

MARSHALL ISLANDS



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Country Note

MARSHALL ISLANDS

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Disaster Risk Financing and Insurance

PCRAFI 2015



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The Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) is a joint initiative between the Secretariat of the Pacific Community

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Acronyms and Abbreviations

CFA	Compact of Free Association
DAEF	Disaster Assistance Emergency Fund
DRFI	disaster risk financing and insurance
DRM	disaster risk management
HFA	Hyogo Framework for Action
JNAP	Joint National Action Plan
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
PIC	Pacific Island Country
RFA	Regional Framework for Action
SIDS	Small Island Developing States
SOPAC	Applied Geoscience and Technology Division of SPC
SPC	Secretariat of the Pacific Community
SPREP	Secretariat for the Pacific Regional Environment Programme
TC	Tropical Cyclone
UNDP	United Nations Development Programme
UNISDR	United Nations International Strategy for Disaster Reduction

Currency: US\$

Section

A

Executive Summary

The likelihood that a hazardous event will have a significant impact on the Marshall Islands has risen with the increasing levels of population and assets in the urban areas of Majuro and Ebeye. The low-lying atolls are at risk of damage to both assets and people as a result of storm surges and tsunamis. In December 2008, a state of emergency was declared following weeks of high seas, which resulted from storm surges coinciding with high tides and two tropical depressions (Marshall Islands Government 2009; UNOCHA 2008). These events caused damage to roads, houses, and other infrastructure on the low-lying atolls of Majuro and Ebeye. Similar events are expected to become more frequent with climate change and rising sea levels.

The Marshall Islands is expected to incur, on average over the long term, annual losses of US\$3 million due to earthquakes and tropical cyclones. In the next 50 years, the Marshall Islands has a 50 percent chance of experiencing a loss exceeding US\$53 million, and a 10 percent chance of experiencing a loss exceeding US\$160 million (PCRAFI 2011).

The government takes an ex-ante approach to financing the cost of disasters, but the resources available are limited. While the government has a contingency budget and access to the Disaster Assistance Emergency Fund (DAEF), the immediate cash available through the former is only US\$200,000 and through the later only

US\$100,000. Consequently the government relies heavily on donor support to fund post-disaster expenditures.

The Marshall Islands has a maximum amount of US\$15.6 million potentially available in ex-ante instruments to facilitate disaster response, which is equivalent to 44 percent of the recurrent budget in 2013. These contingent funds are composed of US\$0.2 million from the contingency budget, US\$0.1 million from the DAEF, and the maximum payout of US\$15.3 million from the Pacific Catastrophe Risk Insurance Pilot. It is estimated that there is a 1 percent chance in any year that disaster losses will exceed the total amount available. However, it should be noted that the risk insurance pilot will release funds only if certain pre-agreed upon event magnitudes are reached. If the contingency budget and DAEF alone are considered, there is an 18.6 percent chance that funds will be exceeded in any one year.

The government's post-disaster budget execution process relies on a variety of financial tools, but the size of the economy limits access to immediate post-disaster cash resources. The government has dedicated, yet limited, funds that can be accessed following an event and used effectively; however, not all currently followed procedures are embedded within the financial legislature, including those

related to the unique requirements of post-disaster financing.

A number of options for improving disaster risk financing and insurance are presented here for consideration:

- (a) **develop an integrated disaster risk financing and insurance strategy;**
- (b) **assess the domestic insurance market for both public and private assets to establish what products are currently offered and to determine their level of uptake;**
- (c) **carry out a quantitative analysis to determine whether contingent credit could be an effective tool to access additional liquidity post-disaster; and**
- (d) **investigate the possibility of establishing policies for financial assistance to disaster victims in remote communities.**

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Introduction

The Marshall Islands has a land area of 181km² scattered across a collection of 29 atolls and five islands. Most of the atolls and islands have an elevation of less than 6m above sea level, including the capital, Majuro, many parts of which are less than 1m above sea level. The low-lying atolls and islands lie in an expanse of ocean of almost 2 million km². This scattered geography increases both the time and cost involved in initial post-disaster response.

According to the 2011 Population and Household Census, the population of the Marshall Islands is 53,158.¹ The two urban centers, Majuro and Ebeye (a small islet on Kwajalein atoll), have populations of 28,000 and 9,614, respectively. Ebeye has the highest population density in the Pacific, equivalent to an estimated 66,750 people per square mile; this is higher than the population density in Tokyo, estimated at 15,619 people per square mile.²

Events in 2013 demonstrated that the Marshall Islands is extremely vulnerable to the threat of both storm surge and drought.

In May 2013 a statement of emergency was issued because of severe drought conditions in the atolls of Mejit and Utrik, located in the north. In contrast, flooding forced the airport on the main island of Majuro to close on June 25, 2013. The seawall that protects the runway broke in four places as a result of high tides and an associated storm surge. Both of these incidents highlight the vulnerability of the population and their assets, both public and private.

The Marshall Islands government, in conjunction with the Secretariat of the Pacific Community Applied Geoscience Division (SPC-SOPAC), the Secretariat of the Pacific Regional Environment Programme (SPREP), the United Nations Development Programme (UNDP) Pacific Centre, the United Nations International Strategy for Disaster Reduction (UNISDR), and other partners, has developed several institutional frameworks on disaster risk management (DRM) and climate change adaptation at the national, subregional, and international level, including the following:

- Hyogo Framework for Action (HFA) 2005–2015
- Pacific Disaster Risk Reduction and Disaster Management Framework for Action (Regional Framework for Action or RFA) 2005–2015
- National Action Plan for Disaster Risk Management, 2008–2018
- Marshall Islands Emergency Response Plan, 2010
- Policy for Climate Change Adaptation, 2006
- Joint National Action Plan (JNAP) for Disaster Risk Management and Climate Change Adaptation, 2011–2014

Disaster risk financing and insurance (DRFI) is a key activity of the HFA Priorities for Action 4 and 5.

The HFA is a result-based plan of action adopted by 168 countries to reduce disaster risk and vulnerability to natural hazards and to increase the resilience of nations and communities to

disasters over the period 2005–2015. In the Pacific, the HFA formed the basis for the development of the Regional Framework for Action.

The RFA cites DRFI activities as a key national and regional activity. Theme 4—“Planning for effective preparedness, response and recovery”—has an associated key national activity, “Establish a national disaster fund for response and recovery.” Theme 6 of the RFA—“Reduction of underlying risk factors”—cites the development of “financial risk-sharing mechanisms, particularly insurance, re-insurance and other financial modalities against disasters as both a key national and regional activity” (SOPAC 2005). These regional implementation activities align with the three-tiered disaster risk financing strategy developed by the World Bank.

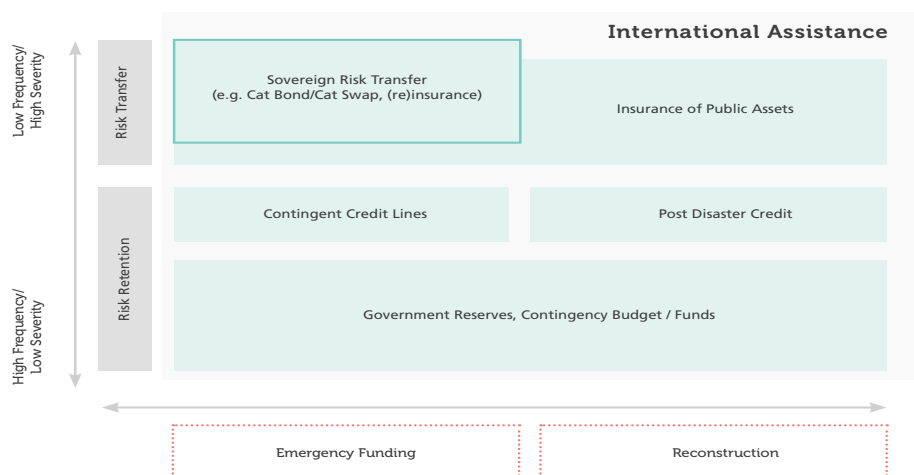
Goal 2 of the Marshall Islands (2007) National Action Plan for Disaster Risk Management seeks to “mainstream DRM in planning, decision making and budgetary processes at national and local levels.” This goal includes establishing a sustainable fund for DRM.

The Pacific Disaster Risk Financing and Insurance Program enables countries to increase their financial resilience against natural disasters by improving their capacity

to meet post-disaster funding needs without compromising their fiscal balance. This program is one application of the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI). The Pacific DRFI Program is built upon a three-tiered approach to disaster risk financing. These layers align to the basic principles of sound public financial management, such as the efficient allocation of resources, access to sufficient resources, and macroeconomic stabilization. The three tiers acknowledge the different financial requirements associated with different levels of risk: (i) self-retention, such as a contingency budget and national reserves, to finance small but recurrent disasters; (ii) a contingent credit mechanism for less frequent but more severe events; and (iii) disaster risk transfer (such as insurance) to cover major natural disasters. See figure 1.

This report aims to build understanding of the existing DRFI tools in use in the Marshall Islands and to identify gaps where engagement could further develop financial resilience. The report also aims to encourage peer exchange of regional knowledge, specifically by encouraging dialogue on past experiences, lessons learned, optimal use of these financial tools, and the effect these tools may have on the execution of post-disaster funds.

Figure 1 — Three-Tiered Disaster Risk Financing Strategy



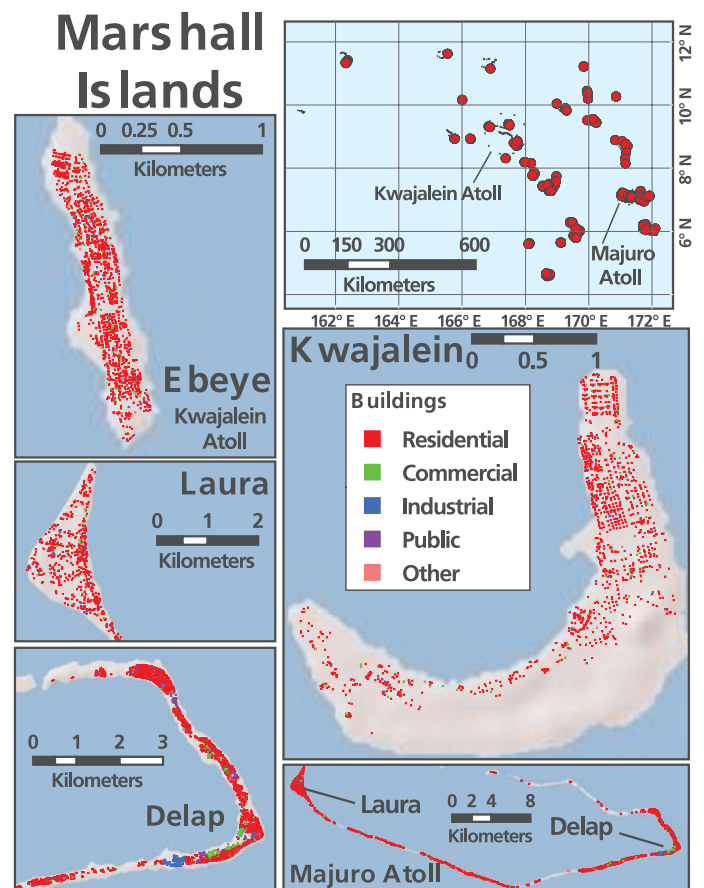
Source: World Bank 2010.

Economic Impact of Natural Disasters

Between 1988 and 2008, 18 natural disasters affected around 12,700 people in the Marshall Islands. The estimated direct cost of these events was US\$317 million (SPC-SOPAC 2012). Half of these disasters were slow-onset disasters such as droughts. Droughts have made access to safe water an especially important issue for the Marshall Islands. Droughts also increase the risk of water-borne diseases, since the supply of water for both drinking and sanitation is limited. The frequency of drought events suggests that there may be a case for establishing a drought response budget line.

The likelihood that a hazardous event will have a significant impact on the Marshall Islands has risen with the increasing levels of population and assets in the urban areas of Majuro and Ebeye. These low-lying atolls are at risk of damage to both assets and people as a result of storm surges and tsunamis. In December 2008, a state of emergency was declared following weeks of high seas, which resulted from storm surges coinciding with high tides and two tropical depressions (Marshall Islands Government 2009; UNOCHA 2008). These events caused damage to roads, houses, and other infrastructure on the low-lying atolls of Majuro and Ebeye. Similar events are expected to become more frequent with climate

Figure 2 — Building Locations

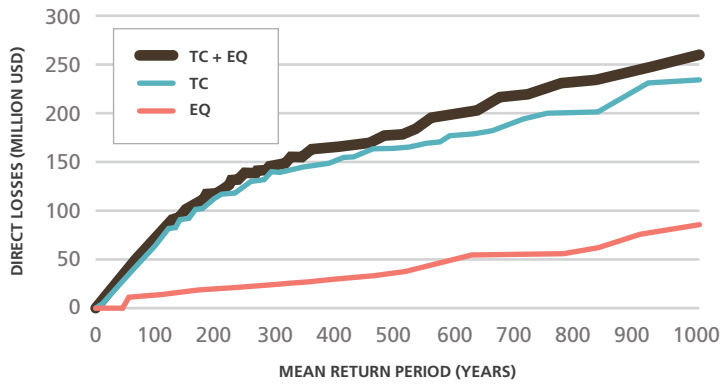


Source: PCRAFI 2011.

Section

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Figure 3 — Direct Losses by Return Period



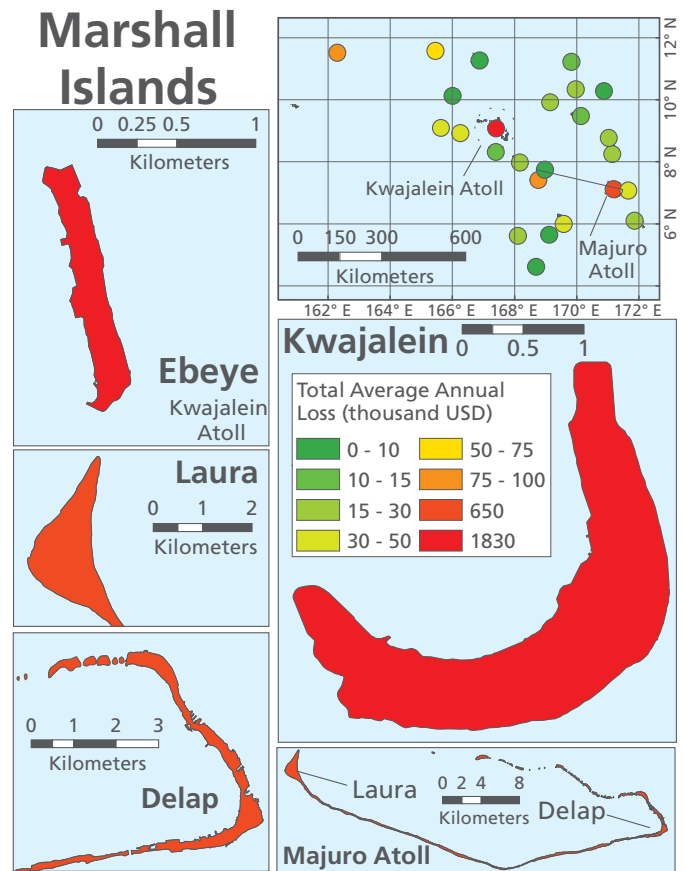
Source: PCRAFI 2011
 Note: TC = tropical cyclone; EQ = earthquake.

change and rising sea levels. Figure 2 shows the location of buildings in the Marshall Islands and provides an indication of the assets that have accrued over time.

The remote atoll and island subsistence economies are highly dependent on agriculture, which in turn is highly susceptible to adverse weather conditions. An estimated 6,384 people were affected by the drought in 2013 (RMI 2013b). Household water catchments and other water storage facilities ran out of water, and levels of salinity in underground water sources breached safety levels for consumption. The prolonged drought and high groundwater salinity levels devastated food crops such as breadfruit, banana, and taro. This situation will have long-lasting impacts on food security and the health of the populations of the affected atolls.

The Marshall Islands is vulnerable to losses from tropical cyclones, which cause damage to buildings, infrastructure, and livelihoods. In 1997, for example, Typhoon Paka caused US\$80 million of damage to crops and affected 70 percent of houses on Ailinglaplap Atoll (PCRAFI 2011). During a 20-year period, cyclones in the Marshall Islands caused on average US\$63 million per

Figure 4 — Average Annual Losses by Area



Source: PCRAFI 2011

Section

cyclone (SPC-SOPAC 2012); Typhoons Zelda, Axel, and Gay caused significant damage and loss within the span of one year (1991–1992).

The Marshall Islands is expected to incur, on average, US\$3 million per year in losses due to earthquakes and tropical cyclones. In the next 50 years, it has a 50 percent chance of experiencing a per-event loss exceeding US\$53 million, and a 10 percent chance of experiencing a per-event loss exceeding US\$160 million (see figure 3).

The expected average annual loss can also be shown by area, as in figure 4. Areas colored in red indicate high levels of average annual losses, ranging from US\$0.78 million to US\$2.1 million. The full risk profile for the Marshall Islands can be found in annex 3.

▼ **Photo Credit**
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Public Financial Management of Natural Disasters

In the Marshall Islands, a major constraint in financial response to natural disasters is the limited number of staff to implement activities. Authority lies with a few key individuals who are also responsible for many other portfolios of work. The drought response occurred at an already busy time—that is, when the Ministry of Finance was preparing for the annual regional Forum Leaders Meeting and working on the 2014 budget and annual donor round table.

The Compact of Free Association (CFA) agreement, established with the United States in 1986, provides the Marshall Islands with economic assistance worth around US\$45 million a year until the agreement expires in 2023. In 2013 the CFA agreement provided over US\$72 million in funds in total. But use of the funds must be related to the specific areas detailed in the agreement, which states that “funds received under the CFA, as amended shall not be transferred to any other activity, or reprogrammed or expended for any other purpose during the financial year” (Marshall Islands Government 2013a).⁴

The CFA agreement was amended in 2004 to include specific guidance on establishing the Disaster Assistance Emergency Fund (DAEF)—discussed below—and accessing additional post-disaster financial support from the U.S. Agency for International Development (USAID). According to the amended CFA, additional finance is available once one of the following criteria is met: “(i) the President of the Republic of the Marshall Islands officially declares a national state of emergency in accordance with the laws of the Government of the Republic of the Marshall Islands; (ii) the disaster is deemed to be beyond the ability of the Government of the Republic of the Marshall Islands to respond, including taking into account the available resources of the Disaster Assistance Emergency Fund and the need to protect the sustainability of the Fund; or (iii) the Government of the Republic of the Marshall Islands has requested assistance through the United Nations designated representative for the coordination of disaster and humanitarian assistance.” (CFA 2004).

In 2004, the renewal of the CFA agreement provided a stream of grants, due to decline over time, that were aimed primarily at

the education, health, and infrastructure sectors. When the annual grants under the CFA agreement cease in 2023, the Marshall Islands' fiscal stress is likely to increase, as is its financial vulnerability to natural disasters.

The Marshall Island already faces many challenges associated with gaining economic and fiscal self-sufficiency, and these are made greater by the occurrence of natural disasters.

Effective post-disaster financial response relies on two fundamental capabilities:

- (a) The ability to rapidly mobilize funds post-disaster; and
- (b) The ability to execute funds in a timely, transparent, and accountable fashion.

The next section discusses the existing procedures for post-disaster budget mobilization and execution and where possible provides examples of their use.

Post-Disaster Budget Mobilization

The Ministry of Finance plays a leading role in facilitating disaster response efforts. The ministry waives normal tendering procedures upon receipt of the statement of emergency, and it executes payments rapidly, sometimes on the same day. Following the declaration of disaster in May 2013, the Ministry of Finance led a national post-disaster assessment of the ongoing drought in the northern islands, and it led a flash-funds appeal to generate and consolidate donations from members of the public and local businesses.

The government takes an ex-ante approach to DRFI, but its available resources are limited.

While the government has a contingency budget and access to the DAEF, the immediate cash available through the former is US\$200,000 and

Table 1— Sources of Funds Available

	SHORT TERM (1-3 MONTHS)	MEDIUM TERM (3-9 MONTHS)	LONG TERM (OVER 9 MONTHS)
<i>Ex-post Financing</i>			
Donor Assistance (relief)			
Budget Reallocation			
Domestic Credit			
External Credit			
Capital Budget Realignment			
Donor Assistance (reconstruction)			
Tax Increase			
Tax Incentives (Flash Appeal)			
<i>Ex-ante Financing</i>			
Emergency Fund			
Contingency Budget			
Contingent Credit			
Sovereign (parametric) Catastrophe Risk Insurance			
Traditional Disaster Insurance			

Source: Government of Marshall Islands; World Bank.

Box 1— The Pacific Catastrophe Risk Insurance Pilot

The Pacific Catastrophe Risk Insurance Pilot aims to provide immediate budget support following a major tropical cyclone or earthquake/tsunami. The insurance is designed to cover emergency losses, which are estimated using both a modeled representation of the event based on hazard parameters and a calculation of total modeled physical damage. Unlike a conventional insurance scheme, where a payout would be assessed against actual incurred costs, this scheme pays out on the results of a model. The advantage of this approach is that it results in a much faster payout. The payout would act as a form of budget support and would go some way to cover the costs that would be incurred by the

government in the aftermath of a severe natural disaster that disrupts the provision of government services. Countries can choose between three layers of coverage—low, medium, and high—depending on the frequency of events. The lower layer will cover events with a return period of 1 in 10 years, that is, more frequent but less severe events. The medium layer will cover events with a 1-in-15-year return period, while the higher layer will cover less frequent but more severe events, or those with a return period of 1 in 20 years. However, countries may request that a more customized option be developed for them.

through the latter is US\$100,000. Consequently the government relies heavily on donor support to fund post-disaster expenditures.

Ex-post financial measures such as post-disaster budget reallocation take between one and two weeks to mobilize and require cabinet approval. Reprogramming of funds can be done only following the declaration of disaster, which is normally a few weeks after the statement of emergency. This means that the reprogramming of funds between ministries can take up to six weeks, although ministers can reprogram up to 5 percent of their budget between departments with relative ease. Interdepartment reprogramming can be done within one or two days following the declaration of disaster.

The Marshall Islands has a variety of ex-ante and ex-post financial tools, and the time it takes to mobilize and execute these funds varies significantly. Building on the World Bank disaster risk financing and insurance framework (see annex 1), table 1 shows the ex-ante and ex-post financial tools available, indicates those utilized by the Marshall Islands, and gives indicative timings. The tools utilized by the Marshall Islands are highlighted in blue. Those sections highlighted

in gray are for generic instruments that to date have not been used in the Marshall Islands.

Ex-Ante Practices and Arrangements

The uncertainty surrounding international assistance has increased pressure on countries to establish domestic sources of finance for post-disaster relief. This includes the establishment of national reserves or the transfer of risk to the international insurance market. The ex-ante practices and arrangements that have been made by the Marshall Islands are described below.

Disaster Assistance Emergency Fund

Under the CFA agreement with the United States government, the DAEF was legally established in 2004. The fund, which may be drawn on only to pay for assistance and rehabilitation after a disaster or emergency, was first implemented in 2005. Each year, upon receipt of US\$200,000 from the Marshall Islands government, the DAEF receives an equal amount in the form of a grant from the United States. The funds held within the DAEF can accrue interest until they are released post-disaster. The total

amount in the fund as of June 2013 was just over \$1.5 million.

The amount of funding released following an event was increased in 2013 as a means of setting a precedent for other donor funds.

After the government declares a state of national emergency, it can withdraw an amount of up to US\$100,000 per event. This amount reflects renegotiation in 2013: initially, the amount was S\$50,000, but it became apparent that other donors saw this amount as a precedent and contributed the same amount. The same pattern was witnessed during the drought response in March 2013: after the government withdrew US\$100,000, other donors matched this amount with their initial contributions.

Contingency budget

The Marshall Islands holds a nominal contingency budget for the payment of unforeseen expenditures equivalent to US\$200,000 each year. The process for deciding to draw on these funds is not legislated but reflects self-imposed restraint and prudence by the staff at the Ministry of Finance. The limited amount of cash means it can be easily exhausted either by a disaster or another unforeseen event.

Sovereign catastrophe risk insurance

The Marshall Islands' participation in the Pacific Catastrophe Risk Insurance Pilot provides access to an injection of liquidity within the first month of an eligible disaster.

The pilot was launched on January 17, 2013, and the Marshall Islands opted for coverage against tropical cyclones with the associated hazards of storm surge, precipitation from tropical cyclone, and flooding caused by tropical cyclone (see table 2).

In the event that the Marshall Islands experiences a tropical cyclone with an estimated emergency loss that exceeds the selected attachment point, the country will be eligible for a payout worth over five times its contingency budget. Events that generate an emergency loss⁵ beneath the attachment point must be managed by optimizing the use other financial tools.

External debt

The current stock of public debt is equivalent to 55.9 percent of gross domestic product (IMF 2013). Of this, approximately 97 percent is external. An estimated 64 percent of the external debt is central government debt

Table 2— Selected Insurance Coverage, 2014–2015 Pilot Season

	TROPICAL CYCLONE
Policy period	November 1, 2014–October 31, 2015
Peril selected	Tropical cyclone
Layer of coverage selected	1 in 15 years
Coverage limit as a percentage of contingency budget	>500 percent
Reporting agency	Joint Typhoon Warning Center

Source: World Bank.

to the Asian Development Bank, with the balance being state-owned enterprise debt guaranteed by the central government.

The Asian Development Bank debt is all on concessional terms. It is therefore expected that the level of existing debt will remain manageable in the coming years, although an increase in both principal repayments and interest is expected to occur from about 2017. The current debt-service ratio is estimated to be equivalent to 10 percent of the export of goods and services, down from 16.5 percent in 2010 (IMF 2013).

Given the relatively low levels of debt servicing, increasing the use of contingent credit could be explored as an alternative to securing cash reserves for disaster response.

The opportunity cost of holding cash is high for a country that is driven by the expenditures of the public sector. Holding cash may also result in the diversion of funds from investment in the health and education sectors, which would have long-term development impacts.

Ex-Post Practices and Arrangements

Because disasters often exceed a country's capacity to cope with them, there will always be a need for ex-post practices and arrangements. An optimal strategy for DRFI relies on a combination of ex-ante and ex-post financial instruments. Ex-post arrangements benefit from being able to establish the extent of the disaster and prioritize the response needs. As a result these arrangements take longer to implement than ex-ante arrangements, but they can often mobilize larger amounts of finance. This section discusses the ex-post practices and arrangements that have been made by the Marshall Islands.

Budget reallocation

The Marshall Islands, like many small island states, has limited sources of domestic revenue and limited budget flexibility. The largest sources of domestic revenue are taxes on trade and consumption, closely followed by revenue from taxes on income and profits, which respectively generated US\$17.3 million and US\$11.3 million in fiscal year 2012/13 (IMF 2013). Grants from the CFA and from development partners amounted to \$59.2 million. This means that contributions from donors account for approximately 62 percent of the annual budget. The country's limited budget flexibility and limited immediate access to cash make it difficult to fund disaster response domestically.

The reprogramming of funds requires cabinet approval under Article VII, Section 7 of the Marshall Islands Constitution, and a maximum of 5 percent of funds can be reprogrammed.

However, under the Financial Management Act 1990, ministers may reprogram funds between their departments with approval from the Secretary of Finance (Marshall Islands Government 1990). Table 3 shows the total budget classified into three core categories: wages, commitments, and operations. Of those three categories, only the amount allocated for operations could be reprogrammed in the wake of a disaster—that is, US\$3.6 million for the fiscal year 2013.

Donor funds for relief and reconstruction

While donor funds will always be required following a disaster, there will always be an element of uncertainty surrounding how much will be provided, what will be provided, and when the funds will arrive in country. Consequently, overdependence on international relief as a source of post-disaster financing can

Table 3— Fiscal Year 2013 Proportion of General Budget Expenditures

	FISCAL YEAR 2013 US\$M	% OF TOTAL NUDGET
Wages and salaries	19	53 percent
Commitments	13.1	37 percent
Operations	3.6	10 percent
Total budget	35.7	100 percent

Source: Marshall Islands Government 2013a.

delay the provision of initial relief and can inhibit ex-ante contingency planning. Development partners, international organizations, local nongovernmental organizations, businesses, and individuals contribute in the form of cash grants and aid in kind. The provision of aid in kind, while vital, can affect the costs borne by governments for the distribution these goods.

Donor assistance for reconstruction often takes significant amounts of time and involves negotiation between the country and its donors to establish key priorities. However, significant amounts of finance can be assigned. For example, the total response plan for the drought in 2013 was estimated at US\$4.8 million, of which US\$1.5 million was funded by contributions from donors and development partners.

Flash appeal

Following the statement of emergency for the drought in 2013, the Ministry of Finance led a flash appeal to generate and consolidate donations from members of the public and local businesses. This is the first time the government has led such an appeal to collect funds for relief and response efforts.

Total Response Funds Available

The Marshall Islands has a maximum amount of US\$11.2 million available in ex-ante instruments to facilitate disaster response,

which is equivalent to 44 percent of the recurrent budget in 2013. Figure 5 shows the three-tiered DRFI strategy alongside the sources of funds and the maximum amounts of funding available to the Marshall Islands following an event. However, it should be acknowledged that the contingency budget is not exclusively for disaster response, and it is unlikely that the full US\$0.2 million would be available for response. In addition, there is likely to be a significant gap after the contingency and DAEF have been exhausted before a payout under the catastrophe risk insurance pilot would be triggered. Additional tools and donor funds should be used to minimize any such gap. It is estimated that there is a 1 percent chance in any year that disaster losses will exceed total response funds available. However, there is an 18.6 percent chance that disaster losses will exceed the combined funds of the contingency and DAEF in any one year.

Post-Disaster Budget Execution

While it is commonly accepted that the Ministry of Finance waives normal tendering procedures following the statement of emergency this process has yet to be formally documented. This oversight could give rise to problems in the future. At the moment, the process depends on the knowledge of a few key individuals, but without adequate formal documentation ministry staff could cease this practice in the future. Given that the statement of emergency allows access to the DAEF and enables expenditure from the contingency fund, this possibility poses some concern.

The CFA clearly lays out the eligibility process for accessing funds post-disaster. This means that it has been easy to access and expend funds following events such as the storm surge in 2008 and the drought in 2013. However, the initial

disbursement of US\$100,000 from the DAEF sets a precedent for other donors that in the future could prove insufficient and that will require regular revisions.

The process for budget reallocation is detailed in Article VII, Section 7 of the Marshall Islands Constitution and appears to be working well.

The process for the transfer of funds between subcategories in the same program area is stipulated in the Financial Management Act, which says that budget reallocation from one ministry to another requires cabinet approval, while transfers between subcategories in the same department require the approval of the minister responsible and the secretary of finance.

In the past, ministers have made only limited use of their authority to reprogram funds following a disaster. Anecdotal evidence suggests that on average, only 1 percent of funds are reprogrammed. Instead the favored approach has been to reduce budgetary allocations for the

Figure 5 — Amount of Ex-Ante Funds Available for Immediate Response

Disaster risks	Disaster risk financing instruments	Amount of funds available
<p>High-risk layer (E.G. Major earthquake, major tropical cyclone)</p>	<p>Disaster risk insurance</p>	<p>Catastrophe risk insurance coverage: (US\$10.9m)</p>
<p>Medium-risk layer (E.G. Floods, small earthquakes)</p>	<p>Contingent credit</p>	
<p>Low-risk layer (E.G. Localized flood, landslides)</p>	<p>Contingency budget, national reserves, annual budget allocation</p>	<p>Contingency budget: (US\$0.2m) DAEF: (US\$2.8m)</p>

Source: World Bank.

following fiscal year. In 2008 a national state of emergency was declared as the prices of imports, notably fuel, soared. To help fund the rising import bill, all government departments were asked to reduce their total budget expenditure by 5 percent in 2011. As a small island economy with limited reserves, the Marshall Islands has little capacity to deal with increasing prices.


The 2013 drought highlights the vulnerability of communities located in the outer islands and the high cost of facilitating response to these areas. The estimated cost of transporting the relief supplies to the affected islands was over US\$1 million (Marshall Islands Government 2013b). This includes the hire of five boats to visit three islands each, with each trip expected to take 14 days. It also includes the charter of a plane to bring necessary medical supplies to all 15 of the affected islands. The total response plan was estimated to cost US\$4.8 million, of which US\$2.1 million was financed by contributions from donors and the government. This left a financing gap of US\$2.7

million, of which US\$1.1 million was identified for immediate needs.

The government covered about 10 percent of the total cost of the 2013 drought response plan, equivalent to 14 percent of the operational budget, and more than could be reprogrammed under section Article VII of the constitution. Given the limited availability of immediate cash, the Marshall Islands government could have trouble meeting its financial commitments beyond 2013.

Overall, the post-disaster budget execution process works well in the Marshall Islands and employs a variety of financial tools, but the small size of the economy means that access to immediate cash is limited. The government has dedicated, yet limited, funds that can be accessed following an event and is able to utilize these effectively, but not all procedures are embedded within the financial legislature, especially those related to the unique requirements of post-disaster financing.

▼ **Photo Credit**

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Domestic Catastrophe Risk Insurance Market

The non-life (general) insurance market in the Marshall Islands is small, with an estimated total premium of US\$3 million.

There are no local non-life insurers, and all business is placed offshore by two insurance agencies. The Marshalls Insurance Agency advised that it places the majority of its insurance business with Century Insurance Co. Ltd., a company based out of Saipan in Northern Mariana Islands, with an A. M. Best financial security rating of BBB. Meanwhile, Moylan's Insurance Underwriters Inc. is based in Guam and has a branch in the Marshall Islands. Moylan's (Marshall Islands) advised that it places its insurance business with two companies, Dongbu Insurance Co. Ltd., which is based in South Korea and has an A. M. Best financial security rating of A, or First Net Insurance Co. Ltd., which is based in Guam and has an A. M. Best financial security rating of B

The non-life insurance premium in the Marshall Islands is approximately US\$57.00 per capita, lower than the average for Pacific Island Countries, which indicates relatively low insurance penetration.

At present the insurance industry is unregulated. However, anecdotal evidence suggests that the government is looking to change

this and hopes to encourage growth in this industry going forward.

Insurance for catastrophe insurance perils of typhoon (cyclone) and earthquake are not readily available in the market. Typhoon (cyclone) insurance is available only on an individual building-by-building basis, subject to insurance underwriters' express acceptance. Property insurance rates for the typhoon peril are considerably higher than the Pacific average, at between 1 percent and 3 percent of value (depending on construction and value), with a deductible of 10 percent of the sum insured. No rating information was available on the earthquake/tsunami peril.

The Marshall Islands government does not have a formal risk financing or property insurance program in place for key public buildings or infrastructure assets. Consequently, it is not known whether government-owned statutory authorities and utility companies have property insurance programs in place. It is known that the Ministry of Public Works insures some individual public buildings but not whether those policies include the perils of typhoon and earthquake/tsunami.

Section

04

Options for Consideration

The Marshall Islands has implemented several DRFI tools to improve its financial resilience to natural disasters. To build further on these developments and minimize any potential loss of institutional knowledge the following recommendations are suggested for consideration.

Recommendation 1: Develop an integrated disaster risk financing and insurance strategy.

This strategy would identify solutions to provide additional liquidity to complement the US\$0.3 million available. It would also aim to produce a post-disaster budget execution manual to help embed the existing processes and remove the risk of lapse should key staff leave the Ministry of Finance.

Recommendation 2: Conduct an assessment of the domestic insurance market for both public and private assets to establish what products are currently offered and to determine their uptake. At present the domestic insurance market is extremely limited. It appears that insurance can be purchased only on the two largest atolls of Majuro and Ebeye.

The extent of insurance coverage remains to be ascertained.

Recommendation 3: Explore the use of other DRFI instruments, such as contingent credit, to access additional liquidity post-disaster, and identify providers of this type of finance.

The advantage of this type of instrument is that countries would only be receive the funds following an event. This could be a plausible option for financing response to comparatively frequent events, such as droughts and storm surge.

Recommendation 4: Investigate the possibility of establishing disaster-linked social safety net programs. These could involve the application of insurance to a social safety net program or perhaps the utilization of cash-for-work programs. These measures could help those located furthest away from the main economic centers. These communities are often the most vulnerable to natural hazards and suffer disproportionate impacts on their living standards following an event.

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End Notes

¹ A summary of the Marshall Islands 2011 Population and Household Census is available at <http://www.doi.gov/oia/reports/upload/RMI-2011-Census-Summary-Report-on-Population-and-Housing.pdf>.

² The calculation is based on figures from Tokyo Metropolitan Government, <http://www.metro.tokyo.jp/ENGLISH/PROFILE/overview03.htm>.

³ Priority for Action 4—“Reduce the Underlying Risk Factors”—has an associated key activity of financial risk-sharing mechanisms, such as insurance, while Priority for Action 5—“Strengthen disaster preparedness for effective response at all levels”—includes the establishment of emergency funds such as contingency budget, national reserves, and annual budgetary allocations. See UNISDR (2005).

⁴ “Reprogrammed” funds are those transferred between ministries; as defined in the Financial Management Act 1990, they are “appropriated funds which are shifted to another program area” (Marshall Islands Government 1990).

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About PCRAFI

The Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) is a joint initiative between the Secretariat of the Pacific Community through its Applied Geoscience and Technology Division (SPC-SOPAC), the World Bank, and the Asian Development Bank, with financial support from the government of Japan, the Global Facility for Disaster Reduction and Recovery (GFDRR), and the European Union, and with technical support from Air Worldwide, New Zealand GNS Science, and Geoscience Australia.

The initiative aims to provide the Pacific Island Countries (PICs) with disaster risk modeling and assessment tools for enhanced disaster risk management, and to engage PICs in a dialogue on integrated financial solutions to increase their financial resilience to natural disasters and climate change. The initiative is part of the broader agenda on disaster risk management and climate change adaptation in the Pacific region.

The Pacific Disaster Risk Financing and Insurance (DRFI) Program is one of the many applications of PCRAFI. It is designed to increase the financial resilience of PICs by improving their capacity to meet post-disaster financing needs without compromising their fiscal balance. Through DRFI, technical assistance is available to PICs to build capacity in the public financial management of natural disasters. The technical assistance will build on the underlying principles of the three-tiered

disaster risk financing strategy and focus on three core aspects:

- the development of a public financial management strategy for natural disasters, recognizing the need for ex-ante and ex-post financial tools;
- the post-disaster budget execution process, to ensure that funds can be accessed and disbursed easily post-disaster; and
- the insurance of key public assets, to resource the much larger funding requirements of recovery and reconstruction needs.

The PICs involved in PCRAFI are the Cook Islands, the Federated States of Micronesia, Fiji, Kiribati, the Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, the Solomon Islands, Timor-Leste, Tonga, Tuvalu, and Vanuatu.

For further information, please visit <http://pacrisk.sopac.org> or contact PCRAFI@spc.int.

Annex 1

World Bank Framework for Disaster Risk Financing and Insurance

Major disasters increase public spending requirements and reduce revenues, placing further strain on limited national budgets. The immediate and long-term fiscal consequences of a disaster depend on the sources of revenue available to the government versus its public expenditure commitments. Investment in disaster risk financing instruments can help prevent the diversion of funds from key development projects and significantly reduce the time needed to activate an initial response. Financial protection is a core component of any comprehensive disaster risk management strategy, and should be implemented alongside the pillars of risk identification, risk reduction, preparedness, and post-disaster reconstruction (see figure A.1).

The World Bank framework for disaster risk financing and insurance advocates a three-tiered approach for the development of financing arrangements to cover the residual disaster risk that cannot be mitigated. These layers align to the basic principles of sound public financial management, such as the efficient allocation of resources, access to sufficient resources, and macroeconomic stabilization. The first layer, retention, relates to countries' development of an internal layer of protection against natural disasters to prevent the diversion of funds from

development projects (see figure A.2). This layer uses tools such as contingency budgets and national reserves. The aim is to finance small but high-frequency disasters. The second layer is aimed at less frequent but more severe events that are too costly to pre-finance through retention mechanisms. Here, liquidity mechanisms—such as contingent credit, which can mobilize additional funds immediately following an event—become cost-effective.

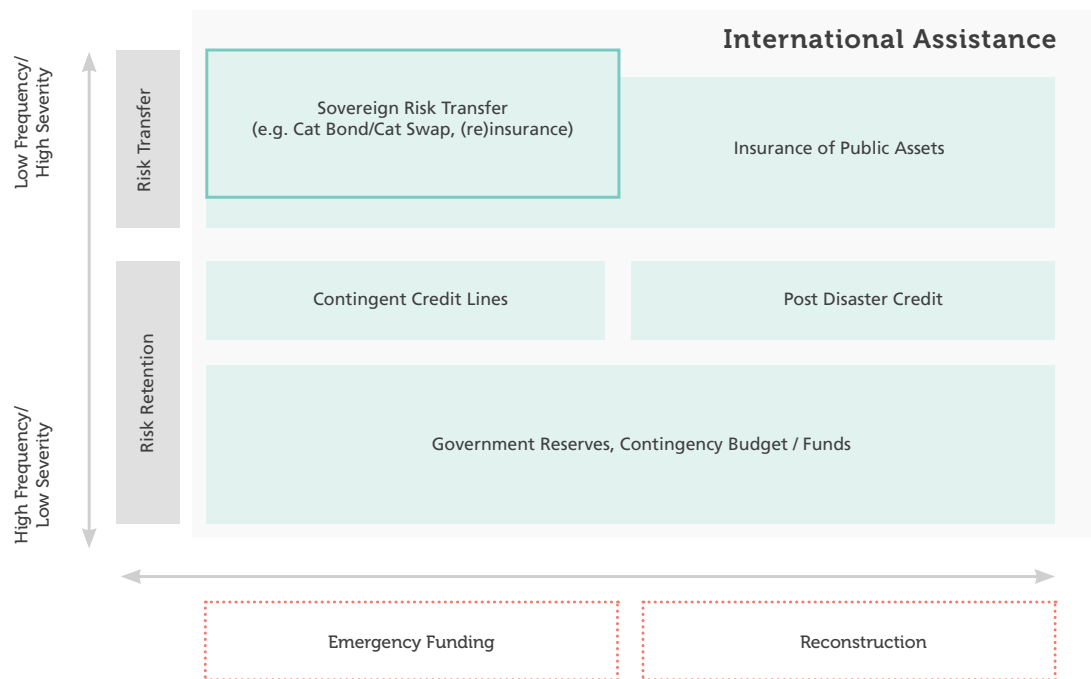
The third layer, disaster risk transfer (such as insurance), focuses on mobilizing large volumes of funds for large but infrequent natural disasters. For events of this type, risk transfer instruments—such as insurance or catastrophe swaps and bonds—become cost-effective in averting a liquidity crunch.

There is a clear time dimension to post-disaster funding needs and the various phases of relief, recovery, and reconstruction. Some financing instruments can be activated rapidly. Others may take longer to activate but can generate substantial funding. The disaster risk financing strategy needs to reflect both time and cost dimensions, ensuring that the volume of funding available at different stages in the response efforts matches actual needs in a cost-efficient manner.

Figure A.1 — Disaster Risk Management Framework



Figure A.2 — Three-Tiered Disaster Risk Financing Strategy



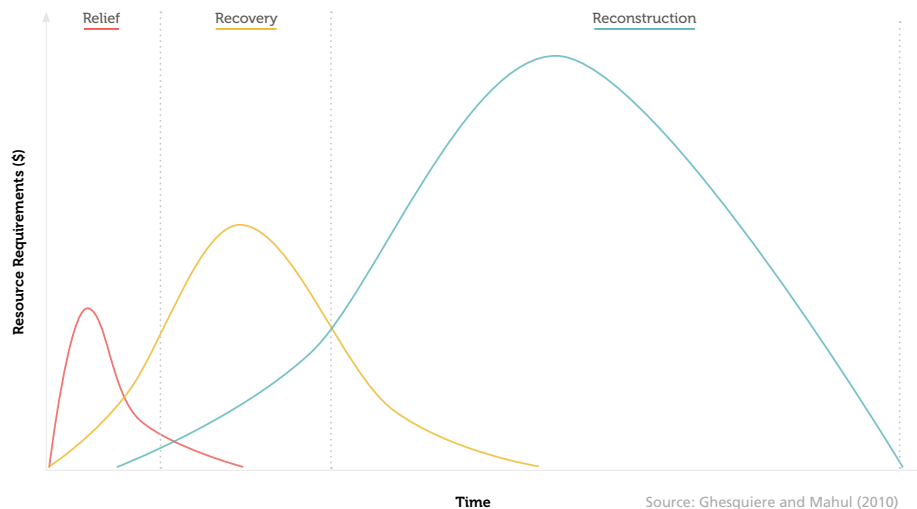
The initial relief phase requires a quick injection of liquidity from day 0 but does not need to be sustained for a long period of time (see figure A.3). Rapid budget mobilization and execution are key for financing initial disaster response, and governments should develop appropriate policies and procedures for procurement and acquittals to facilitate them. Initial relief should be met via annual budget allocations and the establishment of dedicated reserves for disaster response that can be accessed immediately; major catastrophes will exhaust these funds quickly. The residual risk associated with higher-cost events should be transferred to third parties via a mixture of more expensive (re)insurance tools and catastrophe bonds and, for the most extreme events, international assistance.

The recovery phase requires additional funds but not immediately (see figure A.3). Some of

the funds for this phase can therefore be raised via post-disaster budget reallocation and the realignment of national investment priorities. However, the opportunity cost for these options is high, given that they can lead to reduced expenditure on other key investment areas, such as health and education. Consequently, governments may also choose to utilize development partner contingent credit arrangements.

In contrast, the reconstruction phase has much larger financing requirements needed over a much longer period of time (see figure A.3). Given the large funding requirements associated with reconstruction, this phase often requires post-disaster reconstruction loans to complement traditional disaster insurance. Governments may also introduce temporary post-disaster tax increases aligned to budget restructuring.

Figure A.3 — Post-Disaster Phases: Funding Requirements and Duration



If adequate and timely funding arrangements are not in place, the adverse socioeconomic impact of a disaster can be significantly exacerbated, at both the macroeconomic and household levels. An optimal disaster risk financing and insurance strategy aims to combine ex-ante and ex-post financial instruments to secure adequate and timely funding at lower cost for the successive post-disaster phases. The optimal mix of finance instruments will be unique to each country based upon its associated hazard and exposure. Table A.1 lists potential finance instruments that can be used to address disasters. Those that are shaded in blue indicate the generic timelines for mobilizing and executing these funds, though each country may be slightly faster or slower depending on its internal processes. The table can be adapted by countries to reflect these differences according to the financial instruments they have utilized and the time it takes to mobilize these funds. Given the

innovative nature of the work in this area and the number of products under development, this list is not exhaustive.

Ex-post financing vehicles are those that become available in the wake of an event. The most familiar form of ex-post disaster financing is donor assistance for relief. There are two forms this finance can take, cash grants and aid in kind, and both play an important role in response. The provision of aid in kind, while vital, can affect the distribution costs for these goods. While donor funds will always be required, there can often be an element of uncertainty surrounding how much will be provided, what will be provided, and when funds will arrive in country.

Budget reallocation often plays a key role for the continuation of relief and the initial stages of the recovery program. Generally, this process takes time, as the reallocation of funds will need to be

Table A.1— Availability of Financial Instruments Over Time

	SHORT TERM (1-3 MONTHS)	MEDIUM TERM (3-9 MONTHS)	LONG TERM (OVER 9 MONTHS)
<i>Ex-ante Financing</i>			
Donor Assistance (relief)			
Budget Reallocation			
Domestic Credit			
External Credit			
Capital Budget Realignment			
Donor Assistance (reconstruction)			
Tax Increase			
Flash Appeal			
<i>Ex-post Financing</i>			
Emergency Fund			
Contingency Budget			
Contingent Credit			
Sovereign (parametric) Catastrophe Risk Insurance			
Traditional Disaster Insurance			

Source: World Bank 2013.



agreed upon by the cabinet and across ministries. Budget reallocation can sometimes divert funds from key development projects and hence seriously harm the long-term growth prospects of the country. The same issues are relevant to capital budget realignment, although the timelines for that process are typically significantly longer.

Domestic credit, such as the issuance of government bonds, can be used to raise additional revenue to fund post-disaster expenditures. Again, due to the processes involved, domestic credit will take some time to operationalize and is best suited to financing recovery and reconstruction activities. External credit will likewise take time to be agreed upon with providers and will require clear articulation of the activities it is to finance. Both of these forms of credit will have an impact on the debt-servicing ratio of a country and may not be a viable option for heavily indebted countries.

Donor assistance for reconstruction can be delivered as a form of direct budget support, grant, or a post-disaster reconstruction loan. The form of finance used here will depend on the size of the event, the development status of a country (for example, low-income countries may have access to concessional loans and have more access to grants), and the debt-servicing ratio of a country. Typically, this form of finance is conditional and requires sufficient lead time for aligning the priorities of countries and donors to meet reconstruction and recovery needs.

Tax increases will help redress the increase in public expenditure following a disaster by generating additional revenue. Although higher taxes could be politically unfavorable, they create a sustainable source of finance for reconstruction activities. Conversely, some governments have applied tax incentives to encourage donations to response

funds from both the private sector and members of the public. This approach can be popular when tax credits are written off on annual tax returns.

Ex-ante financing provides an element of financial certainty during a disaster, because governments have established these sources of finance in advance. These funds can be quickly disbursed following an event so that essential relief work commences immediately. A reserve fund provides a dedicated amount of funding for response and if properly managed can accrue over time to increase the level of funding available. However, the opportunity cost of holding money in a dedicated fund is high, as it diverts funds from the operational budget. Careful analysis should be undertaken to identify the optimal level of reserves that a country should hold and maintain.

Contingent credit is a relatively new instrument, with current forms offering disbursement following an event whose magnitude has been agreed upon in advance. It can be fungible or conditional by design. As with other sources of credit, the amount available will depend on the development status of the country and the debt-servicing ratio. The advantage of contingent credit is that a drawdown can be made within a 24-hour period.

Parametric insurance uses hazard triggers, linking immediate post-disaster insurance payouts to specific hazard events. Unlike traditional insurance settlements that require an assessment of individual losses on the ground, parametric policies do not pay based on actual losses incurred. Instead, the payout disbursements are triggered by specific physical parameters for the disaster (e.g., wind speed and earthquake ground motion). The payouts provide a rapid, yet limited, injection of liquidity that can be a valuable boost to relief funds.

Traditional disaster insurance offers indemnity coverage. Receipt of funds may take longer than with parametric insurance, as a detailed damage assessment is required. However, as payouts are directly linked to the damage experienced, the payout will better match the needs of the insured party.

Public financial management in the Pacific is dictated by the fact that many PICs are classified as Small Island Developing States (SIDS). Typically, countries in this classification have a narrow revenue base, are net importers, and have a consequential reliance on aid as an income stream. These characteristics can limit the options available for post-disaster finance. It is unlikely that a SIDS government could afford to reallocate the capital



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budget, and a tax increase could make many items unaffordable and hence be detrimental to citizens' quality of life. Given these constraints on the national budget, alternatives such as contingent credit and risk transfer options should be used to reduce the drain on limited public funds.

PIC governments face critical challenges for financial resilience to natural disasters. Most PICs have restricted options for securing immediate liquidity for swift post-disaster emergency response without compromising their long-term fiscal balance. In addition, PICs are constrained by their size, borrowing capacity, and limited access to international insurance markets. In the absence of easy access to debt and well-functioning insurance markets, a large portion of the economic losses stemming from adverse natural events is borne by governments and households, with support from development partners.

The Pacific has seen several recent cases that show the need for immediate liquidity post-disaster. In the Cook Islands, in the immediate aftermath of TC Pat in 2010, a delay in the receipt of travel funds meant that key government personnel could not immediately commence the initial damage assessment. Following TC Vania in 2010, Vanuatu had to reallocate a significant amount of the national budget. Similarly, Fiji and Samoa had to reallocate budgetary funds in the wake of TC Evan in 2012 and 2013; and the Santa Cruz earthquake in the Solomon Islands in February 2013 drained the annual budget for the National Disaster Management Office and used the majority of the national contingency budget.

Lacking contingency reserves and access to short-term loan funds, PICs have limited post-disaster budget flexibility and rely heavily on post-disaster donor assistance. Studies by SPC (2011 and 2012) that look at the fiscal impact of past disasters in selected PICs demonstrate the financial constraints

in post-disaster budget reallocation and build a case for establishing national reserves. While international assistance will always play a valuable role, overdependence on such assistance as a source of financing carries limitations; international aid can be uncertain, which inhibits contingency planning, and can be slow to materialize. Increasingly, PICs such as the Cook Islands are establishing national reserves for funding initial response.

The World Bank, SPC, and their partners, with grant funding from the government of Japan, have implemented the Pacific Disaster Risk Financing and Insurance Program to help the PICs increase their financial resilience to natural disasters and improve their financial response capacity in the aftermath of natural disasters. This program is part of the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI).

Annex 2

Glossary

Attachment point. The attachment point (deductible) amount is essentially the excess payable before any payout is made under a policy. That is, anything under this value will be borne by the policy holder.

Catastrophe swap. A catastrophe swap, also known as a cat swap, is a financial tool used to transfer some of the risk that the covered party faces from catastrophes to the international reinsurance or capital markets. In the case of the Pacific Catastrophe Risk Insurance Pilot, tropical cyclone and/or earthquake risk is passed to the financial markets.

Coverage limit. This indicates the maximum payout as defined under the policy.

Emergency losses. Emergency losses in the context of the Pacific Catastrophe Risk Insurance Pilot are calculated by using a percentage of the estimated ground-up losses.

Exhaustion point. The exhaustion point indicates the loss level at which the payout under a policy reaches its maximum point.

Ground-up losses. Ground-up losses in this context refer to estimated total damage to buildings, infrastructure, and cash crops.

Payout. A payout refers to the amount of cash that countries will receive following an eligible event.

Premium. The premium is the cost that an insured party will pay for a given level of coverage: the more that is included in the coverage provided, the higher the premium will be. Premiums are determined by the amount of coverage a country chooses, the event attachment point (deductible) and exhaustion point (limit) of that coverage, and the risk profile of the country.

Risk pool. A risk pool is a group of people, institutions, or countries that collaborate to manage risk financially as a single group.

Annex 3

Risk Profile: Marshall Islands

Population, Buildings, Infrastructure and Crops Exposed to Natural Perils

An extensive study has been conducted to assemble a comprehensive inventory of population and properties at risk. Properties include residential, commercial, public and industrial buildings; infrastructure assets such as major ports, airports, power plants, bridges, and roads; and major crops, such as coconut, palm oil, taro, vanilla and many others.

Table 1 summarizes population and the inventory of buildings, infrastructure assets, and major crops (or “exposure”) at risk as well as key economic values for the Republic of the Marshall Islands. It is estimated that the replacement value of all the assets in the Republic of the Marshall Islands is 1.7 billion USD of which about 83% represents buildings and 17% represents infrastructure.

Figures 1 and 2 illustrate the building exposure location and replacement cost distribution, respectively. The footprints of about 7,700 of the approximately 13,000 buildings shown in Figure 1 were digitized from high-resolution satellite imagery. Figure 3 displays the land cover/land use map that includes the location of major crops. The data utilized for these exhibits was assembled, organized and, when unavailable, produced in this study.

Table 1— Summary of Exposure in Marshall Islands (2010)

GENERAL INFORMATION:	
Total Population:	54,800
GDP Per Capita (USD):	2,840
Total GDP (million USD):	155.8
Asset Counts:	
Residential Buildings:	11,407
Public Buildings:	608
Commercial, Industrial, and Other Buildings:	879
All Buildings:	12,894
Hectares of Major Crops:	8,601
COST OF REPLACING ASSETS (MILLION USD):	
Buildings:	1,404
Infrastructure:	286
Crops:	6
Total:	1,696
GOVERNMENT REVENUE AND EXPENDITURE:	
Total Government Revenue	
(Million USD):	103.8
(% GDP):	66.6%
Total Government Expenditure	
(Million USD):	104.1
(% GDP):	66.8%

¹ Data assembled from various references including WB, ADB, IMF and The Secretariat of the Pacific Community (SPC).

² The projected 2010 population was trended from the 2006 census using estimated growth rates provided by SPC.

Tropical Cyclone and Earthquake Hazards in Marshall Islands

The Pacific islands region is prone to natural hazards. The Republic of the Marshall Islands is located north of the equator in an area known for the frequent occurrence of tropical cyclones with damaging winds, rains and storm surge all year round. In the North Pacific region from Taiwan to the equator in latitude and from Indonesia to east of Hawaii in longitude, more than 1,400 tropical cyclones with hurricane force winds spawned in the last 60 years, with an average of about 25 tropical storms per year. The Republic of the Marshall Islands was affected by devastating cyclones several times in the last few decades. For example, typhoon Paka in 1997 caused severe damage to crops and damaged 70% of houses on Ailinglaplap Atoll, with total damages estimated at 80 million USD for the entire nation. Typhoons Zelda, Axel and Gay each caused significant damage and losses within a span of one year (1991-1992). Figure 4 shows the levels of wind speed due to tropical cyclones that have about a 40% chance to be exceeded at least once in the next 50 years (100- year mean return period). These wind speeds, if they were to occur, are capable of generating moderate to severe damage to buildings, infrastructure and crops with consequent large economic losses.

The Republic of the Marshall Islands is situated along a relatively quiet seismic area but is surrounded by the Pacific "ring of fire," which aligns with the boundaries of the tectonic plates. These boundaries are extremely active seismic zones capable of generating large earthquakes and, in some cases, major tsunamis that can travel great distances. No significant earthquakes have been observed in recent history. However, in 1899, a large earthquake off the eastern coast of New Ireland, Papua New Guinea generated a tsunami that caused a considerable amount of

Figure 1 — Building Locations

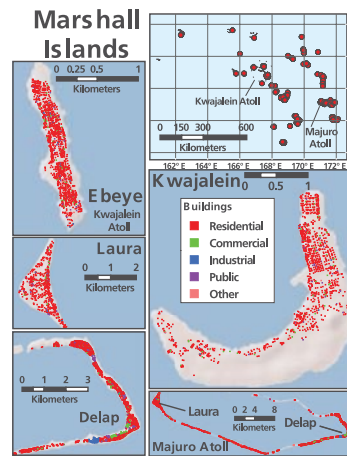


Figure 2 — Building replacement cost density by district.

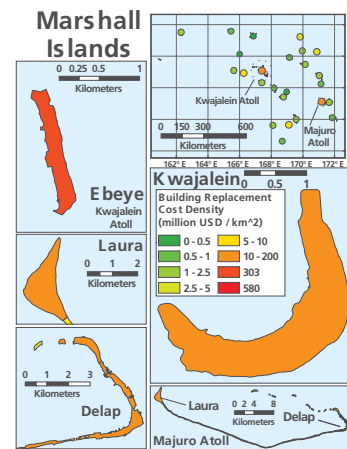
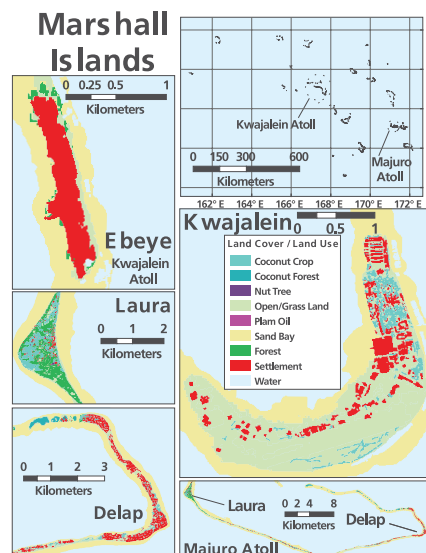


Figure 3 — Land Cover / Land Use Map



Section

damage in the Republic of the Marshall Islands. Figure 5 shows that the Republic of the Marshall Islands has a 40% chance in the next 50 years of experiencing, at least once, very weak levels of ground shaking. These levels of shaking are not expected to cause any significant damage to well-engineered buildings.

Risk Analysis Results

To estimate the risk profile for The Republic of the Marshall Islands posed by tropical cyclones and earthquakes, a simulation model of potential storms and earthquakes that may affect the country in the future was constructed. This model, based on historical data, simulates more than 400,000 tropical cyclones and about 7.6 million earthquakes, grouped in 10,000 potential realizations of the next year’s activity in the entire Pacific Basin. The catalog of simulated earthquakes also includes large magnitude events in South and North America, Japan and the Philippines, which could generate tsunamis that may affect Marshall Islands’ shores.

The country’s earthquake and tropical cyclone risk profiles are derived from an estimation of the direct losses to buildings, infrastructure assets and major crops caused by all the simulated potential future events. The direct losses include the cost of repairing or replacing the damaged assets, but do not include other losses such as contents losses, business interruption losses and losses to primary industries other than agriculture. The direct losses for tropical cyclones are caused by wind and flooding due to rain and storm surge, while for earthquakes they are caused by ground shaking and tsunami inundation. After assessing the cost of repairing or rebuilding the damaged assets due to the impact of all the simulated potential future events, it is possible to estimate in a probabilistic sense the severity of losses for future catastrophes.

Figure 4 — Maximum 1-minute sustained wind speed (in miles per hour) with a 40% chance to be exceeded at least once in the next 50 years.

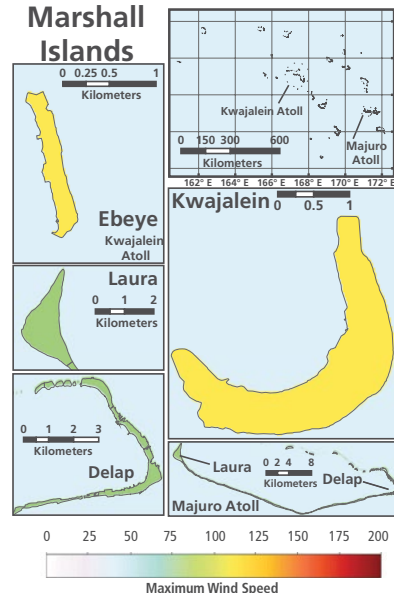
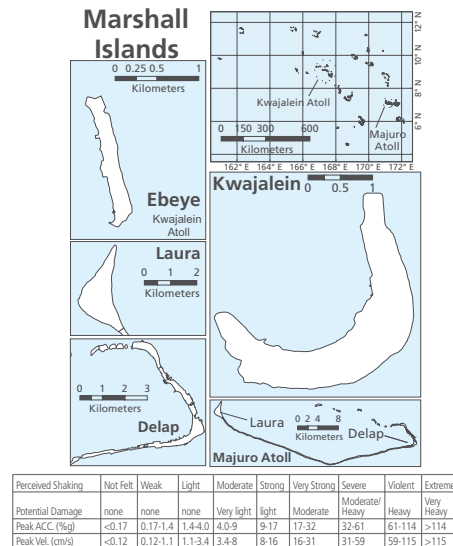


Figure 5 — Peak horizontal acceleration of the ground (Note: 1g is equal to the acceleration of gravity) that has about a 40% chance to be exceeded at least once in the next 50 years.



The simulations of possible next-year tropical cyclone and earthquake activity show that some years will see no storms or earthquakes affecting the Republic of the Marshall Islands, while other years may see one or more events affecting the islands, similar to what has happened historically. The annual losses averaged over the many realizations of next-year activity are shown in Figure 6 separately for tropical cyclone and for earthquake and tsunami, while the contributions to the average annual loss from the different atolls are displayed in absolute terms in Figure 7 and normalized by the total asset values in each atoll in Figure 8. Figure 8 shows how the relative risk varies by atoll across the country.

The same risk assessment carried out for the Republic of the Marshall Islands was also performed for the 14 other Pacific Island Countries. The values of the average annual loss of Republic of the Marshall Islands and of the other 14 countries are compared in Figure 9.

In addition to estimating average risk per calendar year, another way of assessing risk is to examine large and rather infrequent, but possible, future tropical cyclone and earthquake losses. Table 2 summarizes the risk profile for the Republic of the Marshall Islands in terms of both direct losses and emergency losses. The former are the expenditures needed to repair or replace the damaged assets while the latter are the expenditures that the

Figure 7 — Contribution from the different villages to the average annual loss for tropical cyclone and earthquake (ground shaking and tsunami).

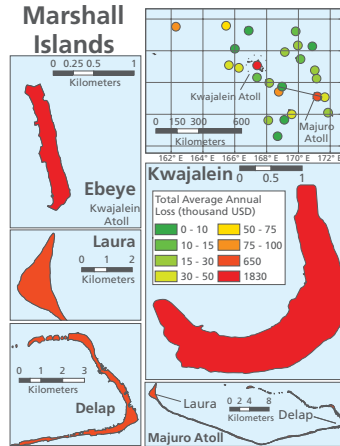


Figure 8 — Contribution from the different villages to the tropical cyclone and earthquake (ground shaking and tsunami) average annual loss divided by the replacement cost of the assets in each village.

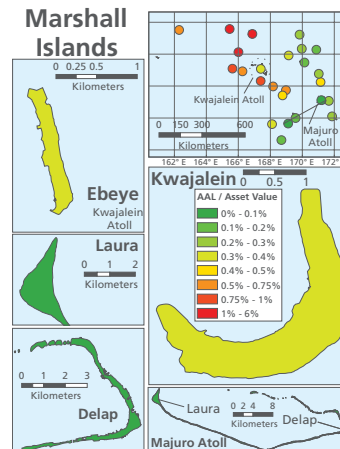
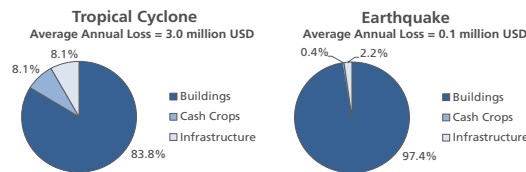


Figure 6 — Average annual loss due to tropical cyclones and earthquakes (ground shaking and tsunami) and its contribution from the three types of assets.



Section

08

Marshallese government may need to incur in the aftermath of a natural catastrophe to provide necessary relief and conduct activities such as debris removal, setting up shelters for homeless or supplying medicine and food. The emergency losses are estimated as a percentage of the direct losses.

Table 2 includes the losses that are expected to be exceeded, on average, once every 50, 100, and 250 years. For example, **a tropical cyclone loss exceeding 66 million USD, which is equivalent to about 42% of Marshall Islands' GDP, is to be expected, on average, once every 100 years.** In the Republic of the Marshall Islands, tropical cyclone losses are expected to be substantially more frequent and severe than losses due to earthquake ground shaking and tsunami. The latter, however, remain potentially catastrophic events.

A more complete picture of the risk can be found in Figure 10, which shows the mean return period of direct losses in million USD generated by earthquake, tsunami and tropical cyclones combined. The 50-, 100-, and 250-year mean return period losses in Table 2 can also be determined from the curves in this figure. The direct losses are expressed both in absolute terms and as a percent of the national GDP.

In addition to causing damage and losses to the built environment and crops, future earthquakes and tropical cyclones will also have an impact on population. The same probabilistic procedure described above for losses has been adopted to estimate the likelihood that different levels of casualties (i.e., fatalities and injuries) may result from the future occurrence of these events. As shown in Table 2, our model estimates, for example, that there is a **40% chance in the next fifty years (100-year mean return period) that one or more events in a calendar year will cause casualties exceeding 70 people in the**

Figure 9 — Average annual loss for all the 15 Pacific Island Countries considered in this study.

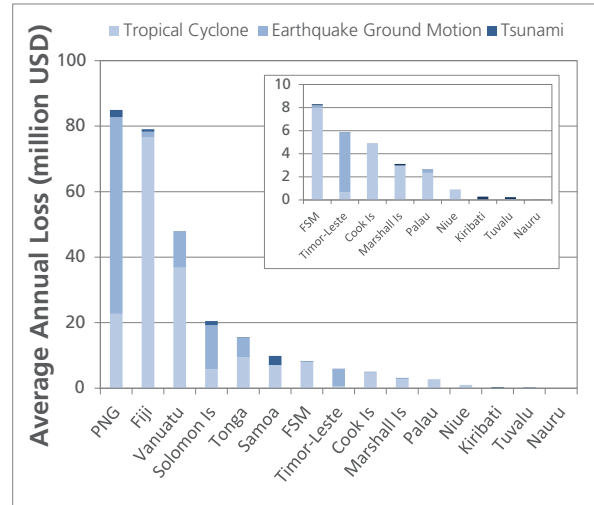
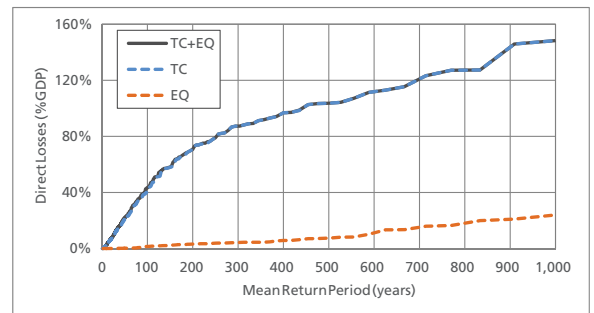
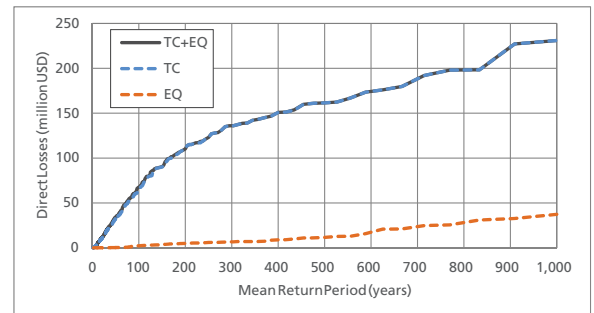


Figure 10 — Direct losses caused by either tropical storms or earthquakes that are expected to be equaled or exceeded, on average, once in the time period indicated. Losses represented in absolute terms and normalized by GDP.



Republic of the Marshall Islands. Events causing 200 or more casualties are also possible but have much lower likelihood of occurring.

Table 2— Estimated Losses and Casualties Caused by Natural Perils

Mean Return Period [years]	AAL	50	100	250
Risk Profile: Tropical Cyclone				
Direct Losses				
[Million USD]	3.0	32.8	66.2	123.0
[% GDP]	1.9%	21.1%	42.5%	78.9%
Emergency Losses				
[Million USD]	0.7	7.6	15.2	28.3
[% of total government expenditures]	0.7%	7.3%	14.6%	27.2%
Casualties	3	36	69	118
Risk Profile: Earthquake, and Tsunami				
Direct Losses				
[Million USD]	0.1	0.3	2.3	5.9
[% GDP]	0.1%	0.2%	1.5%	3.8%
Emergency Losses				
[Million USD]	0.0	0.1	0.5	1.4
[% of total government expenditures]	0.0%	0.1%	0.5%	1.3%
Casualties	0	0	1	3
Risk Profiles: Tropical Cyclone, Earthquake, and Tsunami				
Direct Losses				
[Million USD]	3.1	34.1	67.4	123.0
[% GDP]	2.0%	21.9%	43.3%	78.9%
Emergency Losses				
[Million USD]	0.7	7.8	15.5	28.3
[% of total government expenditures]	0.7%	7.5%	14.9%	27.2%
Casualties	3	38	76	128v



Country Note

MARSHALL ISLANDS

This note on the Marshall Islands forms part of a series of country Disaster Risk Finance and Insurance (DRFI) notes that were developed to build understanding of the existing DRFI tools in use in each country and to identify gaps future engagements in DRFI that could further improve financial resilience. These notes were developed as part of the technical assistance provided to countries under the Pacific DRFI program jointly implemented by the World Bank and the Secretariat of the Pacific Community financed by the Government of Japan. The technical assistance builds on the underlying principles of the three-tiered disaster risk financing strategy and focuses on three core aspects: (i) the development of a public financial management strategy for natural disasters, recognizing the need for ex-ante and ex-post financial tools; (ii) the post-disaster budget execution process, to ensure that funds can be accessed and disbursed easily post-disaster; and (iii) the insurance of key public assets, to resource the much larger funding requirements of recovery and reconstruction needs. The Pacific DRFI Program is one of the many applications of PCRAFI. It is designed to increase the financial resilience of PICs by improving their capacity to meet post-disaster financing needs without compromising their fiscal balance.

Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) is a joint initiative of SOPAC/SPC, World Bank, and the Asian Development Bank with the financial support of the Government of Japan, the Global Facility for Disaster Reduction and Recovery (GFDRR) and the ACP-EU Natural Disaster Risk Reduction Programme, and technical support from AIR Worldwide, New Zealand GNS Science, Geoscience Australia, Pacific Disaster Center (PDC), OpenGeo and GFDRR Lab