance to incorporation of risk management measures and away from continual disaster relief. Prioritize 'survival first' among competing short-term resource allocation choices. Abandon the belief that accepting adaptation now risks future compensation for climate change.	Coordinate RMNH at the highest level of government, as an economic and social 'survival' issue, rather than an environmental problem.	Mainstream RMNH into national sustainable development and economic planning. Allocate national budgets to RMNH rather than relying on donor funding of the 'development budget.' Promote no-regrets adaptation measures through preferential tax policies, subsidies, or adjusted insurance premiums.
Regional level	Provide accurate information on natural hazards and risk management in a form that national decision makers can use, without political risk.	Review emerging institutional arrangements in other small island developing states and promote best practices in PICTs.	Review the state of readiness of PICTs to address potential disasters and strengthen regional multi-hazard early warning systems.
Donor level	Make donor assistance conditional on risk reduction behaviour and impose risk management standards. Reward proactive governments. Adopt a longer time frame and broader scope for development financing.	Accept the cross-cutting nature of RMNH and deal with the complexities of inter-sectoral coordination, implementation and maintenance.	Use high visibility projects to demonstrate that RMNH strategies are cost-effective.

Glossary

Adaptation	That element of risk management of natural hazards comprising the various processes, policies and actions designed to limit the potential impacts relating to climate change, climate variability, extreme events, and sea level rise risks.
Climate change	Predicted future changes in global and local climates, including the incidence of extreme climate events, due to increased greenhouse gas concentrations in the atmosphere.
Climate proofing	Climate proofing means making an asset resistant to climate damage, not making it immune to damage from extreme events.
Cyclone	A system of winds rotating inwards towards an area of low barometric pressure.
Disaster Risk Management	The systematic management of administrative decisions, organization, operational skills and abilities to implement policies, strategies and coping capacities of the society or individuals to lessen the impacts of natural and related environmental and technological hazards through disaster risk reduction and disaster management procedures and practices.
ENSO	El Niño Southern Oscillation — a cyclical climate phenomenon involving extensive warming of the upper ocean in the eastern Pacific along the equator, bringing heavy rain to most Pacific Island countries, usually followed by periods of drought in the converse cooling period known as La Niña. ENSO events are linked with a change in atmospheric pressure which causes a pressure see-saw between the western and central regions of the Pacific Ocean. Complex interactions between the ocean and the atmosphere determine the duration and intensity of ENSO events.
Gross Domestic Product	The total value of goods and services produced by a nation within the national borders.
Hazard Risk Management	The risk management process applied to comprehensive, integrated management of all risks.
Mitigation	Action taken to reduce future damages and losses from natural disasters, such as the anticipated consequences of global climate change.

Natural disaster	Severe disruption to a community's survival and livelihood, loss of life and property resulting from a natural hazard event.
Natural hazard	A geophysical, atmospheric, or hydrological event, or series of events, that has the potential to cause significant harm or loss.
Preparedness	Activities and measures taken in advance to ensure effective response to and recovery from the impacts of hazards, including effective early warning systems, stockpiling of relief supplies, and evacuation plans.
Risk	The likelihood of a specific hazard of specific magnitude occurring in a particular location and its probable consequences for people and property.
Risk management	The decision-making process involving political, social, economic and engineering considerations with relevant risk assessments relating to a potential hazard to develop, analyse and compare regulatory options and to select the optimal regulatory response for safety from that hazard. Essentially risk management is the combination of three steps: risk evaluation; emission and exposure control; risk monitoring.
Risk Management of Natural Hazards	The management of all natural hazard risks — including climate and other natural hazards such as earthquakes and tsunamis — to minimize their potential of becoming natural disasters.
Teletsunami	A long distance tsunami that may travel quickly across oceans and impact countries remote from the point of origin.
Tsunami	A series of travelling waves of long length and period, usually generated by disturbances associated with earthquakes occurring below or near the ocean floor — also called seismic sea wave and, popularly, tidal wave. It can also be defined as a series of ocean waves produced by a submarine earthquake, landslide, or volcanic eruption.
Vulnerability	The potential to suffer harm or loss, related to the capacity to cope with a hazard and recover from its impact.

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