International Strategy for Disaster Reduction

RELATIONSHIP BETWEEN NATURAL DISASTERS AND POVERTY: A FIJI CASE STUDY

SOPAC Miscellaneous Report 678 April 2009

A report prepared for the
United Nations International Strategy for Disaster Reduction
Secretariat's 2009 Global Assessment Report on Disaster Reduction

*Prepared by Padma Narsey Lal, Reshika Singh and Paula Holland

SOPAC

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ACRONYMS

BNPL	basic needs poverty line
CPR	crisis prevention and recovery
DM	disaster management
DRM	disaster risk management
DRR	disaster risk reduction
ERT	emergency response training
FAO	Food and Agriculture Organization
FMS	Fiji Meteorological Services
GDP	gross domestic product
GFDRR	Global Facility for Disaster Reduction and Recovery
HART	Housing Assistance Relief Trust
HDI	human development index
IDDR	International Day for Disaster Reduction
NDC	National Disaster Centre
HPI	human poverty index
NDMA	National Disaster Management Act
NDMC	National Disaster Management Council
NDMO	National Disaster Management Office
PIFRAC	Pacific Islands Framework for Regional Action on Climate Change
RSMC	regional specialised meteorological centre
RDRT	regional disaster response training
SOPAC	Pacific Islands Applied Geoscience Commission
UNDP	United Nations Development Programme
UNDP–PC	United Nations Development Programme – Pacific Centre
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNICEF	United Nations Children's Fund
UNISDR	United Nations International Strategy for Disaster Reduction Secretariat
UNOCHA	United Nations Office of Humanitarian Affairs
USAR	urban search and rescue

EXECUTIVE SUMMARY

Financial support from the Global Facility for Disaster Reduction and Recovery (GFDRR) is gratefuly acknowledged. GFDRR is a partnership between Australia, Canada, Danmark, European Commission, Italy, Japan, Luxembourg, Norway, Spain, Swieden, Swistzerland, United Kingdom and the World Bank.

The United Nations International Strategy for Disaster Reduction Secretariat (UNISDR) and the United Nations Development Programme (UNDP) commissioned a global study to assess the relationship between poverty and extensive disaster risk. Case studies in selected Asia Pacific regions include India, Nepal, Iran, Sri Lanka and Fiji. The objectives of the Fiji study are to:

- develop and pilot a method to assess empirically the relationship between disaster and poverty in the Pacific, using Fiji as the case study
- identify policy implications of the improved understanding of the relationship between poverty and natural disasters, including recommendations for improved data collection and management
- draw out the relevance of the Fiji study for the Pacific and make policy suggestions to help other Pacific Island countries and territories in their disaster risk management.

Relationship between natural disasters and poverty in Fiji

Natural disasters are a common occurrence around the world, including Fiji. Given its geographic location and geophysical characteristics, Fiji regularly experiences natural disasters of geological and hydro-meteorological origin. In the past 37 years, Fiji reported a total of 124 natural disasters, affecting almost all parts of the country. Tropical cyclones accounted for 50 per cent of the events, followed by floods (33 per cent) and earthquakes (8 per cent).

These natural disasters had a considerable impact on the lives and livelihoods of the people of Fiji. The total direct cost associated with disaster events in Fiji between 1970 and 2007 was an estimated US$532 million. Only 17 per cent of all the events accounted for 86 per cent of this total cost. These statistics reflect only the 104 disaster events (51 per cent) for which the government reported cost estimates. Cyclones were the highest contributor to the total costs reported during 1970 to 2007, reflecting their dominance in terms of number and frequency.

Disasters are widely acknowledged to affect disproportionately the poorest in a community as they have relatively higher sensitivity to disaster events compared with communities of higher development status. Recurrent events increase the vulnerability of the poor to disasters, increasing poverty levels such that many households often are unable to break out of the poverty cycle.

Fiji's real gross domestic product (GDP) per person has increased over time, reaching F$3,722 in 2006. This value, however, has not been equitably distributed across the community in Fiji. The Gini coefficient, which is a measure of inequality in the GDP, decreased from 0.43 in 1977 to 0.34 in 2002-03. The limited data suggests inequality across both the communities is decreasing, with the Indo-Fijian community showing a greater decrease in inequality. There is, however, a need for caution in making any firm conclusion about the changes in income distribution as Narsey (2008) found some discrepancy in particularly the 1990/91 HIES data. Detailed poverty analysis by Narsey shows that poverty level has indeed increased since the 1970s. Moreover, the real value of the lowest income declined by around 15 per cent (Ministry of Finance and National Planning 2004). This decrease in real wage rate has placed more people in Fiji below the basic needs poverty line (BNPL).

Number of people living in poverty levels in Fiji have increased substantially. In 1976, only 15 per cent of households were reported to be living in poverty. This proportion had increased to 35 per cent (or one in three households) by 2002-03. Slightly more Indo-Fijians than Fijians were living below the poverty line (37 per cent compared with 34 per cent). The poverty level is expected to continue this upward trend, given political and economic uncertainties in Fiji.

Increased disaster risks due to climate change are also expected to exacerbate poverty. The effects of disaster on the poor will be different, however, across regions and between the two ethnic communities because the poor are differently distributed across regions and ethnic groups.

Analytical method

To assess the relationship between disaster and poverty in Fiji, a combination of qualitative and quantitative approaches was adopted:

- qualitative and quantitative analysis of the nature, number and frequency of hazard and disasters
- quantitative analysis of the structure of the economy, economic development trends based on official Fiji Government statistics, and statistics reported by international financial institutions such as the World Bank and the Asian Development Bank
- trend analyses as well as qualitative analysis of household wellbeing, based on official statistics released by the Fiji Government, reports from the Asian Development Bank and the World Bank, official international statistics on poverty and development released by the UNDP and academic reports released on the subject
- quantitative econometric assessment of the two-way relationship between poverty and disaster, focusing on the aggregate national level analysis.

The choice of a quantitative method to assess the relationship between disasters and poverty measures for Fiji was influenced by the availability of robust time series and cross-sectional quantitative data for key parameters that determine/influence both poverty and disaster effects, including vulnerability to disaster events at the household, sector and national levels.

Results of the analysis of disaster and poverty in Fiji

Econometric analysis, combined with qualitative deductive analysis, confirms the existence of a complex two-way relationship between disaster and economic and social wellbeing in Fiji. It confirms that disasters increase poverty in the country and reduce national economic growth. It also confirms, conversely, that increases in poverty make disaster outcomes much more severe. Ultimately, however, a complex set of factors influences the depth and breadth of these relationships.

At the national level, with a relatively low GDP, low economic growth and high reliance on primary sector, Fiji is highly sensitive to natural disasters. Low GDP and low economic growth also mean the country's tax revenue base is shallow, so the government does not have sufficient resources to invest in basic transport and communication infrastructure to support private sector led economic growth. Fiji is also struggling to provide good and accessible medical services and universal education. Moreover, with an economic development status lower than that of many other countries, the government of Fiji is insufficiently equipped to invest in risk reduction services and/or quickly respond to disasters and help the country recover and rehabilitate. Consequently, Fiji has conventionally relied on humanitarian and development support from development partners in times of natural disasters and for recovery and rehabilitation.

At the household level, income and other social indicators indicate the household's sensitivity to natural disasters. People with low household incomes, particularly those living below the BNPL, often live in marginal areas. Many do not have water security or safe sanitation, and they often have limited education. Disasters are expected to increase people's poverty status, particularly given they do not have the financial assets to respond, recover and rehabilitate quickly, putting added pressure on their poverty status.

Policy implications and key recommendations for disaster risk reduction and disaster management in Fiji

Analysis of the relationship between disasters and poverty in Fiji suggests a multi-pronged approach to disaster risk management and poverty alleviation is required. Attention needs to be given to reducing the sensitivity of particularly poor households to disasters by improving the economic and social wellbeing of communities and the country. That is, Fiji's national economic development, as well as disaster risk management strategies, must be sensitive to the needs and vulnerabilities of the poor living in hazardous areas. This focus on reducing sensitivities, as well improving people's ability to respond to and cope with disaster events, applies equally when developing and implementing efforts to encourage both economic development and disaster risk management.

Pro poor economic development

Recommendation 1: Adopt a pro poor development strategy that targets poor communities living in areas prone to natural hazards.

To help reduce the sensitivities of the poor to disasters, and to inform targeted poverty reduction strategies and improved preparedness and risk reduction measures:

- Identify the geographic distribution of the poor and the socioeconomic characteristics of particularly the poor living in hazardous conditions (including in the urban squatter areas), and assess their sensitivities to natural disasters.
- Adopt development strategies that aim to improve household income security and basic development conditions (such as housing or access to water) that reduce sensitivities to disaster.
- Minimise residual disaster risk by controlling economic and infrastructure development to reduce exposure to disasters. Governments and development agencies must integrate (in other words, 'mainstream') disaster risk considerations in national development planning and budgeting processes at national, provincial, district and village/settlement levels, and in designing development initiatives.

Mainstreaming of disaster risk to policy development

Disaster risk reduction benefits the poor more than disaster management does. For every dollar invested in disaster risk reduction, between two and four dollars are returned in terms of avoided or reduced disaster impacts.

Recommendation 2: Increase investment in disaster risk reduction as an effective measure to reduce the disaster vulnerability of the poor and thereby improve overall economic development.

- Invest in social services that improve social conditions, such as universal education, access to water and sanitation, thereby reducing the sensitivity of the poor and improving their capacity to respond to, cope with and adapt to disaster impacts more effectively.

In the past, the Fiji Government has regularly invested in drainage and flood protection infrastructure, but the level of investment has decreased in recent years, particularly following the 1987 political coup. The government has no dedicated strategy to ensure the development planning and budgeting processes at national, provincial, district and village/settlement levels address hazard and risk considerations. Building codes, where they exist, do not include considerations of increased risks from climate change related disasters, for example, and where codes and guidelines are available for certain hazards, these are not enforced.

Recommendation 3: Integrate disaster risk reduction considerations in all development initiatives.

- Integrate (in other words, 'mainstream') disaster risk considerations in national development planning and budgeting processes at national, provincial, district and village/settlement levels, and in development design.
- Revise infrastructure development planning and approval guidelines in all sectors to reflect requirements for hazard and risk assessments.
- Revise development approval processes and guidelines to require hazard and risk assessments of development initiatives, particularly in hazard prone areas.
- Strengthen the risk assessment and management skills of planners and development agencies that approve development projects.
- Develop simple disaster risk management checklists to guide planners and development agencies in their review of policies and plans/development projects.

Disaster management

Disaster management constitutes having emergency plans, equipment and trained and knowledgeable people to help monitor hazards, operate end-to-end early warning systems and manage emergency responses. The nature and frequency of awareness programs, the strength of the media in reaching every part of the country, past experiences of the public and cultural beliefs also determine the extent of a community's vulnerability.

A weak end-to-end early warning system increases the vulnerability of the poor, along with their ability to make decisions and respond appropriately during an emergency. Although Fiji has sophisticated equipment at the Fiji Meteorological Centre in Nadi, other parts of the country lag in having updated early warning systems. In recent years, this discrepancy has severely affected efforts to distribute warnings in time to different parts of the country.

Also constraining the early warning system are poor hazard monitoring capabilities due to limited institutional capacity, difficulty in retaining qualified staff and limited monitoring stations in key locations in the hazard prone areas. In addition, poor communication equipment, a lack of proper rescue equipment and insufficient personnel training in disaster management have resulted in the inefficient operation of the Disaster Management Team in some parts of the country.

Recommendation 4: Review the disaster monitoring and early warning system.

- Review monitoring capabilities for each hazard category, including the distribution of appropriate monitoring stations and gaps in technical expertise in data analysis and forecasting. This review may also cover gaps in the current network arrangements, with specialised international partners monitoring and forecasting disaster events.
- Review the end-to-end warning system for each disaster category, to identify how to strengthen monitoring, the generation of appropriate information and the communication of early warnings to communities. This review should cover the required equipment and personnel training.
- Develop appropriate training and communication material to improve community awareness of disaster events, community preparedness, and practical household response strategies for each type of disaster event.

Under the Natural Disaster Management Act (NDMA) 1998, the National Disaster Management Office (NDMO) focuses on post-disaster response, recovery and rehabilitation. The NDMA institutes a number of bodies and individuals responsible for aspects of disaster management, including the National Disaster Management Council (NDMC), Fiji Red Cross, the Emergency Committee, the National Disaster Controller and the NDMO. Disaster management efforts are constrained by organisational and as well as operational issues, including (Rokovada 2006):

- the absence of appropriate information to predict, assess or respond to disaster events (for example, hazard maps, the scale of inundation, and disaster impacts)
- the institutional design of the decision making and coordination process
- the inadequate resources available to the NDMO
- the inadequate equipment at emergency operations centres at the divisional and district levels
- the fact that NDMO operations are not linked to/integrated with Fiji's rural development/administrative machinery may it difficult to directly engage with, and coordinate disaster response initiatives at divisional, provincial, district and community levels.

Recommendation 5: Review the authority of the NDMO and its organisational arrangements in relation to the Ministry of Provincial Development and other government agencies, and information systems available to the office for strengthening capacity for disaster risk reduction and disaster management (DRR&DM).

- Clarify the appropriate authority of the NDMO in disaster management, including the coordination of disaster assessments following disaster events, to underpin appropriate domestic humanitarian and rehabilitation responses.
- Review the coordination of disaster responses from national and international humanitarian agencies, and improve the coordination of disaster assistance from government and nongovernment agencies.
- Review the scope and depth of different geographic information systems (GISs) and databases available in the country that could support disaster risk management.

All levels of government and all communities should simultaneously pursue DRR&DM. The Fiji Government agreed, under a Pacific regional framework for action, to establish appropriate mechanisms for developing and promoting DRR&DM, and to review regularly all DRR&DM arrangements. The government has not fully acted on these commitments, although the National Disaster Management Plan of 1995 and the NDMA have been under review for several years.

Recommendation 6: Urgently complete the review of the National Disaster Management Plan of 1995 and the Natural Disaster Management Act 1998, and develop a national action plan for DRR&DM, reflecting the regional framework of actions for disaster risk management and climate change.

- Urgently develop and implement a DRR&DM national action plan linked to national development plan and budget processes, meeting the Fiji Government's commitment to the Pacific Island Forum Leaders to systematically implement the Pacific regional framework for DRR&DM (and the Pacific Island Framework for Action on Climate Change).
- Develop appropriate DRR&DM policies and legislation that set appropriate institutional arrangements for ensuring the coordination of DRR initiatives across all sectors and across all levels of government, as well as appropriate DRR&DM strategies, decision making processes and initiatives.
- Develop a funding strategy for addressing a prioritised and appropriately sequenced set of actions, which the national action plan will articulate, and which will reflect a programmatic approach explained in both the Paris Principles of Aid Effectiveness and the Forums Principles of Aid Effectiveness.
- Strengthen the operating guidelines of the Budget and Aid Coordinating Committee and the Development Sub-committee to include DDR&DM considerations in all development projects.
- Encourage development partners to help strengthen DDR efforts.

Disaster risk management: data

To develop and implement targeted DRR&DM strategies, good quality data are critical. Fiji has limited quality data on poverty, hazards, hazard prone areas and disaster impacts, including coverage of disaster events and their effects on household welfare, sectoral activities and national economy.

Recommendation 7: Improve the coverage and quality of data on poverty, hazards (including hazard maps) and on the impacts of disasters on human livelihood and wellbeing at household, sectoral and national levels.

- Develop time series information on determinants of natural disasters to support the forecasting of disaster events.
- Compile time series information on household income and expenditure, the human poverty index and human development index, and their key determinants to inform both development policies.
- Develop a GIS based disaster information system, including maps of hazard and disaster prone areas, the geographic distribution and socioeconomic characteristics of poor, disaster records and disaster impact assessments, to help improve DRR&DM.

Implications of the Fiji study for the other Pacific island countries and territories

The results of the Fiji study are directly relevant to other Pacific island countries (PICs), although the empirical relationship between disaster and poverty may be different in different countries. The types of hazard experienced throughout the Pacific are similar to those found in Fiji, although disaster frequency and intensity vary across countries. Sensitivity to natural disasters is relatively more acute for most PICs when compared to Fiji because of their lower status of the economic and social development, as reflected by key development and poverty indicators, and lower household economic conditions. The broad conclusions of the two-way empirical analysis of Fiji could apply to most other PICs, and the challenges for reducing DDR&DM are also very similar.

Other PICs, like Fiji, have at least acknowledged in principle the importance of taking a DRR&DM approach that focuses on preventative measures to minimise risks, preparedness in the event of a hazardous event, and effective and timely post-disaster response and rehabilitation. As noted, the Pacific Islands Forum Leaders in 2005 signed the DRR&DM Framework for Action 2005–2015. They have also called for this regional framework to be operationalised at the national level. The key recommendations identified for DDR&DM in Fiji would thus equally apply to other PICs.

PREFACE

Disasters are widely acknowledged to affect disproportionately the poorest in a community, as they have relatively higher sensitivity to disaster events compared with communities of higher development status. Recurrent events increase the vulnerability of the poor to disasters, increasing poverty levels such that many households often are unable to break out of the poverty cycle. Medium to longer term impacts of disasters at the national level also challenge development progress towards reducing poverty, possibly (re)creating conditions that place marginal urban and rural communities perpetually 'at risk' (UNISDR 2007).

The exact relationship between disasters and poverty is context specific and often poorly understood. The Secretariat for the United Nations International Strategy for Disaster Reduction (UNISDR 2007a) noted there is little empirical evidence of the long term impact of disasters on the lives and livelihoods of people and on national development prospects. To address this gap, the UNISDR and the United Nations Development Programme (UNDP) supported analysis of the relationship between poverty and disaster risks in selected Asia Pacific countries, including India, Nepal, Sri Lanka, Iran and Fiji.

These studies are intended to help the UNISDR make a global comparative assessment of the link between poverty and disaster, and report in the Global assessment report on disaster risk reduction (see that report's annex for the objectives of the Asian and Fiji studies). For the Pacific, this Fiji case study provides a better understanding of the relationship between disasters and poverty, and offers a study method that other parts of the Pacific could use. It also provides specific multi-pronged policy recommendations for decreasing disaster risk and increasing resilience.

1. INTRODUCTION: HAZARDS, DISASTERS AND POVERTY

No part of the global community, including the Pacific, is immune to the impacts of natural or human induced hazards[1] and few are spared the effects of poverty. This section introduces key concepts of disaster and poverty used in this report to analyse the relationship between disaster and poverty for the Pacific.

1.1 Basic concepts

1.1.1 Hazard

A natural hazard is a condition that may cause loss of life, injury or other health impacts; property damage; loss of livelihoods and services; social and economic disruption; and/or environmental damage (UNISDR 2009). It may be of natural origin and may arise from a variety of geological, meteorological, hydrological, oceanic, biological or technological sources, sometimes in combination (table 1). Geographic location is an important determinant of the types of natural hazard to which a country is exposed. The characteristics of natural hazards vary considerably in terms of their speed of onset, duration, intensity and warning time. Approaches to reduce the impacts of hazards thus need to be context specific and tailored to each hazard type.

Table 1: Types of hazard

Type	Examples
Hydro-meteorological-caused by natural processes or phenomena associated with atmospheric, climatic, oceanographic or hydrological conditions	• Tropical cyclones, precipitation (rain), storm surges, wind, and other severe storms and lightning • Floods debris and mudflows, and landslides • Drought and desertification • Wild fires, temperature extremes and sand or dust storms
Geological—caused by natural earth processes or phenomena	• Earthquakes and associated landslides, and rockslides • Tsunami • Volcanic activity and emissions • Surface collapse and geological fault activity
Diseases, including epidemics and pandemics—caused by an outbreak of bacterial, viral or other sources	• Water and vector borne diseases following flooding • Cholera and other epidemics • Avian flu
Industrial and other disasters	• Fires and oil spills

Source: adapted from Benson and Twigg 2007.

1.1.2 Disaster and disaster risk

Disaster is defined as a serious disruption of the functioning of a community or a society, involving widespread human, material, economic and/or environmental losses and impacts that exceed the ability of the affected community or society to cope using its own resources (adapted from UNISDR 2009). Disaster events may be sudden and unexpected, or slow moving in their onset. They share a common characteristic, however, in their potential to cause widespread community disruption, displacement, economic loss, property damage, death and injury, environmental degradation and profound emotional suffering (Peek 2008). The potential impact of disasters is described by the term 'disaster risk'.

[1] Climate change is an example of a human induced hazard.

1.1.3 Disaster impacts

Globally, natural disasters have killed more than 1.5 million people in the past two decades and affected 255 million annually. Ninety-seven per cent of disaster related deaths reported globally occurred in developing countries (World Bank 2000). Economic losses associated with natural disasters are now estimated to be 15 times higher than they were in the 1950s (adjusting for inflation), and disasters caused approximately US$67 billion in losses in each year from 1994 to 2003 (Peek 2008; World Bank 2006).

Whatever the origin of disasters, their impacts include loss of life, injury to persons, damage to property, destruction of assets, loss of services, social and economic disruption and or environmental degradation. Disasters often affect water supply and sanitation, adding pressure to already poor health conditions in many communities. Cyclones and floods particularly result in an increased incidence of water and vector borne diseases (Campbell-Lendrum and Woodruff 2007). Such effects also lower economic capacity (Freeman 1999), causing further medium term economic losses that usually are not captured by impact assessments conducted in the immediate aftermath of disasters.

At the national level, the impacts of natural disasters are not merely a social and humanitarian issue. They are economically significant, affecting national macroeconomic and the national fiscal environment (Benson and Clay 2004). Disasters usually mean higher government expenditure and/or part reallocation of already committed financial resources (usually from the capital budget), to meet the costs of disaster relief and the costs of repair and rehabilitation of public property, and to provide support to victims. Disasters also mean a fall in government revenue because they cause a reduced level of economic activity, including possible net falls in imports and exports. Reduced economic activity implies reduced direct and indirect tax revenue, and thus increased budgetary pressures, which may result in governments borrowing more, placing inflationary pressures on the economy. International modeling results also suggest disasters can dampen investment and reduce long term economic growth, through their negative effect on a country's credit rating and an increase in interest rates for external borrowing (Benson and Clay 2004; Cochran 1994). Ultimately, such effects manifest themselves at the household level.

1.1.4 Sensitivity and disaster risk

Disaster impacts are determined not only by the nature of the hazard, but also by the society's vulnerability. Vulnerability is defined as the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard (UNISDR 2009). These circumstances can be linked to the structure and the status of the national economy, the condition of physical infrastructure (including access to water and sanitation) and the socioeconomic characteristics of households (including income, health and education). Vulnerability is thus the concept that explains why, with a given level of physical exposure, people are more or less at risk (UNDP 2009).

Vulnerability has three component elements: the sensitivity of households and communities to hazards; the ability to respond to disasters; and the ability to cope with the immediate effects of disasters. (The term 'sensitivity' is used in this report to emphasise individuals' and communities' conditions that particularly have the potential to magnify the effect of disaster.) Vulnerability is high in many areas as a result of poor infrastructure, which is often perceived as a key component of a country's economic status. Freeman (1999) demonstrated a direct link between vulnerability to natural disasters and poor infrastructure. Poor infrastructure affects people's ability to engage in income generating activities, as well as their ability to respond to disasters. Poor infrastructure standards, weak government regulations (such as the absence of building codes) and weak regulatory enforcement also increase disaster risks.

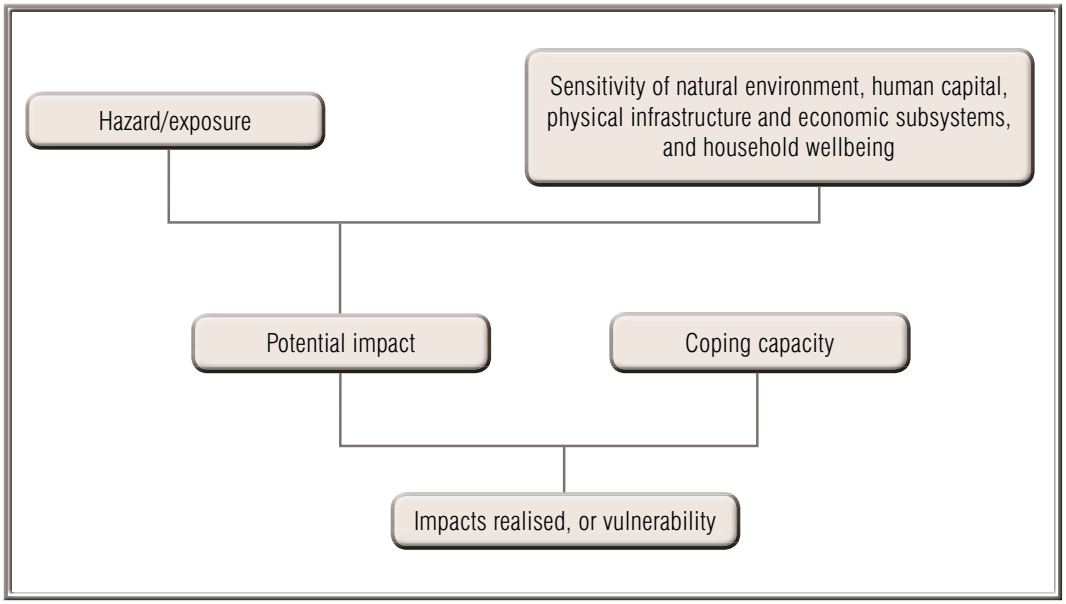
Countries that heavily rely on the primary sector are also generally found to be more sensitive to the effects of natural disasters (Benson 1997; Benson and Clay 2004), particularly disasters of hydro-meteorological origin. At the same time, the process of development adopted and the development choices made in many countries affect those countries' vulnerability to disasters—for example, environmentally unsustainable development practices, such logging in areas prone to landslides, increase disaster risks.

Human vulnerability is exacerbated by weak end-to-end disaster warning systems and the ability of people to manage disaster. Disaster management constitutes having emergency plans, equipment, and trained and knowledgeable people to help monitor hazards, operate end-to-end early warning systems and manage emergency responses. The nature and frequency of awareness programs, the strength of the media in reaching every part of the country, past experiences of the public and cultural beliefs also determine the community's vulnerability.

At the household level, sensitivity to external shocks can be viewed in terms of livelihoods and food and nutritional status. The former also depends on human development conditions, such as household income, access to water and sanitation, maternal and child mortality, and education. The poorer the economic and social wellbeing at the household level, the more sensitive the household is to the impact of hazards (primarily because it has a low threshold for withstanding external shocks) and the less able it is to respond to, cope with and adapt to disasters (because it does not have much, if any, capital reserve on which to draw).

The vulnerability of communities, economies and countries is thus a result of the interaction of hazards exposure, the economic status of households, the sensitivity of the environment and economy to hazards, the state of infrastructure, and the ability to respond to and cope with disaster events (figure 1).

Figure 1: Factors determining vulnerability to natural disasters



Source: adapted from (Schroeter, D. and ATEAM Consortium 2004).

Unfortunately, no single measure adequately captures the vulnerability of people and economies to external shocks (see Eriksen and Kelly 2007). Several different measures have thus been used to describe vulnerability (box 1).

Box 1: Different measures of vulnerability and risk

The economic vulnerability index combines vulnerability due to risk exposure factors—such as smallness, remoteness, reliance on agriculture and the structure of the economy—as well as a natural shock index, capturing factors such as homelessness and other human asset capacity (a measure of undernourishment, mortality, adult literacy etc.), and instability in the natural environment and markets. It is a measure of vulnerability associated with exposure risks, as well as a natural shock index. Unfortunately, it is available only for the least developed countries. Although useful as an inter-country comparative tool, the economic vulnerability index does not provide empirical evidence of the relationship between disasters and livelihood (see www.un.org/special-rep/ohrlls/ldc/ldc%20criteria.htm).

continued next page

The environment vulnerability index identifies three aspects of vulnerability: risks to the environment (natural and anthropogenic), the innate ability of the environment to cope with the risks (resilience) and ecosystem integrity (the health or condition of the environment as a result of past impacts) (Kaly et al. 1999).

The disaster risk index measures the relative vulnerability of countries to three key natural hazards: earthquake, tropical cyclone and flood. It reflects the average risk of death per country in large and medium scale disasters associated with earthquakes, tropical cyclones and floods, based on data from 1980 to 2000. It also enables the identification of socioeconomic and environmental variables that are correlated with risk of death and that may point to the causal processes of disaster risk. It indexes countries for each hazard type according to their degree of physical exposure, their degree of relative vulnerability and their degree of risk (UNDP 2009).

1.1.5 Poverty

Poverty is usually considered an important factor for determining household sensitivity and vulnerability to hazards because household income level determines people's coping and adaptation capacities. Poverty exacerbates the negative effects of disasters on households, increasing the severity of existing poverty and/or increasing the number of people suffering from it.

Before examining this relationship, it is important to explain what is meant by 'poverty'. The most common definition is based on household and per person incomes. A person is conventionally considered poor if his or her income level falls below some minimum level necessary to meet needs such as housing, food, clothing, education, health and so on. This minimum level is usually called the 'poverty line'. The World Bank defined the global poverty line to be in the range of US$1.25 and US$2 per day (in terms of 2005 purchasing power parity). The 10 to 20 poorest countries of the world have an average poverty line of $1.25 a day, and about 1.4 billion people in the developing world lived in poverty (or on less than US$1.25 a day) in 2005.

An alternative measure used to describe poverty is the ability to meet basic needs. The basic needs poverty line (BNPL) is the minimum income that an individual requires to meet his or her basic needs and is based on the food poverty line and the non-food poverty line. The latter, at its basic level, 'is the monetary cost of the non-food essentials' deemed necessary for a 'standard' household to achieve the minimum socially acceptable standard of living in non-food items (Narsey 2008). It comprises housing and household expenses, utilities, transport, education, medical expenses, clothing and entertainment.

What is necessary to satisfy basic needs varies across time and societies, however, so the definitions of poverty and poverty lines also vary across time and place. Each country uses a poverty line appropriate to its level of development, and societal norms and values. For the Pacific, poverty is thus defined in terms of not only income level but also other social indicators, including education level and access to water and sanitation (box 2).

Box 2: Definition of poverty in the Pacific

'An inadequate level of sustainable human development manifested by:

- a lack of access to basic services such as primary health care, education and potable water
- a lack of opportunities to participate fully in the socioeconomic life of the community
- a lack of adequate resources (including cash) to meet the basic needs of the household or the customary obligations to the extended family, village community, and/or the church.'

Source: Abbott and Pollard 2004.

As in the case of disaster vulnerability, no one measure adequately captures poverty of opportunities. Many different measures have been used,[2] including the human development index and the human poverty index (box 3).

Box 3: Measures of poverty: the human poverty index and human development index

Human development index (HDI)

The HDI provides a composite measure of three dimensions of human development: living a long and healthy life (measured by life expectancy), having an education (measured by adult literacy and enrolment at the primary, secondary and tertiary levels) and having a decent standard of living (measured by purchasing power parity (PPP) income per person). A higher HDI implies higher levels of human development.

Human poverty index (HPI)

The HPI is derived from average longevity, or life span (represented by the percentage of people expected to die before age 40), knowledge (measured by the percentage of adults who are illiterate) and a decent standard of living (represented by a composite of three variables: the percentages of people with access to health services and safe water, and the percentage of malnourished children aged under 5). A lower HPI implies the economy is doing well in terms of the basic social indicators. The HPI thus looks beyond income deprivation and represents a multidimensional alternative to the $1 a day (PPP US$) poverty measure.

Source: UNDP 2008.

1.2 The link between disaster risk and poverty

There is considerable anecdotal evidence of a link between disaster risk and poverty. Findings from worldwide consultations with the poor (World Bank 2000), the UNDP's (2004) report on mutual links between disaster and development, and the UK Department for International Development's (Department for International Development 2004) explanation of the links between development and disasters in view of the long term impacts on poverty trends have all pointed to a relationship between disasters and poverty.

It is widely acknowledged that the poor often live on marginal lands and in poorly constructed houses, and often have poor access to water and sanitation—for example, 80 per cent of the poor in Latin America, 60 per cent of the poor in Asia, and 50 per cent of the poor in Africa live on marginal lands characterised by poor productivity (World Bank 1997). According to White et al. 2004, people living in such conditions generate a range of immediate 'unsafe conditions'. Such conditions make the poor more sensitive to disasters and exacerbate their poor economic status. While those better-off may choose to live in higher risk areas, the poor often have no other choice. Poor thus live in poorly constructed houses, have poor access to water and sanitation, and often do not have food and nutritional security. Living in poverty thus increases their sensitivity to disaster. Given limited income and limited financial savings (if any), the ability of the poor to respond to and recover from disaster is limited at best. Further, the poor cannot easily adapt to disaster by investing in options such as disaster-proof technology, relocating to less hazardous areas, replacing lost items or even taking out insurance (World Bank 1997).

[2] Recently, two other indexes have been developed: the economic vulnerability index and the environmental vulnerability index. The economic vulnerability index is available only for least developing countries. For the environmental vulnerability index, see Kaly, et al (1999). See also Eriksen and Kaley 2007, for a review of indexes, including the vulnerability indexes.

It has been noted that disasters can even induce poverty, especially among those living near the poverty line. The World Bank (2000) also noted disasters and the destruction of assets of the poor can trap families in chronic poverty because they will not have the necessary income to rebuild their homes, replace assets and meet basic needs. In other words, disasters can be a source of poverty (Intergovernmental Panel on Climate Change 2007).

At the national level, the ability of a community to cope with and recover from external shocks also depends on the health of natural resources and supporting ecosystems (natural capital asset), human health (human capital asset), physical infrastructure (physical asset) and financial resources (financial asset) available to people (Carney 1998). It is often stated that recurring disasters can hold back development and progress towards national development goals, including the millennium development goals (MDGs) (Intergovernmental Panel on Climate Change 2007, UNDP 2004). Many countries report this problem in their national MDG progress reports.

The impacts of natural disasters at the national level are, however, not merely a matter of social and humanitarian importance; they are of economic importance too. They manifest in households' socioeconomic status, and the cumulative effects will be experienced across sectors and through government finances. The impact of disaster at household, communities and national levels limits their ability to respond to and recover and rehabilitate from external shocks, influencing economic productivity, economic growth and the status of economic development. There is, however, little quantitative empirical evidence of the long term impact of disasters on the lives and livelihoods of people, and on national development prospects (UNISDR 2007, appendix 3).

1.3 This study

To address the evidence gap, the United Nations International Strategy for Disaster Reduction Secretariat (UNISDR) and the United Nations Development Programme (UNDP) commissioned a global study to assess the relationship between poverty and disaster risk. Case studies in the Asia Pacific include India, Nepal, Iran, Sri Lanka and Fiji.

Fiji was chosen as the case study for the Pacific because the types of hazard experienced throughout the Pacific are similar to those found in Fiji, although disaster frequency and intensity vary across countries. Further, Fiji has a relatively weak economic and social development status, as reflected in key development and poverty indicators and low household economic conditions. Fiji was also chosen as a case study because its quantitative information and relevant databases are generally in a better state than those of other parts of the Pacific.

2. LINK BETWEEN DISASTERS AND POVERTY - METHOD

To examine the relationship between disasters and poverty, partial analytical and quantitative relational analysis could be adopted, depending on the scale of analysis of interest as well as the availability of quantitative data (table 2). Partial analysis can describe:

- hazard characteristics and disaster profiles (qualitative and quantitative)
- the structure of the economy and economic development trends based on official government statistics and statistics reported by international financial institutions such as the World Bank and the Asian Development Bank (quantitative)
- the nature of household wellbeing (including poverty status), using official statistics released by the governments, reports from the World Bank and the Asian Development Bank, official international statistics released by the United Nations Development Programme (UNDP) (the human development index [HDI] and the human poverty index [HPI]), and academic reports released on the subject (trend analysis as well as qualitative).

On the other hand, to determine empirically the link between poverty and disaster, the following questions must be asked: (1) do natural hazards contribute to or exacerbate poverty? and (2) does poverty have an impact on susceptibility to loss of life, buildings and agricultural assets? From these questions, two generic hypotheses are derived:

Hypothesis 1: Natural disasters are likely to (a) contribute to poverty by affecting key conditions reflected in human development indicators and assets directly, as well as indirectly by affecting their value and productivity; and (b) exacerbate households' ability to avoid and recover from poverty, and restrict their coping mechanisms.

Hypothesis 2: Poverty is likely to correlate with (a) the exposure of households to natural hazards, and (b) households' susceptibility to suffering loss from hazard events.

An econometric assessment of the two-way relationship between poverty and disaster, at the aggregate national level or cross sectional household level could be adopted to empirically test these hypotheses.

Table 2: Types of analysis used

Analytical approach	Nature of analysis
1. Partial analysis	*Disasters and effects* Type and frequency of hazards Trend in lives lost and people affected Trend in number of disaster type
	Economic characteristics Trend in gross domestic product (GDP) per person Relational trend in agricultural GDP and GDP Government expenditure Government revenue
	Human development characteristics Trend analysis of population growth Trend of incidence of poverty and Gini coefficient HDI and HPI estimation, component analysis Trend analysis of HDI, HPI and their components

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1. Quantitative relational analysis—regression analysis (ordinary least squares estimation)	Relationship between disasters and poverty (income and other social characteristics) Relationship between economic and social outcomes and disasters at household, sectoral and macro levels (Panel data estimation and other non-linear estimations could not be used, given the highly aggregated and limited data.)

2.1 Method used in the Fiji case study

The choice of a quantitative approach to analysing the relationship between disasters and poverty measures for Fiji was influenced by the availability of robust time series and cross-sectional quantitative data for key parameters that determine/influence both poverty and disaster effects (and vulnerability to disaster events) at the household, sector and national levels (table 3). Rigorous empirical assessment of the two relationships between disaster and poverty and the marginal effects of key factors at the household level and the national level is possible only if good quantitative information is available for key parameters. For household level analysis, econometric analysis of cross-sectional survey data or panel data[3] is often conducted.

Unfortunately, such detailed information on key variables-either as cross-sectional data following a particular disaster or panel data over time-is not available for Fiji. Consequently, at the national level, two hypotheses only (slightly adapted and simplified for the Fiji context) were tested. The hypotheses were quantitatively tested (or analysed) via ordinary least square (OLS) regression, using the software Microfit 4.1 (Pesaran and Pesaran 1997) and a data set from 1990–2002.

Hypothesis 1 (Fiji): Disasters affect poverty level and economic development in Fiji.

Hypothesis 2 (Fiji): Poverty level affects disaster outcomes in Fiji.

Empirical analysis to test these hypotheses in Fiji was critically constrained by the lack of adequate time series data on key variables. This forced the use of proxy measures for key variables and the use of particular functional forms for the equations in the regression analysis.

Table 3: Types and sources of data used in the analysis of the relationship between disaster and poverty in Fiji, and data constraints

Types of data	Source	Comments
1. Disaster		
Type of hazards (as described in Table 1) and incidence of disaster	NDMO,[4] EMDAT,[5] GLIDE, FMS and Pacific Disaster Net[7]	Data for disaster type were fairly consistent across the data sources.
Number of people affected		The number of affected people reported for some disasters differed across the sources. The number provided by the NDMO was preferred.

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[3] Panel data are a data set of observations on multiple phenomena over multiple time periods. Time series and cross-sectional data are both one-dimensional whereas panel data sets are two-dimensional.

[4] The National Disaster Management Office (NDMO) retains hard copy records of disaster events and provides the detail of the scale and impact of natural disasters, and it augments that information provided in the Pacific Disaster Net.

[5] EMDAT is an emergency events database created by WHO Collaborating Centre for Research on the Epidemiology of Disasters (CRED) with the initial support of the WHO and the Belgian Government. The database is intended to inform decision making to support disaster preparedness, vulnerability assessment and decision making (www.emdat.be/).

[6] The Fiji Meteorological Service (FMS) functions as a department under the Government of Fiji Islands and has responsibility for providing an essential service to the country. It also serves on a regional scale, providing weather forecasting and tropical cyclone warning services to many other countries and a vast area of the tropical south west Pacific.

[7] This web based portal, www.pacificdisaster.net, provides a wide range of data on natural disaster events across the Pacific. In the case of Fiji, data on natural disasters extend from the 1800s to the present day.

Areas affected		This is a concern because a number of disaster records did not state the area affected by the disasters. Those stated were mostly available at the aggregate level or district level.
Number of fatalities		The number of fatalities reported for some disasters differed across the sources. The analysis used the numbers provided by the NDMO.
Estimated cost		Cost assessments by various government agencies and nongovernment organisations differed in some cases. For most disasters, the cost of impacts was missing in disaster records. Cross-sectional and panel data on costs, economic and social characteristics, and impacts were unavailable. All costs were converted to US dollars using the conversion rates for the year in which the assessment was carried out.
2. Economic		
GDP	Asian Development Bank, Reserve Bank of Fiji	Consistent data were available from the sources.
Labour input	Asian Development Bank, International Monetary Fund	Consistent data were available from the sources.
Capital input	International Monetary Fund	Yearly data were extracted from the International Financial Statistics (IFS) database.
Trade ratio	Asian Development Bank, Reserve Bank of Fiji	Ratio was calculated as the sum of exports and imports as a ratio of GDP.
3. Social		
Data on performance against key UN millennium development goals	Secretariat of the Pacific Community, UNDP	
Income poverty	Bureau of Statistics, Narsey (2008)	Only three household income and expenditure surveys completed for Fiji
HDI	UNDP	Time series national level HDI measures were available, but not the time series HDI component data.
HPI	UNDP	The HPI is a better measure of poverty because it captures not only the income aspects of poverty but also the other basic vulnerability indicators, such as access to water and sanitation. Time series data on this index and the components of this index were not available, however, thus leaving the HDI to be used as a proxy for poverty.

3. DISASTER AND POVERTY LINKS IN FIJI

To understand the relationship between disasters and poverty in Fiji, it is important to first understand the types of hazard facing Fiji and their impacts, the structure and status of the country's economy, and the country's economic and social development. These issues are described in section 3.1. Section 3.2 contains a detailed econometric analysis of the relationships between poverty, disaster and other key factors.

3.1 Partial analysis

Geographic, economic and socioeconomic characteristics of a country and its communities are important determinants of vulnerability to natural disasters. This is particularly relevant in a small island developing country such as Fiji.

3.1.1 Natural hazards, disasters and their impacts in Fiji

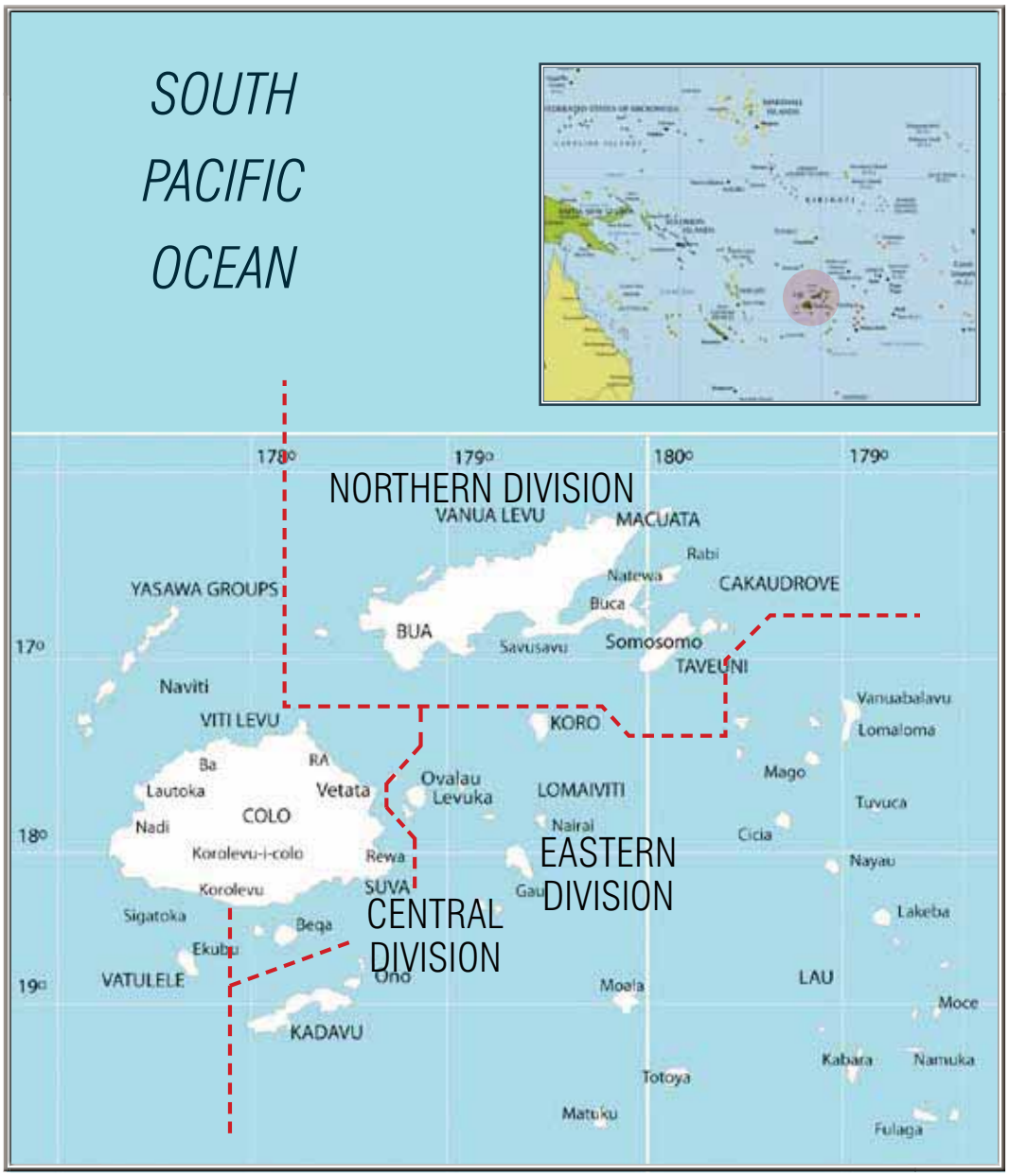
Given its geographic location and characteristics, Fiji regularly experiences natural hazards of geological and hydro-meteorological origin. Comprising approximately 330 islands, it is located along the equatorial belt (latitude 12^0N and 22^0S, and longitude 174^0E and 178^0W). Accordingly, Fiji has a tropical South Sea maritime climate, with most parts experiencing clear summer and winter conditions and pronounced windward/leeward rainfall effects. As such, storms and tropical cyclones often affect the Fiji islands, usually between November and April. Many of the islands are of volcanic origin of varying geological age, so also suffer from earthquakes at times.

In the past 37 years, Fiji reported 124 natural disasters, affecting almost all the parts of Fiji. Tropical cyclones accounted for 50 per cent of these events, followed by floods (33 per cent) and earthquakes (8 per cent). Other natural disasters, such as tsunami and severe local storms, accounted for about 4 per cent of incidents, and drought constituted 5 per cent of the total number of disaster events (figure 2).[8] Climate change is expected to increase the frequency and extreme conditions of many of the hydro-meteorological events, resulting in high winds, high precipitation and associated floods and landslides, and extreme drought conditions.

Based on the concepts of 'extensive' and 'intensive' disaster risk developed by the United Nations International Strategy for Disaster Reduction Secretariat (UNISDR) and the United Nations Development Programme (UNDP), and the criteria created for Fiji for this project (box 4), 60 per cent of the disaster events in Fiji could be regarded as extensive and the remainder as intensive. However, while most disaster events occurring in Fiji were extensive, intensive disasters caused the majority of disaster impacts, accounting for 86 per cent of fatalities and 74 per cent of economic costs. This experience differs from that elsewhere in Asia, where extensive disasters collectively had a much greater impact than that of the intensive disaster events (UNISDR 2007). The assessment for Fiji may partly reflect the fact that information on extensive disaster events and their impacts at the subnational level has not been collated in the same systematic manner in Fiji. Data on many lesser events is sometimes not collected at all. Accordingly, a more thorough reporting on the impacts of small and highly localised events in the future may change the results from this analysis.

[8] These records do not include health related disasters or epidemics.

Map 1: The Fiji islands



Box 4: 'Extensive' and 'intensive' disaster risk categories

Definitions

'Extensive risk' refers to diffuse risk manifesting frequently over wide territories, often occurring on an ongoing basis, causing fewer than 50 deaths or destroying fewer than 500 houses (UNISDR 2009).
'Intensive risk' refers to concentrated risk manifesting infrequently in specific locations, and often as one-off events, causing more than 50 deaths or destroying more than 500 houses (UNISDR 2009).

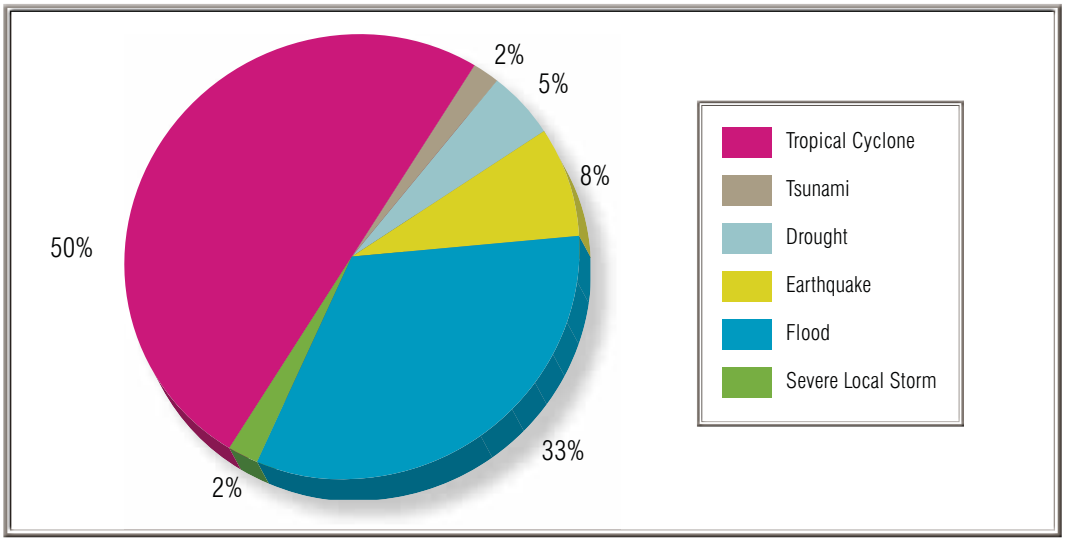
Extensive and intensive risk in Fiji

The global UNISDR risk categories are not easily applicable to Fiji and elsewhere in the Pacific. Events that are considered to be disasters locally may be viewed as small by global standards. Instead, therefore, 'extensive' disasters for Fiji were categorised as those that caused five fatalities or fewer, or that generated losses of F$5 million or less. By comparison, 'intensive' disaster events for Fiji were categorised as those that caused over five fatalities or that generated losses of over F$5 million. Based on available data and according to these criteria:

- 60 per cent of reported disaster events in Fiji could be considered to be 'extensive' when considering fatalities, or 26 per cent of events could be considered extensive when considering costs
- 40 per cent of disasters in Fiji were intensive when considering fatalities, whereas 74 per cent were intensive when considering costs.

Note: There is no consensus as to the most appropriate criteria for defining 'extensive' and 'intensive' risks. The cut-off point used in the categorisation appears to be country specific.

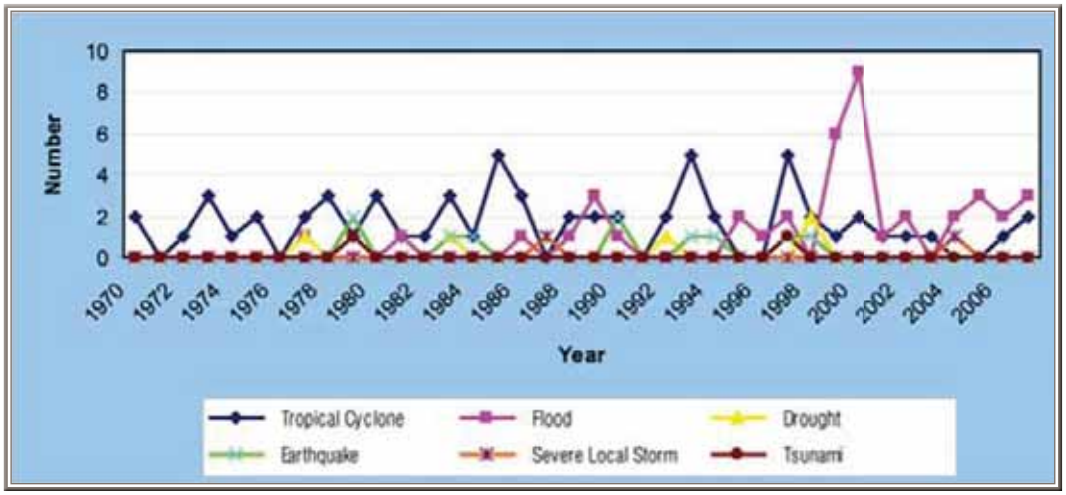
Figure 2: Relative importance of different disaster events in Fiji, 1970-2007



Sources: compiled from EMDAT, Glide, the Fiji Meteorological Service and the National Disaster Management Office.

For Fiji, while the number of climatic events (cyclones and storms) does not show an upward trend, the incidence of flooding events has increased, particularly since mid-1987 when the country's first political coup occurred. The 1987 coup had a major impact on the country, as trained and experienced personnel left and national governance declined across all sectors. In terms of the increase in the number of flood events occurring since 1987, the coup might have led to a reduced emphasis on risk reduction by the government (maintenance of drainage in low lying areas, dredging of major rivers etc.). However, a longer time series analysis would be needed before such a conclusion could be drawn.

Figure 3: Disaster events in Fiji, 1970–2007



Sources: compiled from EMDAT, Glide, the Fiji Meteorological Service and the National Disaster Management Office.

Disaster impacts

Disasters cause both direct and flow-on (indirect) effects on people and their livelihood, including effects on economic and social wellbeing, infrastructure and the environment. Government finances and services are also affected by disasters. The following discussion is based on information from post-disaster impact assessments undertaken by government and nongovernment agencies.[9] These assessments were largely made from the perspective of the disaster response and humanitarian assistance, so often focused on only some of the disaster effects, such as fatalities, the number of people affected and some of the direct economic costs (discussed later). Also note that impact assessments were not always conducted in times of disasters and, where they were undertaken, they did not systematically report or quantify all impacts. The data are thus only partial.

(a) Human 'costs' of disasters

The Government of Fiji reported a total of almost 1.8 million people affected by disasters in the past 37 years, including over four hundred fatalities (table 4). Cyclones, floods and storms accounted for almost half those affected. On the other hand, although there were only two reported drought events, drought accounted for almost 45 per cent of all disaster affected people. Of the fatalities, 99 per cent were due to hydro-meteorological disasters, with the remainder due to earthquake (figure 4). While earthquakes are usually considered to cause greater impacts on people and assets, their localised nature and the relatively low level of development in Fiji have contributed to small earthquake impacts, compared with the wide geographic reach of cyclones and other hydro-meteorological hazards.

Table 4: Direct impacts of major disasters, Fiji, 1970–2007

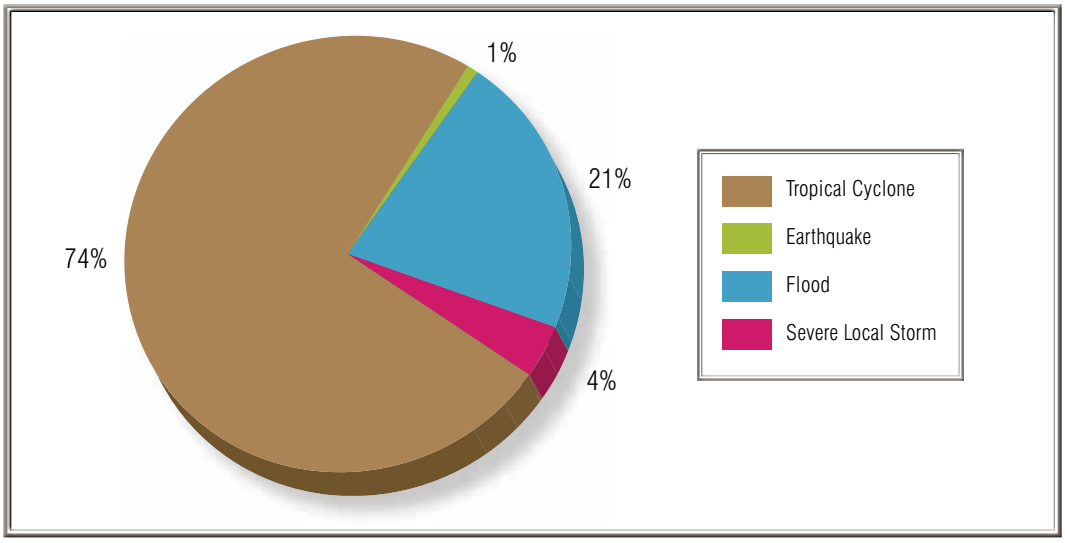
Disaster	Number of events	Number of people affected	Number of people killed
Flood	41	221 724*	88
Tropical cyclone	63	791 653*	309
Earthquake	10	0	5
Drought	6	840 857	0
Tsunami	2	0	0
Severe local storm	2	8369	17
Total	124	1 862 603	419

* For only those years in which the number of people affected was recorded. The actual number of people affected could be higher than recorded.

Sources: compiled from EMDAT, Glide, the Fiji Meteorological Service and the National Disaster Management Office.

[9] The agencies include the National Disaster Management Office (NDMO 2008), United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA, pers. comm. 2008) and the Red Cross, pers. comm. 2008).

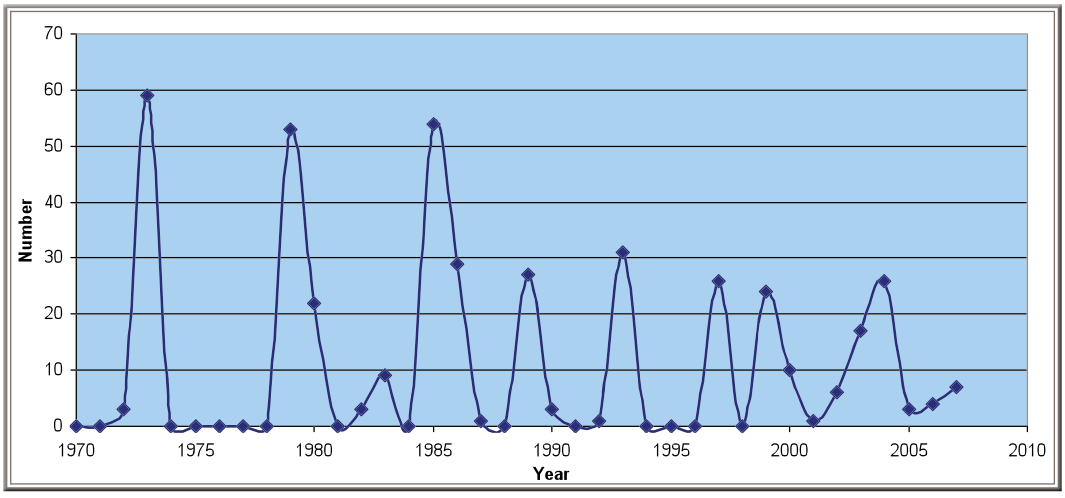
Figure 4: Percentage of lives lost per disaster event, Fiji, 1970–2007



Sources: compiled from EMDAT, Glide, the Fiji Meteorological Service and the National Disaster Management Office.

The number of disaster events does not show any distinct pattern over time. The number of lives lost, however, gradually declined in the past 37 years (figure 5). This finding perhaps suggests people in recent years have been better prepared and/or more responsive to disaster warnings, particularly given that vulnerability to disasters depends on not only the intensity of the hazards but also people's preparedness and responsiveness.

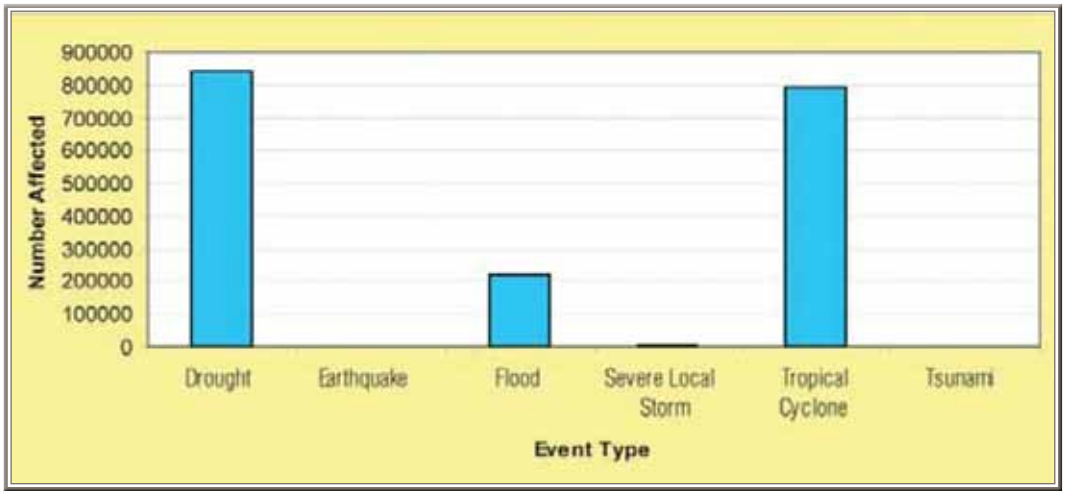
Figure 5: Reported number of lives lost from disaster event, Fiji, 1970–2007



Source: compiled from EMDAT, Glide, the Fiji Meteorological Service and the National Disaster Management Office.

An average of 50 341 people, or just under one tenth of Fiji's population, is directly affected by disasters each year, with droughts having the greatest impact on the population (figure 6). However, numbers and statistics cannot capture the often considerable human suffering associated with disasters (box 5).

Figure 6: Reported number of people affected by disaster event, Fiji, 1970–2007



Source: compiled from EMDAT, Glide, the Fiji Meteorological Service and the National Disaster Management Office.

Box 5: A human face of natural disasters

During the 2009 January floods, many cases were reported of people being without food or water, let alone having any means to recover. Three hundred villagers in the Navosa district, for example, were without food, or means to buy any food, for almost three weeks following the January floods. The families were relying on foods they can harvest from the wild, such as breadfruit, guavas and bananas. The villagers were sharing information on where to find the nearest breadfruit trees, for example, so they can share it equally among them. Their crops on the 190 acres of farms were destroyed, and they did not have any source of income to pay for children's books and uniforms, or for non-tuition related fees. One of the village elders reported that 'Our children cannot go to school because the farms we depended on have been destroyed'.

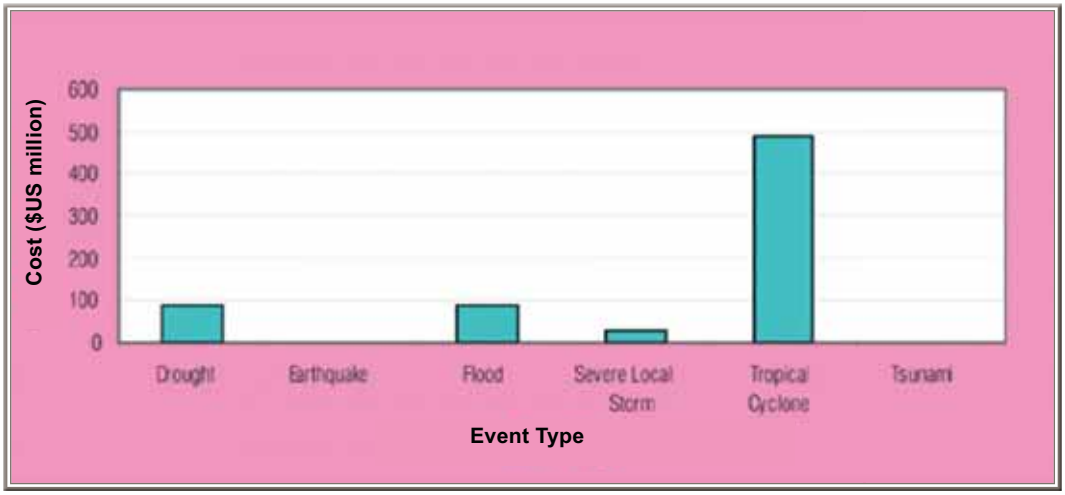
Source: adapted from Fiji Times, 30 January 2009.

(b) Economic costs of disasters

The direct cost of disaster events in Fiji for 1970–2007 was estimated to be about US$532 million. Of this total cost, 86 per cent arose from only 17 per cent of the events. These statistics reflect only 51 per cent (or 104 events) of the disaster events for which the government reported cost estimates. (It is possible that the government did not consider the remaining events to be major enough to warrant impact assessment).

Cyclones accounted for the highest proportion of total costs reported for Fiji during 1970–2007 (figure 7), reflecting their dominance in terms of number and frequency. They also dominated in terms of the number of events and the total impact in a year, with 1985 being the worst year (figure 8).

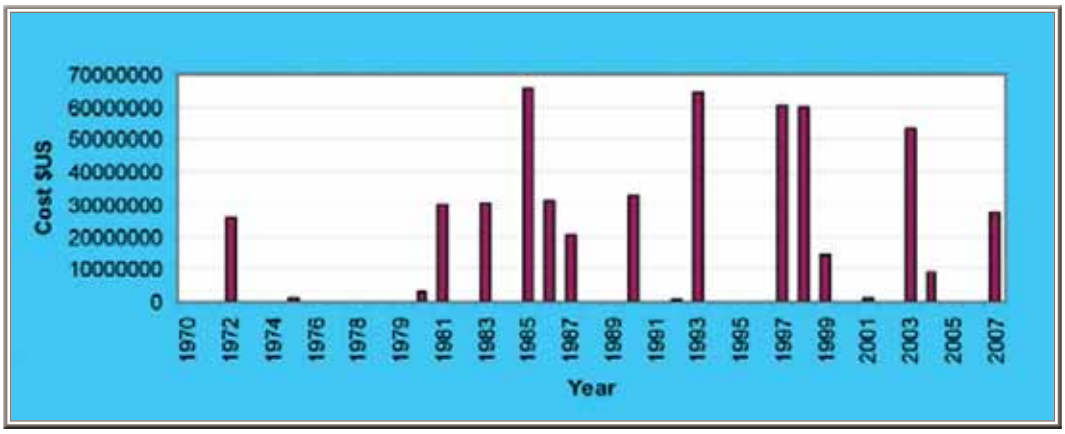
Figure 7: Total estimated costs by disaster event type, Fiji (US$)



Sources: compiled from EMDAT, Glide, the Fiji Meteorological Service and the National Disaster Management Office.

In 1985, five tropical cyclones affected all of Viti Levu, Fiji. These cyclones, particularly Cyclone Eric and then Cyclone Nigel which followed only two days later, swept across western and central Viti Levu, causing damage to infrastructure, housing and crops. The total estimated cost was about US$66 million, although this estimate is only partial because many costs were not assessed.

Figure 8: Reported estimated annual (nominal) cost of disasters, Fiji, 1997–2007



Sources: compiled from EMDAT, Glide, the Fiji Meteorological Service and the National Disaster Management Office.

In terms of a single event, Cyclone Kina in 1993 affected most parts of Fiji and was the most destructive (box 6), with reported economic losses of around US$ 65 million. This is almost the same as US$66 million reported for all of the five cyclones in 1985.

Box 6: Tropical Cyclone Kina, 1993

Tropical Cyclone Kina struck Fiji in January 1993 and lasted five days. Extensive physical damage occurred throughout the country, from the Yasawa Islands in the west and northern and eastern Viti Levu, to southern Vanua Levu, the Lomaiviti Group and the Southern Lau Group.

Cyclone Kina affected crops and livestock, homes and buildings, and public infrastructure, including the Sigatoka and Ba bridges. Twenty-three people were also killed.

The total, albeit partial, economic costs were estimated to be US$65 million.

Source: NDMO pers. comm., November 2008.

Conventionally, government line ministries make disaster assessments and report to the National Disaster Management Office, which coordinates disaster response assistance. Cost estimates often reflect only damage assessment for buildings, equipment, etc. and other capital items and supplies borne by the public sector (health, infrastructure, education, power utilities etc.). At times, the government agencies may also assess direct losses to the agricultural and fisheries sectors, often based on visual assessment and expert opinion. Where these assessments are included, they can increase the estimated cost by almost 100 per cent (table 5).

Table 5: National Disaster Management Office's assessment of sectoral impacts of Cyclone Ami and related flooding (F$)

Sectors	Subsectors	Costs	Total cost
Public sector	Housing Health Agriculture Education	22 089 200 857 000 1 020 671 4 770 635	28 737 506
Economic	Taveuni Chamber of Commerce Labasa Chamber of Commerce Tourism Sugar industry Agricultural commercial crops	113 500 12 110 000 144 000 13 600 000 39 309 948	65 277 448
Infrastructure	Roads and bridges Regional water supply Rural water supply Sewerage Public buildings	2 725 000 1 179 500 927 758 522 223 437 954	5 792 435
Utilities	Telecommunications Power supply (Fiji Electricity Authority)	1 185 400 3 395 000	4 580 400
Total			104 387 789

Source: McKenzie et al. 2005a.

Similarly, post-disaster assessments do not conventionally include estimates of direct financial losses to households or the private sector.[10] Where the cost estimation does include impacts on households (such as Holland 2008), the impacts can be significant. For the 2004 Navua flood damage, Holland (2008) estimated a cost of about F$13 million for some of the direct costs, attributing almost 50 per cent to the direct losses incurred by households (table 6).

Table 6: Estimated economic losses from the 2004 Navua floods, Fiji (F$)

Item	Value of loss
Household	6 745 228
Business, agricultural and fisheries losses	3 813 225
Government losses Replacement, rehabilitation and provision of emergency supplies	2 472 333
Humanitarian aid valued Australian High Commission and French Embassy	1768
Unvalued humanitarian aid Blankets, bottled water and Red Cross provisions	Unknown
Other losses Volunteers to government and nongovernment organisations, trauma and irreplaceable items	Unknown
Estimated total (excluding 'unknown' values)	13 032 554

Source: adapted from Holland 2008.

[10]SOPAC recently determined the financial costs to households and businesses of the 2004 flood in Navua (Holland 2008).

Box 7: Household level impacts of 2004 Navua floods, Fiji

Situated on the Navua floodplain, families and businesses around Navua town are subject to major floods on an average of one every seven years, with minor floors occurring regularly between them. The last major flooding in Navua occurred in 2004 as a result of heavy rainfall caused by consecutive tropical depressions. Estimated losses from the floods are about F$13 million, with families losing an estimated F$4815 per household or F$963 per person (the average household comprising around five people at the time) (Holland 2008). This settlement comprises people who used to engage in rice farming and now work on other forms of agriculture or earn income from non-agricultural employment. Commercial rice farming was abandoned following trade liberalisation and the removal of import restrictions, when farmers could not compete with cheaper rice imports from Asia. Periodic floods and pest infestation also contributed to the demise of rice farmers in the region. More recently, residents of Navua include a large number of sugarcane farmers, displaced from their land by the nonrenewal of their native land leases. Given the average household income of F$3500 a year, a loss of $4815 is highly significant and forced many families to fall below the poverty line.

Source: Holland 2008.

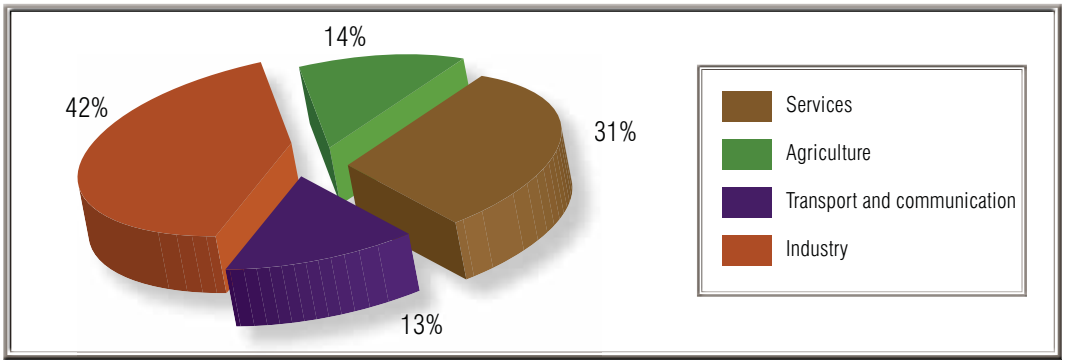
Disaster impact assessments in Fiji usually also do not include the costs of flow-on effects, yet such effects can be devastating in the short and long terms. Indirect costs not often captured by impact assessment include:

- the household's reduced ability to pay for schooling less, forcing children to drop out of schools
- the cost to families of the increased incidence of water and vector borne diseases
- decreased government services following a reduction in tax revenues
- the forced relocation sale of productive assets by affected households, which push many into poverty
- a reduced ability to afford clean water, food, clothing and medicine
- migration to urban areas to live in other hazardous areas without access to basic health services
- flow-on economy-wide impacts on other sectors and employment.

3.1.2 National economy, sensitivity to disasters and disaster risks

As noted, sensitivity to disasters and disaster risks depends on a complex interplay of the nature of the hazard, the structure and status of the economy, the condition of physical infrastructure, and the government financial status. Fiji, which is the largest economy among the Pacific island countries, has a gross domestic product (GDP) of about F$2.9 billion (table 7). With a population of 835 869, this gives a per person income of F$3 469 (US$1 825), classifying Fiji as a lower middle income country according to United Nations' definitions. The industry sector, which includes mining, manufacturing, electricity, gas and water, construction and trade, is the major contributor to the GDP. Using 2006 figures, this sector contributed 42 per cent to the GDP, followed by government services, which accounted for 31 per cent (figure 9).

Figure 9: Composition of Fiji's GDP, 2006



Source: ADB 2008b.

Fiji's economy is particularly sensitive to natural disasters because it nevertheless heavily relies on the primary sector. The primary sector—agriculture, fisheries and forestry—is the second major export earner in the country after tourism. Agriculture has lost its claim as the main export earner following the recent decline in the sugar industry, which resulted from a combination of factors, including declining productivity on farms and in milling sectors, well as nonrenewal of native land leases. Yet, while the contribution of the primary sector has been declining, it still forms a significant portion of the GDP, and the national GDP mirrors the contribution of the agricultural sector to the economy (figure 10).

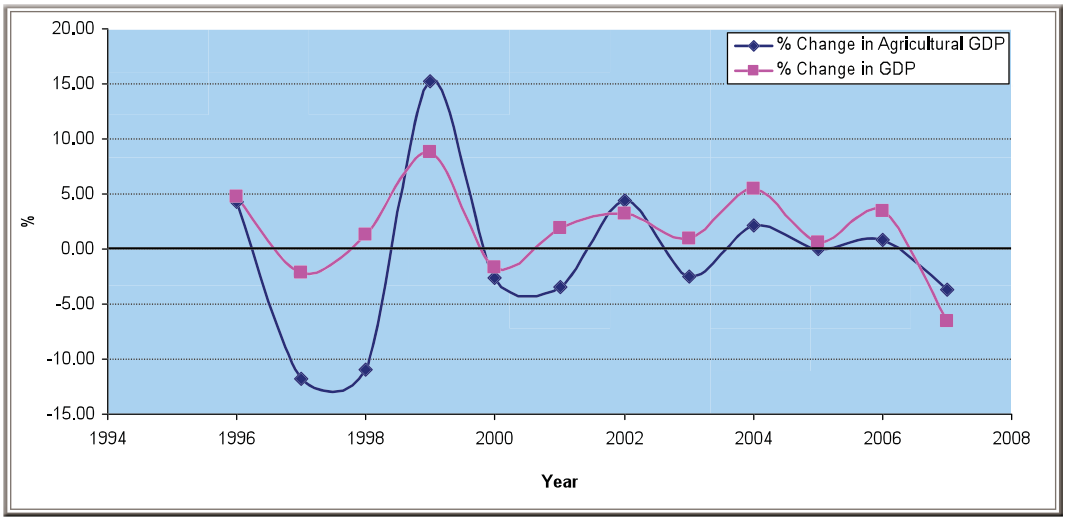
Table 7: Fiji's economy

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
GDP (constant 1995 prices)	2373.0	2487.2	2433.1	2464.4	2680.8	2637.4	2688.6	2774.5	2800.1	2953.2	2971.6	3073.0
GDP growth rate	–	4.8	–2.2	1.3	8.8	–1.6	1.9	3.2	0.9	5.5	0.6	3.4
Estimated mid-year population ('000)	768.2	774	787.6	796.7	806.3	810.5	815.7	823.6	833.3	835.0	842.5	849.5
GDP per head of population (F$)	3089.8	3209.0	3089.0	3102.3	3344.9	3268.1	3321.8	3422.5	3438.1	3602.1	3611.7	3721.9
Investment (F$ million)	581.3	493.8	562.6	879.6	812.2	551.1	577.7	771.8	940.5	873.2	929.1	N/A
Unemployment rate (%)	5.4	5.8	7.0	7.9	8.3	7.6	8.7	8.5	8.1	5.8	5.9	6.4
Labour force ('000)	286.2	297.8	310.1	320.2	330.7	341.7	352.5	345.2	349.9	354.8	362.0	369.3
Government revenues	705.5	733.4	798.0	1138.5	1002.9	910.0	900.1	1038.3	1066.3	1176.2	1221.9	1391.6
Government budget surplus/deficit	–0.3	–4.6	–6.7	–0.9	–3.6	–4.8	–7.6	–6.9	–6.5	–4.4	–5.2	–4.0

Source: ADB 2008.

Sugar production alone contributes approximately 6 per cent of total GDP and 25 per cent of total domestic exports. It also provides employment to 40 500 people. A majority of the economically active population are employed in subsistence agriculture (Fiji Islands Bureau of Statistics 2008). Total paid employment in 2007 was 119 800, which is only part of the employment base because the economically active population includes those who are self-employed (including most sugarcane farmers and those whose production is primarily for nonmarket, subsistence consumption). Nationally, the total active labour force in 2007, including those on farms, was 376 700. Around 6.9 per cent of the labour force remained unemployed in 2007.

Figure 10: Percentage change in GDP and agricultural GDP, Fiji



Source: Reserve Bank of Fiji 2008.

Econometric analysis of 1990–2007 economic data suggests a direct correlation between agricultural production and national GDP. Fiji's reliance on primary industry and the tourism sector makes it highly vulnerable to cyclones and storms. Given the productivity in the primary sector depends on good weather conditions, any natural disasters of hydro-meteorological origin, such as cyclones and storms, will cause significant negative impacts on not only human livelihoods but also the overall economy. A decline in national economic activity means a decrease in government revenue, which then affects the ability of the government to deliver its planned development activities and basic social services.

Government revenue in 2006 was approximately F$1 400 million, of which taxes contributed about 86 per cent. Following major disasters and other external shocks such as coups, national GDP and its growth rate in Fiji were affected. Prasad (2007) stated that the Fiji economy grew by 3.4 per cent in 2006, largely reflecting the positive contributions of the agriculture, forestry, fisheries and subsistence, wholesale and retail trade and manufacturing sectors. That report also estimated the economy would contract by more than 3 per cent in 2007, as a result of the 2006 coup. In fact, the economy contracted by 6.6 per cent in 2007.

Moreover, with lower economic development status, compared with other countries, the government has limited capacity to invest in risk reduction services, quickly respond to disasters or help the country quickly recover and rehabilitate. Fiji has always relied on humanitarian and development support from development partners in times of natural disasters and for recovery and rehabilitation (see table 8 for an example of development partner assistance). Such support from development partners, has also been seen to create moral hazard problems, where by countries do not have incentive to adequately invest in disaster risk reduction initiatives when they know that in times of disasters donor support will be forthcoming (World Bank 2006a).

Table 8: International assistance to Fiji for Cyclone Ami

Source	Description	Value (US$)
Australia	Hire of helicopter for assessment and relief deliveries, relief assistance through the Fiji Red Cross and contribution to local appeal	29 900
	Hire of purification units, aircraft with 5000 water containers, 3000 tarpaulins and 3200 light blankets	Not costed
France	Aircraft with tarpaulins, blankets and other relief supplies	Not costed
Japan	Offer of medium term school/health centre rehabilitation	Not costed
New Zealand	Contribution to Prime Minister's appeal and additional relief support	14 500
	Supplies of water, tarpaulins and other support	Not costed

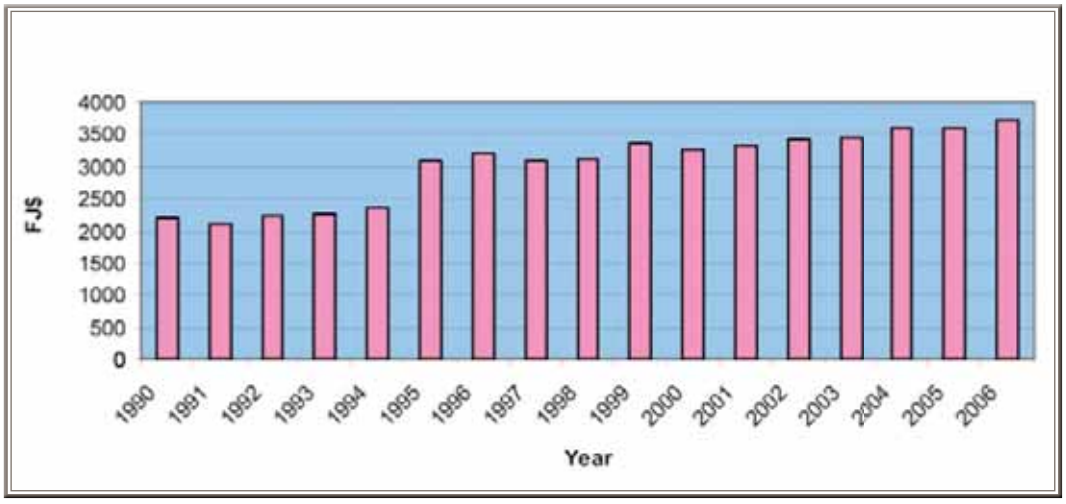
continued next page

Norway	Through the UN Office for the Coordination of Humanitarian Affairs, a relief effort through the National Disaster Management Office (uncommitted)	5 000
United Kingdom	Relief assistance through the Fiji Red Cross and a contribution to the Prime Minister's appeal	7 280
United States	Cash to the Fiji Red Cross for water purification equipment	15 000
European Union	Offered assistance for both relief and rehabilitation	Not costed
International Federation of Red Cross	Relief assistance through the Fiji Red Cross	1 450
World Health Organisation	Technical/financial assistance to the Ministry of Health	Not costed
United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA)	Grant through the National Disaster Management Office for local purchase of tarpaulins and rope	15 000
Pacific Islands Forum	Regional Natural Disaster Relief Fund emergency grant	9 710
SOPAC	Post-disaster impact assessment to reduce vulnerability	Not costed

Source: Lal 2003.

On average the economic wellbeing in the country has gradually increased in the past three decades. The real GDP per person was at F$3 722 in 2006 (figure 11), up from about F$2200 in 1990. This increase in economic wellbeing, however, has not been evenly distributed across Fiji.

Figure 11: Real GDP per person, Fiji, 1990–2006



Source: ADB 2008 b.[11]

The Gini coefficient, which is a measure of inequality in the GDP, has also decreased in Fiji over time. Fiji's national Gini index was 0.43 in 1977, but then fell substantially to 0.34 by 2002-03 (table 9). This suggests inequality across both the communities is decreasing, with the Indo-Fijian community showing a greater decrease in Gini coefficient. There is, however, a need for caution in making any firm conclusion about the changes in income distribution as Narsey (2008) found some discrepancy in particularly 1990/91 HIE data, and detailed analysis (discussed below) shows that poverty level has indeed increased in Fiji.

[11] Note that the real GDP per person value for 1995 might not have been solely a result of an increase in GDP; the sudden increase can be attributed to a change in the base year from 1989 to 1995.

Table 9: Gini coefficients for Fiji (per person income), 1977 to 2002-03

	1977	1990-91	2002-03
National average	0.43	0.49	0.34
Indigenous Fijian	N/A	0.42	0.31
Indo-Fijian	N/A	0.53	0.36

Sources: Stavenuiter 1983 for 1977; Ahlburg 1995 for 1990-91; Abbott 2006 for 2002-03.

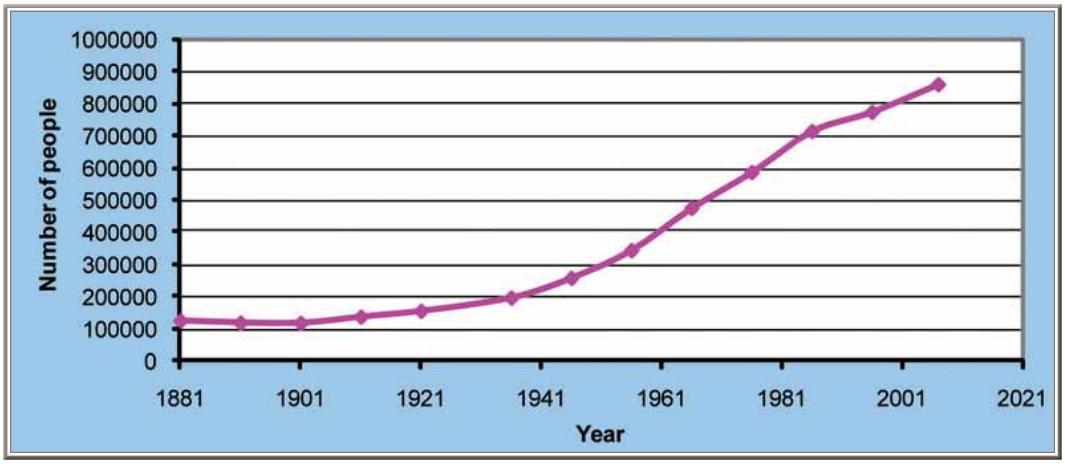
A particular concern in this context is that the real wage rate for Fiji appears to have decreased over time while the overall cost of living has risen (by around 42-45 per cent). Moreover, the real value of the lowest income declined by around 15 per cent in the last two decades (Ministry of Finance and National Planning 2004).

3.1.3 Household characteristics and sensitivity to disasters

The socioeconomic characteristics of households-including their economic wellbeing, access to water and sanitation, and education-are important determinants of households' sensitivity to disaster, as well as their ability to respond and cope. In other words, those characteristics determine household vulnerability to disasters.

Fiji is a multicultural society, with a population of 835 869 and an average population growth of 0.7 per cent in the past five years. This growth rate is a major departure from the historical population trend of about 3 per cent growth, particularly during the latter half of the 20th century (figure 12). Today, the urban population constitutes 51 per cent of the national population and is growing at a rate of 1.7 per cent per year. By comparison, the rural population is declining at a rate of 0.1 per cent per year—a result of rural–urban migration.

Figure 12: Population of Fiji, 1881–2007



Source: Fiji Islands Bureau of Statistics 2008

With the demand for land and housing outstripping the capacity of the towns and cities to accommodate it, many of the new migrants (particularly the non-professional class) find themselves in squatter and other informal settlements. These settlements are usually on marginal lands located, for example, on flood plains, on steep land or in mangrove areas along the coast, which are often susceptible to flooding and/or other natural hazards.

Conditions in squatter settlements around Fiji are very poor, with families usually having no access to clean piped water or power, and shelters are often rudimentary. Reflecting the lack of employment opportunities for the families living in squatter settlements, households generally lack access to health services, and malnutrition is also often high. Compounding the lack of income, unemployment for many dwellers makes it difficult for children to complete their education, aggravating already limited employment opportunities. Such social conditions also decrease these households' ability to respond to and cope with disasters, increasing human vulnerability to natural disasters.

Box 8: Squatter settlements in Fiji

Squatter settlements are rapidly developing around the urban centres throughout Fiji, particularly in Suva. The country had an estimated 182 squatter settlements in 2003, having risen by about 73 per cent since 1996 (a growth rate of over 10 per cent per year). Almost 10 per cent of the national population of 850 000 residents now live in squatter settlements-a proportion that is rapidly increasing due to both push and pull factors.

Push migration factors reflect the loss of opportunities in rural areas, such as the termination of land leases, lack of government and institutional support, and low rural wages. The push factors mainly apply to Indo-Fijians, who made up 37 per cent of the population in 2007. The indigenous Fijians, who comprise 56 per cent of the population, communally own almost 89 per cent of land. The remainder of the land is owned by the state (3.9 per cent) or in fee simple (7.9 per cent). With the recent expiry of leases post 1997, the majority of land leases were not renewed to sitting Indo-Fijian tenants. Looking for alternative sources of income, these Indo-Fijians migrated to urban centres, only to end up in squatter settlements. The pull factors reflect the attraction to the city of the modern sector's expanding opportunities-the so-called 'bright lights' phenomenon.

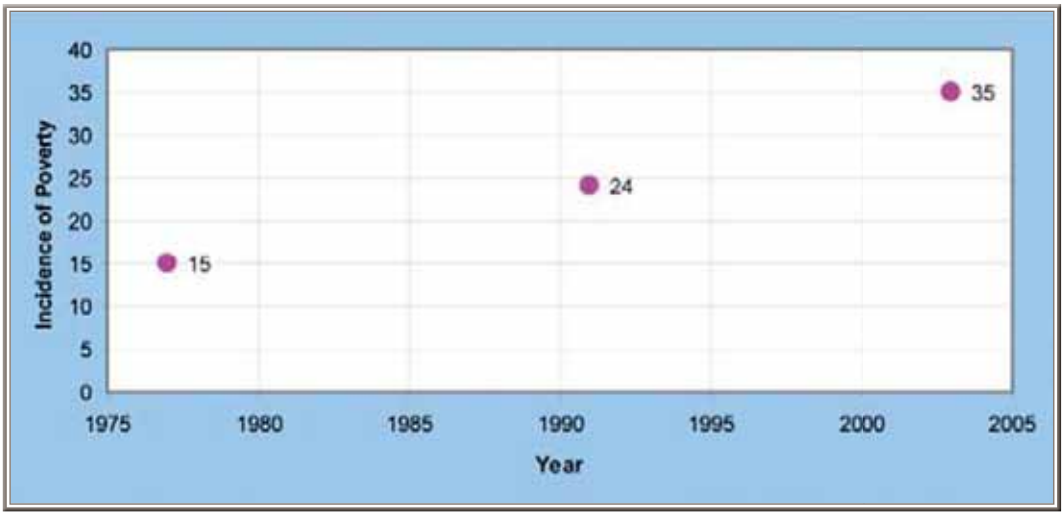
Today, almost 15 per cent of people in Fiji are estimated to live in squatter settlements, and the proportion is expected to increase as the loss of preferential access into the European Union for Fiji sugar increases the number of farms becoming nonviable, and the push factors dominate the Fijian rural-urban migration.

Sources: Bibi 2006, Fiji Islands Bureau of Statistics 2008, Lal 2008, Reddy 2006.

3.1.4 Poverty in Fiji and sensitivity to disasters

The basic needs poverty line (BNPL) in Fiji was last estimated in 2002-03, at US$66-80 per week (US$3450-4140 per year per household of four adults-equivalent). Any household in Fiji with income less than the BPNL is thus defined as being in poverty (Narsey 2008). In 2002-03, one in three households was considered to be living in poverty. Based on the limited data available, the poverty level in Fiji appears to have increased over the past 30 years (figure 13), and the rise is expected to continue, given political and economic uncertainties.

Figure 13: Incidence of poverty in Fiji



Source: household income and expenditure reports from the Fiji Islands Bureau of Statistics.

The incidence of poverty varies spatially and ethnically. It is higher in the rural areas than in the urban areas (40 per cent in 2002-03 compared with 29 per cent). Additionally, based on existing data, Indo-Fijians have a higher poverty incidence than indigenous Fijians (37 per cent compared with 34 per cent) (Narsey 2008).

The presence of many poor people in a given region can constitute a clear factor of vulnerability (IDB 2000), as would the presence of poor people in any one sector. Accordingly, Indo-Fijians are expected to be slightly more vulnerable to disasters than indigenous Fijians, because they have a higher poverty level. The disaster risks of the Indo-Fijian people are likely to be highest in the Northern Division where almost 60 per cent of the poor Indo-Fijian population lives.

The majority of the poor people in Fiji are engaged in the primary sectors (table 10). This is likely to change rapidly with expanding urbanisation and growth in urban poor. At the moment, however, because the primary sectors are most vulnerable to natural disasters (particularly cyclones, floods and storms), poorer people relying on primary industries face a double jeopardy from disasters-namely, the sensitivity of their main income source to disasters, as well as the poverty that renders them less able to cope with the effects of disasters. The poor are also more vulnerable than other income groups because they generally lack knowledge of disaster risks and have more difficulty recovering from disasters.

Table 10: Sectors of employment of the heads of poor households, Fiji, 1990-91

Sector	Number of poor households	% poor households
Agriculture, forestry and fishing	14 023	60.0
Mining and quarrying	70	0.3
Manufacturing	1 823	7.8
Electricity, gas and water	23	0.1
Construction	935	4.0
Trade	2 174	9.3
Transport and communications	1 542	6.6
Finance, insurance and real estate	397	1.7
Community, social and personal services	2 384	10.2

Source: United Nations Development Programme 1997.

People with very low incomes also exhibit poor social conditions. They live in hazardous locations, their housing is poor, and they have poor health conditions, including high child mortality and maternal mortality. Table 11 summarises the key social characteristics.

Table 11: Basic human development indicators for Fiji

Indicator	Data
Life expectancy at birth (years)	68.3
Infant mortality rate (per '000 live births, 2005)	16.0
Population using adequate sanitation (% in 2004)	72.0
Literacy rate as a percentage of population aged 15 years and above	92.6
Births attended by skilled health staff (% of total, 2002)	99.0
Improved water source (% of population with access, 2006)	530

Sources: UNDP 2007.

The 2005 assessment of Fiji's performance against the millennium development goals indicates that Fiji is not performing too well against its targets (table 12), including in areas such as food security, access to water, and sanitation. This situation exists despite an increase in government expenditure in these sectors over time (table 13).

Table 12: Key Fiji's millennium development goal targets

	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 7
	Poverty and hunger reduction	Universal primary education	Gender equality in education	Reduced child mortality	Reduced maternal mortality	Access to water and sanitation
Indicator	Share of population under-nourished	Children reaching grade 5 as a percentage of grade 1 pupils	Secondary school enrolment ratio	Children under 5 deaths per 1000 live births	Deaths per 1 000 000 births	Share of rural population with access to improved water
Fiji	4	95.8	1.07	18	75	51

Note: Yellow panels are areas of concern.

Source: UNESCAP/ADB/UNDP 2007.

Table 13: Government expenditure, Fiji (F$ million)

Purpose	1990	1995	2000	2005
GDP (current F$)	1742.0	2373.0	3138.2	4237.9
Education	69.5	112.0	151.9	189.6
Health	31.3	56.9	82.3	114.4
Agriculture	7.4	8.4	7.6	22.2
Housing and community amenities	2.3	5.1	5.5	25.0

Source: ADB 2008b.

In terms of the HDI, Fiji had an index of 0.762 for 2005, ranking 92nd in the world. On the other hand, Fiji's HPI was estimated to be 21.2, ranking 50th in the world. A high HPI and lower HDI imply that people are deprived of basic services, which makes them vulnerable to shocks, including hazards. Fiji's HDI and HPI statistics place it at the medium level of human development.

The HPI is expected to reflect sensitivity to external shocks better than the HDI does, because it includes key factors that directly affect individual and household sensitivity to disasters, including malnourishment and access to health services. Unfortunately, complete time series data for the HPI, or its components, are not available. Only the complete time series data for the composite HDI (not for its components) are available and thus were used in this study as a proxy of poverty of opportunities. The limited time series statistics for the HDI suggest Fiji is regressing in terms of its human development and poverty level.

3.1.5 Partial analysis—concluding remarks

The above partial and deductive analysis highlights a complex two-way relationship between disaster and economic and social wellbeing, and confirms that a complex set of factors influence this relationship. Fiji, with relatively low GDP, low economic growth and high reliance on the primary sector, is highly sensitive to natural disasters. The tax revenue base is shallow, and the government does not have resources to invest in basic transport and communication infrastructure to support private sector led economic growth. Fiji is also struggling to provide quality, accessible medical services and universal education.

At the household level, income and other social indicators suggest a household's sensitivity to natural disasters. People with low household income, particularly those living below the BNPL, often live in marginal areas. Many do not have water security or safe sanitation, and they often have limited education. Disasters are expected to increase people's poverty status, particularly because the poor do not have the financial assets to quickly respond to disaster and then recover and rehabilitate, putting added pressure on their poverty status.

The empirical assessment of the relationship between disaster, the structure and status of the national economy and poverty is discussed next.

3.2 Empirical analysis

Given the data constraints described in chapter 2, the study attempted only a national level empirical analysis of the relationship between disaster and poverty. Ordinary least square (OLS) regression (defined in box 9) analysis was conducted using the software Microfit 4.1 (Pesaran and Pesaran 1997). Data sets from 1990 to 2002 were applied.

3.2.1 Regression analysis

Two separate hypotheses were tested using OLS regression analysis.

Hypothesis 1 (H_1): Disasters affect the poverty level and economic development in Fiji.

To test this hypothesis, the following two relationships were stipulated, acknowledging that factors other than disaster determine the national poverty level. Among the factors included are the availability of credit to households, government expenditure on infrastructure, credit availability, education and health, as well as the occurrence of coups:

(a) Poverty = fn (credit availability; government investment in health, education and infrastructure; disasters)

In this equation, poverty is treated as a dependent variable while the variables listed on the right hand side of the equation are the independent or explanatory variables (box 9). The HDI is used as the poverty measure to capture the sensitivity of households to disasters.

(b) Economic status = fn (labour, public sector investment, trade ratio, credit availability, coups, disasters).

In this equation, the GDP is treated as the dependent variable and used as the measure for economic status. The variables listed on the right hand side of the equation are the independent or explanatory variables.

Box 9: Econometric jargon

dependent variable—a parameter whose value is influenced/determined by one or more independent variables

independent variable—a variable that does not depend on other factors

regression analysis—an analytical approach to determining the functional relationship between dependent and independent variables. It is undertaken, in its simplest form, by using the ordinary least square (OLS) method.

OLS regression—an estimation of the key relational coefficient for each independent variable. The factor coefficient indicates the marginal effect of that factor parameter on the outcome. Its sign indicates whether the relationship between the dependent and independent variables is a positive or negative one.

The following two equations were estimated using OLS regression analysis to test H_1.

Hypothesis 1 (H_1): Disasters affect the poverty level and economic development in Fiji.

Equation 1(a)

$$HDI = C + a0 * LDBT + a1 * LAG + a2 * COUP + a3 * D + a4 * LRSL + a5 * LGE$$

where:

HDI = human development index as a proxy for poverty
C = constant
LDBT = log of total debt
COUP = coup dummy
D = disaster dummy, which takes a value of zero when no disaster, and one when there was disaster in that year
LAG = log of agricultural GDP
LRSL = log of difference between short term and long term interest rates as a proxy for credit availability
LGE = log of government expenditure on education.

Coefficients $a0,\ a1, a2, a3, a4, a5$ indicate the incremental effect that the respective independent variables have on the dependent variable.

Equation 1(b): Analyzing the impact of disasters and the HDI on the GDP

$$LY = a0 + a1 * LL + a2 * LK + a3 * TR + a4 * D + A5 * HDI$$

where:

LY = log of the GDP as a measure of national economic development
LL = log of labour used
LK = log of capital used
TR = trade ratio
D = dummy variable for disaster
HDI = human development index

Hypothesis 2 (H_2): Poverty level affects disaster outcome in Fiji.

To test the second hypothesis, the following functional form was analysed using the OLS regression method:

Equation 2

$$PAF = C + a0 * HDI + a1 * LDBT + a2 * UR + a3 * LRSL + a4 * LGXTC$$

where:

C = constant
PAF = population affected by disasters
HDI = human development index
LDBT = log of total debt
UR = unemployment rate
LRSL = log of the difference between short term and long term interest rate as a proxy for credit availability
LGXTC = government expenditure on transport and communication

The analysis was carried out at the national level only because household level data were limited. It used key measures of the dependent or independent variables or their proxies (table 14).

Table 14: Key variables used in the OLS regression analysis, and the rationale for their use

Measure	Dependant variable	Explanatory variables	Rationale for use or not
1. Economic growth			
	GDP	Labour and capital	The neoclassical model developed by Robert Solow (1956) has been the primary theoretical framework for virtually every study of long run economic growth for many years. The model features a neoclassical production function that explains the level of output in terms of two factor inputs: labor and capital. In equilibrium, the growth of output is limited to the growth of the labor force, meaning that per person output (a crude measure of the standard of living) is constant over time. To explain the growth of per person output, Solow introduced the idea of technological change. The technological progress component can be captured by factors such as investment in human capital (Mankiw et al (1990), good governance (Cooray n.d) and trade ratio.
		Trade ratio	The ratio of exports and imports to the GDP was used to capture the percentage contribution of the trade ratio to economic growth.
		Occurrence of external shock	To find out the impact of disaster on economic growth.
		Occurrence of coup	To capture the extent to which coups impede growth.
2. Poverty and Human Development			
	HDI and components		The HDI was used instead of the HPI because a time series data set on HPI is unavailable for Fiji. Time series data was also unavailable for the HDI component indicators.
	Factors that contribute to human development	Credit availability	The difference between short term and long term interest rates was used as a proxy.
		Agricultural output	Given 60 per cent of the poor households are employed in this sector, the agricultural output was used in the regression analysis to see its impact on human development.
		Government expenditure on education	Given data on the individual components of the HDI were not available, this variable was used to investigate whether government expenditure on education contributes towards improving the HDI.
		Disasters	This component was used to capture the extent to which the occurrence of disasters impedes human development levels.
		Government debt level	This was included to find out whether government borrowings were used to improve human development levels or mainly to meet the current government expenditure.
3. Disaster impacts			
	Number of people affected		Data on number of people affected was the only measure of the impact of disaster was available and therefore; it was used as the dependant variable in this equation.
	Fatalities		The number of lives lost as a time series was not indicative of the actual disaster impacts thus this was not used as a dependant variable.
	Economic costs		For most disasters the costs was not provided thus as a time series, this would not have been representative of the actual disaster impacts. This variable therefore, was not used in the regression.
		HDI: life expectancy, adult literacy rate, school enrolment	Only composite HDI time series data were available. As a component of the HDI, life expectancy could have been included in the regression, but data were not available. Data on two other indicators—adult literacy rate and school enrolment—were also unavailable; otherwise, they too could have been used instead of the HDI as a composite index.
		Government debt level	This variable was used to capture government investment in infrastructure using the borrowings and the investment impacts on people during a disaster occurrence.
		Unemployment rate	This variable was used to reflect the general wellbeing of people in terms of income and other social characteristics.
		Availability of credit	This variable was used to capture whether, if people had access to credit, they were able to prepare well for a disaster and thus reduce the negative impacts of the disaster.

3.2.2 Results

The three regression analyses confirm the existence of a statistically significant two-way relationship between natural disasters and poverty.[12] Table 15 summarises the results of the OLS regression analysis. These results are consistent with those of past studies that used regression analysis of macroeconomic performance against key factors (including natural disaster events) in small island developing states. Comparative cross-sectional data on real GDP performance for 115 countries over a 34 year period also suggest 'countries experiencing a higher incidence of natural disasters tended to achieve lower rates of growth than countries that experienced lower incidence to disasters' (Benson 2003) quoted in Benson and Clay 2004).

Table 15: Results of the regression analysis, summarising each coefficient value

Variables	Equation 1(a)	Equation 1(b)	Equation 2
Dependent variable	HDI	GDP	PAF
Independent variables			
CONSTANT	–3.541 (–2.028)*	0.181 (0.037)	2.331 (0.263)
HDI		0.316 (2.241)*	–0.547 (–0.417)
LDBT	0.254 (2.630)*		–0.073 (–0.119)
COUP	–0.022 (–0.229)		
LL		0.374 (1.474)	
LK		0.344 (0.836)	
LTR		0.0004 (4.228)*	
LAG	0.310 (1.119)		
LGXTC			–0.205 (–0.264)
LGXE	0.252 (1.711)**		
DIS	–0.069 (–0.897)	0.0053 (–0.153)	
UR			0.011 (0.087)
LRSL	0.047 (1.145)		-0.290 (-0.625)
R^2	0.703	0.946	0.195
x^2 *(sc)*	0.420 (0.517)	0.638 (0.424)	2.85 (0.091)
x^2 *(ff)*	0.925 (0.336)	0.004 (0.947)	7.294 (0.071)
x^2 *(n)*	0.014 (0.993)	0.258 (0.879)	9.28 (0.101)
x^2 *(hs)*	1.363 (0.243)	0.676 (0.411)	7.426 (0.06)

*Note: The t-ratios are reported in the parenthesis. * and ** indicate significance at the 5 per cent and 10 per cent levels respectively. The other variables, although not very significant, had the expected signs and were thus included in the regression. Microfit 4.1 (Pesaran and Pesaran 1997) was used for estimation.*

[12]With no serial correlation, heteroscedacity and cross-correlation (see table 15 for an explanation of these).

where:

x^2 *(sc)* = serial correlation
x^2 *(ff)* = functional form
x^2 *(n)* = normality
x^2 *(hs)* = heteroscedacity

The Fiji results also confirm, as expected, that other factors also affect both the effects of disaster on poverty and the effect of poverty on the disaster outcome. This finding is discussed below.

Impact of disaster on poverty and economic development

Both the regression analyses (1a and 1b) demonstrate a direct and significant relationship between disasters and economic wellbeing and poverty

Poverty (HDI) and disasters

Regression analysis 1(a) indicates a negative relationship between the HDI and disasters (with an R^2 of 0.7). In other words, disasters decrease human development conditions (HDI). A decrease in the HDI due to disasters means higher poverty levels. The regression analysis also suggests a weak relationship between disasters and poverty, which may be due to a greater influence of other factors on human development outcomes, including government expenditure on education and the level of government debt. Nevertheless, the analysis confirms, albeit to a limited degree, that disaster increases poverty but that poverty is also influenced by numerous other factors.

Government investment in the education sector, the availability of credit, and government debt level contribute positively towards the HDI. The debt level has a positive relationship because higher debt rates may enable the government to invest in the education and health sectors, which contribute to the HDI. This confirms that improvements in basic education and infrastructure development (usually financed through external borrowing) have a major impact on the human development outcome and thus the resilience of people.

Agricultural output also has a positive relationship with the HDI, as expected given that 60 per cent of poor households are employed in the agricultural sector. If, therefore, agricultural output increases, the income of the poor can be expected to increase, enabling them to better access basic services such as health and education, and thus improving human development.

On the other hand, analysis suggests the occurrence of a coup decreases the HDI, perhaps because economic downturn follows a coup. This can affect the poorer communities more than those with higher incomes. According to Narsey (2008), the nation's poverty situation worsened after the 5 December 2006 coup. He also noted that poverty had steadily increased to an estimated 45 per cent because of the 2006 coup (Fiji Times 2008).

National economic development (GDP) and disasters

Disasters have had a direct impact on national economic development, as reflected by the GDP. The results of regression analysis 2 suggest natural disaster reduces economic development, just as do external shocks in the form of a political coup. These external shocks affect economic activities as well as employment levels. Regular disasters also have a negative effect on national economic development, particularly when governments are forced to divert their limited resources to rehabilitation and rebuilding the infrastructure. Disasters are thus harmful for economies, such as Fiji, because they help trap the economy in a lower growth steady state (Johnson 2004).

For countries with small domestic markets, external trade is an important determinant of economic growth. Employment level and capital also contribute to growth. Higher national GDP means countries are likely to be better prepared for external shocks such as disasters, and to cope better in times of disasters.

Impact of poverty on disaster outcomes

Regression analysis confirms that the level of poverty affects the disaster outcomes in Fiji, as reflected by the number of people affected. In other words, higher poverty means more people are negatively affected by disasters, and vice versa. This is because higher poverty (as measured by the HDI) is expected to make people more sensitive to disasters because they have a poor economic and social condition. Therefore, they cannot (for example) invest in adequate preparedness and risk reduction measures. Poor people also have little ability to respond to and cope with the effects of disaster, or to quickly recover. At the same time, if they do not have access to proper infrastructure, then they may become trapped in disaster prone areas, adding to their sensitivity to disasters.

Results also suggest the number of people affected by a disaster increases as unemployment increases. This is understandable because unemployed people would not have the capacity to prepare for and respond quickly to disasters. Similarly, better access to credit reduces the number of people affected by disasters because it potentially improves income level and thus decreases people's vulnerability. Low credit availability increases the number of people affected by disasters because the poor have difficulty accessing funds to invest in education, housing, health and other basic services.

This suggests that government policies that target improved socioeconomic conditions will make people less vulnerable to disasters and reduce disaster outcomes.

Analysis also indicates some variables are more strongly related than others, which could reflect the use of limited data sets and/or the use of proxies. In other words, disaster and poverty are interrelated but to what degree depends on how poverty and disaster impacts interact, how the variables are measured. It is difficult to empirically quantify the exact relationship between poverty and disaster in the absence of robust data.

Adding to the empirical relationship is the human story of suffering and pain that disasters bring to families, the struggles that families may have to endure to rebuild their lives and livelihoods after disasters affect their homes, cause the death of loved ones and breadwinners, destroy parents' hope for the future of their children, such as what the following poem and local newspaper headlines (box 10) capture.

Box 10: Cyclone Ami

Cyclone Ami you came so sudden
Ripping open my heart
Tearing my dreams, aspirations,
hopes and ambitions apart

As if your devastation was not enough
You sent the desert the next day
Lost crops, lost loved ones, lost homes
And indeed lost job and pay.

No one else can imagine
The hardship and our pain
To educate our children
Now seems all in vain

I await answers and angels
As I sit and gaze the sky
You made my life such a struggle
In despair I question why

Source: Savita Devi, quoted in Lal 2003.

13-year-old boy is ninth drowning victim

Update: 12:31PM A 13-YEAR-old boy of Lakena drowned while for fresh water mussels in the river yesterday afternoon.

Assistant Police Suliano T... search...

Kids swim to school

CROSSING the Sigatoka River with an old tyre tube is how children as young as ...rs old get to school everyday.

Victims await rations

A TOTAL of 103,256 people are yet to be given rations in the Western Division.

In a report DISMAC said the areas which are yet to receive the rations include Navosa, Nadi, Lautoka, Ba ... DISMAC

Damage to old bridge cuts access to town

The old Sigatoka Bridge has cut of easy access to town for a village community.

The people of ...selase Village now have to walk ...el by bus if they ... through ...

Residents flee homes after heavy downpour

People fled their houses yesterday as the torrential downpour moved North.

Labasa town and the lower ...burbs including Noadamu, Namara..., and Bulileka. Were all bad...

Naodamu residen... family membe...

9000 take refuge at evacuation centres

More than 9000 people were last night taking refuge in the 108 active evacuation centres despite flood waters receding in most places.

...nal Disaster Management senior ...iliai Dobui confirme...

Poor drainage causes flood, claims business community

Nadi business community has suffered million dollars worth of damage in the flood.

Nadi Chamber of Commerce ... Doctor Ram Raju ... situation in the tow...

AGRICULTURE - 'To tarry is folly'

WHILST many farmers in the flood prone areas of Fiji were shocked at the intensity and damage caused by the floods, many are just rolling with the punch and getting back to work to have their farms operational again.

$10,000 for victims

AN Australian citizen has spent close to $10,000 buying food for people affected ...ent floods.

Rations reach 17,321 people

Update: 3:09PM DISMAC says a to... 17,321 people have received ... last month.

Students face food shortage problem

STUDENTS of Navunibitu Catholic School in Ra are facing food ... Caretaker and farmhand ... 50, said the ... dam...

50,000 get food

MORE than 50,000 people in the West received food rations worth about $700,000 after the flooding.

...missioner Western Joeli Rokovada ...were doing their best to reach all

Agriculture sector ... affected: Minister

The agriculture sectors suffer... loss with damages ... followed ...

Villagers take shelter at school

40 families from Burebasaga villag... Rewa were evacuated at the Bureb... ...econdary School as their hous... ...the flood on Sunday ... 57 told ...

Poor drainage caus... flood, claims busine... community

Nadi business community has su... million dollars worth of damage i... ...d.

Nadi Chamber of Commerce pre... Doctor Ram Raju ves... situation in ...

Farmers helpless as crops are destroyed

Farmers are depressed as they watch water levels rise at Naqali village destroying most of their crops.

Manas... ...vakaravia, 28 of Gusuis... Naqa... ...30 hectares o...

Nature's wrath or man hand?

The floods in the western towns of B... Nadi and Sigatoka have been the bigges... to date in terms of the damage done and the disruptions to movement on the all-important Queens Highway.

The frequency of floods in our low-lying areas has gone up over the last five years.

Waiting in vain

Cassava diet ... children of Navala i... interior of Ba take a dip in a river nea... village yesterday.

$10,000 for victims

AN Australian citizen has spent close... $10,000 buying food for people affec... by the recent floods.

Lesley Bryce of Sigatoka had been ... ...than a month when the flo... ...tion centres.

PNG gives $1m for fl... victims

Update: 12:35PM PAPUA New ... has donated $1million to the ir... Prime Minister's National Disaster R... Rehabilitation Fund for the victim... month's floods.

Future look bleak for flood victim

The future for Mohammed Tazim and his family of Nawakalevu Settlement looks dim after the flood destroyed their three ... house.

Labasa town latest to be hit by floodwaters

Labasa town was the latest to be ... floodwaters.Police spokesper... Sokomuri said the tow... metres under wa... Yesterday ... contin...

Farmers helpless as crops are destroyed

Farmers are depressed as they watch water levels rise at Naqali village destroying most of their crops.

Manasa Vakaravia, 28 of Gusuisav... Naqa... said they had 30 hectares of la... ...now under water.

Flood damage to cost millions

The Nadi Chamber of Commerce has estimated flood damage at millions ... dollars.

President Doctor Ram ... estimates supplie... the main to...

Thousands without water

THE heavy rains have not only brough... in more water than needed, they have l... to floods that have damaged water sup... systems in many parts of the we... division.

One of the most critically affected ... is Sigatoka.

Five lives lost in floods

Five lives have been lost over the past three days to flooding and landslides.

And this has prompted police ... more officers to flood-str... monitor people's mo...

Landslide victim's family still in shock

The family of 18-year-old Litiana Adikalou who was buried in a landslide at Malabi village in Wainibuka is still in a state of shock.

Hospital running out of water

Ba Mission Hospital has been without water for the past few days.

And health authorities in the area are worried that the remaining water in the hospital's only tank is decreasing.

Divisional Medical Officer Western Dr Tharid Ali said water supply still remains to be th...

Village looked like an island: Headman

Most rural communities in Nadi were last night still coming to terms with the extent of the flood damage.

Nakavu Village assistant headman Tevita Sovau said apart from water cuts and dam... ...household items; thswept away by ... ...aving the villagers

Dredging saves town from flood

People fled their houses yesterday as the tRecent dredging to the Rewa River saved the Nausori Town from rising flood waters last Saturday night, said Nausori Mayor Jagdish Bali.

And he commended ... contractors who contin... the Rewa River for ... neighbours

...te help slow, say ...gers

Villagers of Wailotua in Wainibuka, Tailevu have questioned when the government would come to their rescue ...d save the families whose houses have ...underwater since Wednesday night.

Worst flood ever, says mayor

This is the worst flood that Nadi has experienced in the last 20 years.

Nadi mayor Councillor Timoci Koroiciqa yesterday said the police officers are now patrolling the town to ensure that law and order is maintained.

SOURCE: *The Fiji Times, The Fiji Sun and* ***The Daily Post***

3.3 Coverage and quality of disaster and poverty data

The availability of robust data was a considerable limitation in this study. Historical records of natural disasters in Fiji are patchy, even though once an event is declared as a disaster, government agencies are required to provide the National Disaster Management Office (NDMO) with information on immediate losses and costs (damage to buildings, replacement costs for infrastructure etc.). Such data are collected to underpin immediate post-disaster humanitarian assistance and plan for rehabilitation. Accordingly, the NDMO retains historical records of natural disaster events, yet that data are incomplete and, in some cases, do not match the data reported by international agencies.

Time series data were limited because there is no agreed damage assessment method for use in Fiji. Neither is there an agreed cost measure for determining a dollar value of losses. In some cases, rehabilitation cost estimates are used; but for the agricultural sector, for example, the recorded cost of the standing crop lost or the costs of rehabilitation, is used. Similarly, a formal definition of 'number of people affected' is not available. That measure may, therefore, reflect variously the number of people whose livelihood was affected, the number dead, the number hurt and/or those affected indirectly. As a result, while the policy implications of this analysis are clear, the empirical assesment cannot be used to predict the magnitude of future impacts.

International data on disaster events (available principally through the EMDAT database) are also limited. For a natural disaster event to be recorded on EMDAT, 10 or more fatalities have to have occurred. The majority of natural disasters having affected Fiji do not meet this criterion, so international data sources for Fijian disasters are extremely limited. To supplement that data set, this study had to collate the number of fatalities from other sources.

Also poor is the historical information on spatial and ethnic poverty in Fiji. The primary source of poverty information for Fiji is the household income and expenditure surveys conducted by the Fiji Islands Bureau of Statistics. However, there is no regularity in the survey collection: since the mid-1970s, only three surveys have been completed (1977, 1990-91 and 2002-03) and a fourth is in progress.

Generally, the lack of time series data on key parameters, at both the national and household levels, made it impossible to undertake detailed regression analysis at the different levels, or to include more disaggregated measures of dependent and independent variables. Despite these limitations, the OLS regression results confirm the hypothesis—that is, the national level econometric analysis shows a significant two-way relationship between disasters and poverty (and economic development) in Fiji.

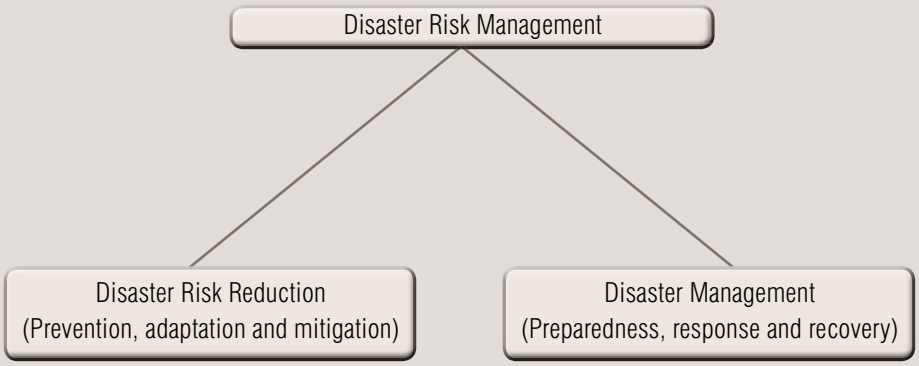
4. POLICY IMPLICATIONS FOR FIJI

Disaster risk management (DRM) comprises disaster risk reduction (DRR) and disaster management (DM) (box 11). This chapter examines the DRR and DM policy implications of the two-way relationship between disasters and poverty discussed in chapter 3. The Fiji case study confirms that a two-way relationship exists between natural disasters and poverty, and suggests that initiatives to reduce disaster risks can also help reduce poverty. Further, it also confirms that efforts to reduce income poverty and other basic social conditions can help reduce people's vulnerability to disaster. That is, any poverty reduction strategy should also account for the DRR issues, for synergy in reducing both disaster impacts and poverty.

The policy recommendations highlighted below are only indicative. A more detailed review of the strengths and weaknesses of current DRM arrangements is necessary to design and implement initiatives and to mainstream DRR and DM into national planning and budgetary process so appropriate DRM is adopted at all levels.

Box 11: What is disaster risk management?

Disaster risk management is a multifaceted challenge, given that concerns about disasters are not only of humanitarian interest but also economic and human development concerns. To reduce the vulnerability of households, communities and nations, a two pronged approach is essential. The Hyogo Framework for Action below calls for disaster risk reduction (DRR) and disaster management (DM):



DRR involves, among other elements, reducing the risk of exposure to hazards, taking adaptive measures at all levels to reduce sensitivity to hazards, and being better prepared for any residual risks. DM, on the other hand, involves taking steps to reduce the adverse impacts of disaster, including being prepared to respond to disaster events quickly, and being able to recover and rehabilitate following any negative outcomes. DRM is everyone's business.

4.1 Poverty reduction and disaster risk reduction

The assessment of disasters and poverty in Fiji suggests attention needs to be given to reducing the sensitivity of poor households to disasters, as well as improving the economic and social wellbeing of the communities and nation. Fiji's national economic development, as well as its DRM strategies, needs to be conscious of the needs and vulnerabilities of the poor living in hazardous areas. This focus on reducing sensitivities, as well improving people's ability to respond to and cope with disasters events, applies equally when developing and implementing efforts to encourage economic development and DRM.

4.1.1 Poverty reduction: pro poor economic development

To reduce disaster risk, the assessment of disasters and poverty in Fiji suggests attention needs to be given to reducing the level of poverty and improving social conditions such as education, access to water and sanitation for the most vulnerable group. Poverty reduction is one of the core development goals identified in Fiji's National Development Strategy 2008–12. Various governments, including the interim government (box 12), have also adopted many other pro poor initiatives. Yet the pro poor initiatives applied by the government over time do not always appear to target where the poor live—for example, although the population residing in the squatter settlements is increasing (box 8), and the social conditions of these people have long been poor or marginal, government funding for squatter resettlement fell by 33 per cent between 2008 and 2009.

Box 12: Poverty reduction as a development goal of different governments in Fiji

Poverty reduction has been a core development objective in the national development strategy of this interim and previous government. The previous Qarase government had created in 2004 a Poverty Eradication Unit (PEU), later to be called the Poverty Monitoring Unit (PMU), and had implemented the Integrated National Poverty Eradication Programme (INPEP), reflecting its commitment to the millennium development goal (no. 1) of eradicating extreme poverty and hunger by 2015.

The government's development goal 9 focuses on reducing poverty and improving the quality of life, as identified in its Sustainable Economic Empowerment and Development Strategy (SEEDS) 2008–12.[13] The government has, for example, supported rural communities through self-help programs, with the Ministry of Provincial Development targeting improvements in economic activities in mainly the primary sector.

The interim government has also identified poverty reduction (pillar 8) and equitable development for all ethnic groups as cornerstones of its development charter, People's charter for change, peace and progress, 2008–15.

In its 2009 Budget, the government allocated F$21.4 million to the agricultural sector, including funds to diversity agricultural production, promote export crops and import substitute agricultural commodities. This allocation is expected to help reduce poverty in rural areas, particularly given that 60 per cent of poor households are associated with the agricultural sector. Such an investment is also expected to help reduce the rural–urban migration, as will allocations such as the F$5.5 million for provincial development (including funding for self-help projects, divisional development projects and rural housing assistance).

Recommendation 1: Adopt a pro poor development strategy that also targets poor communities living in areas prone to natural hazards.

To help reduce the sensitivities of the poor to disasters, and to inform targeted poverty reduction strategies and improved preparedness and risk reduction measures:

- Identify the geographic distribution of the poor and the socioeconomic characteristics of particularly the poor living in hazardous conditions (including in the urban squatter areas), and assess their sensitivities to natural disasters.
- Adopt development strategies that aim to improve household income security and basic development conditions (such as housing and access to water) that reduce sensitivities to disaster.
- Minimise residual disaster risk by controlling economic and infrastructure development to reduce exposure to disasters. Governments and development agencies must integrate (in other words, 'mainstream') disaster risk considerations in national development planning and budgeting processes at national, provincial, district and village/settlement levels, and in designing development initiatives.

[13] See www.health.gov.fj/Poverty/poverty.html

4.1.2 Disaster risk reduction—mainstreaming disaster risk considerations

DRR benefits the poor more than DM does (box 13). For every dollar invested in DRR, between two and four dollars are returned in terms of avoided or reduced disaster impacts (Benson and Twigg 2007).

Box 13: Building a culture of prevention

'More effective prevention strategies would save not only tens of billions of dollars, but save tens of thousands of lives. Funds currently spent on intervention and relief could be devoted to enhancing equitable and sustainable development instead, which would further reduce the risk for war and disaster. Building a culture of prevention is not easy. While the costs of prevention have to be paid in the present, its benefits lie in a distant future. Moreover, the benefits are not tangible; they are the disasters that did NOT happen.'

Source: Annan 1999.

DRR has not yet become a common practice in the Pacific, particularly given that DRR activities rarely show quick results whereas national governments, donors and stakeholders often focus on disaster response support, which can be easily quantified. 'The most vulnerable are often the poorest of the society and as a result DRR relates to issues surrounding social justice, implying commitment by governments and politicians to accept accountability to the most vulnerable' (Department for International Development 2006).

Recommendation 2: Increase investments in disaster risk reduction as an effective measure to reduce the disaster vulnerability of the poor and thereby improve overall economic development.

- Invest in social services that improve social conditions, such as universal education, access to water and sanitation, thereby reducing the sensitivity of the poor and improving their capacity to respond to, cope with and adapt to disaster impacts more effectively.

In the past, the Fiji Government has regularly invested in drainage and flood protection infrastructure, but the level of investment has decreased in recent years, particularly following the 1987 political coup. The government has no dedicated strategy to ensure the development planning and budgeting processes at national, provincial, district and village/settlement levels address hazard and risk considerations. Building codes do not include considerations of increased risks from climate change related disasters, for example, and where codes and guidelines are available for certain hazards, these are not enforced. Nor do government approval processes for development activities explicitly include disaster risk considerations (see recommendation 3 below).

Recommendation 3: Integrate DRR considerations in all development initiatives.

- Integrate (in other words, 'mainstream') disaster risk considerations in national development planning and budgeting processes at national, provincial, district and village/settlement levels, and in development project design.
- Revise infrastructure development planning and approval guidelines in all sectors to reflect requirements for hazard and risk assessments.
- Revise development approval processes and guidelines to require hazard and risk assessments of development initiatives, particularly in hazard prone areas.
- Strengthen the risk assessment and management skills of planners and development agencies that approve development projects.
- Develop simple DRM checklists to guide planners and development agencies in their review of policies and plans/development projects.

4.2 Disaster management

Disaster management constitutes having emergency plans, equipment, and trained and knowledgeable people to help monitor hazards, operate end-to-end early warning systems and manage emergency responses. The nature and frequency of awareness programs, the strength of the media in reaching every part of the country, past experiences of the public and cultural beliefs also determine the extent of a community's vulnerability.

The respective government departments monitor natural disasters. The Fiji Meteorological Service monitors weather and other climatic conditions, but flooding and other hazards are the domain of government agencies such as the Department of Public Works. A weak end-to-end early warning system increases the vulnerability of the poor, along with their ability to make decisions and respond appropriately during an emergency. Although Fiji has sophisticated equipment at the Fiji Meteorological Centre in Nadi, other parts of the country lag in having updated early warning systems. In recent years, this discrepancy has severely affected efforts to distribute warnings in time to different parts of the country.

Also constraining the early warning system are poor hazard monitoring capabilities due to limited institutional capacity, difficulty in retaining qualified staff, and limited monitoring stations in key locations in the hazard prone areas. In addition, poor communication equipment, a lack of proper rescue equipment and insufficient personnel training in disaster management have resulted in the inefficient operation of the Disaster Management Team in some parts of the country.

Recommendation 4: Review the disaster monitoring and early warning system.

- Review monitoring capabilities for each hazard category, including the distribution of appropriate monitoring stations and gaps in technical expertise in data analysis and forecasting. This review may also cover gaps in the current network arrangements, with specialised international partners monitoring and forecasting disaster events.
- Review the end-to-end warning system for each disaster category, to identify how to strengthen monitoring, the generation of appropriate information and the communication of early warnings to communities, especially to the poor. This review should cover the required equipment and personnel training.
- Develop appropriate training and communication material to improve community awareness of disaster events, community preparedness, and practical household response strategies for each type of disaster event with a focus on information needs of the poor.

Under the Natural Disaster Management Act (NDMA) 1998, the National Disaster Management Office (NDMO) focuses on post-disaster response, recovery and rehabilitation. The NDMA institutes a number of bodies and individuals responsible for aspects of DM, including the National Disaster Management Council (NDMC), the Fiji Red Cross, the Emergency Committee, the National Disaster Controller and the NDMO.

DM has been difficult because the NDMO is located in a ministry that has no direct administrative links to the rural areas and or that has limited powers and resources to coordinate disaster response efforts effectively. Currently, agencies at the divisional level have DRM responsibilities, as outlined in the National Disaster Management Plan 1995 (NDMP) and the NDMA. Under these two instruments, the NDMO also has responsibility for DRM but the agency is not strategically or organisationally positioned to coordinate an effective DM response across all levels.

DM efforts are thus constrained by organisational and as well as operational issues, including (Rokovada 2006):

- the absence of appropriate information to predict, assess or respond to disaster events (for example, hazard maps, the scale of inundation, and disaster impacts)
- the institutional design of the decision making and coordination process
- the inadequate resources available to the NDMO

- the inadequate equipment at emergency operations centres at the divisional and district levels
- the fact that NDMO operations are not linked to Fiji's rural development/administrative machinery and do not directly engage with, and help coordinate, disaster response initiatives at divisional, provincial, district and community levels.

Recommendation 5: Review the authority of the NDMO and its organisational arrangements in relation to the Ministry of Provincial Development and other government agencies, and information systems available to the office for strengthening capacity for disaster risk reduction and disaster management (DRR&DM).

- Clarify the appropriate authority of the NDMO in disaster management, including the coordination of disaster assessments following disaster events, to underpin appropriate domestic humanitarian and rehabilitation responses.
- Review the coordination of disaster responses from national and international humanitarian agencies, and improve the coordination of disaster assistance from government and nongovernment agencies.
- Review the scope and depth of different geographic information systems (GISs) and databases available in the country that could support disaster risk management.

All levels of government and all communities should simultaneously pursue DRR&DM. The Fiji Government committed, under a Pacific regional framework for action, to establish appropriate mechanisms for developing and promoting DRR&DM, and to review regularly all DRR&DM arrangements. The government has not fully acted on these commitments, although the National Disaster Management Plan of 1995 and the NDMA have been under review for several years.

Box 14: Disaster management in Fiji

Under the Natural Disaster Management Act 1998 (NDMA), the National Disaster Management Office (NDMO) focuses on post-disaster response, recovery and rehabilitation. The NDMO runs an annual disaster awareness program aimed at raising awareness of hazards and the risks they pose, emphasising that a well prepared community can react effectively to disasters and eventually minimise the negative impacts on its livelihood.

The NDMA also makes other bodies and individuals responsible for aspects of disaster management:

National Disaster Management Council (NDMC)
The NDMC is responsible for disaster management and policies, and makes recommendations to the Cabinet of the Fiji Government. It comprises the Permanent Secretaries of various government ministries, as well as the Fiji Red Cross, and it is chaired by the minister responsible for disaster management.

Fiji Red Cross
The Fiji Red Cross, as a member of the NDMC, is legally a member of the authority 'responsible for disaster management policy and operations'. It can thus provide formal input and advice to Fiji's disaster management policy and operations, as well as in response to specific disasters.

Emergency Committee
In times of emergency, the Emergency Committee is activated and managed by the NDMO under the supervision of the National Disaster Coordinator.

National Disaster Controller
The National Disaster Controller is the Permanent Secretary to the minister responsible for disaster management, who is chair of the NDMC. The role of the National Disaster Controller is to coordinate and plan disaster management measures, to advise the minister/chair of the NDMC on disaster management issues, and to direct government resources for disaster activities as required.

continued next page

National Disaster Management Office (NDMO)

The NDMO is responsible for the day-to-day operation of disaster management activities and implementation of NDMC policies. It is headed by a director, who is the National Disaster Coordinator. The NDMO is also the coordinating agency in times of disaster. It is ill equipped, however, to deal with a major disaster, given the absence of appropriate information and the institutional design (NDMO 2008 pers. Comm., November). Appropriate information about, for example, disaster prone areas and past natural disasters is not always available. Moreover, the NDMO does not have some important resources (for example, vulnerability mapping that could help communities and government better target the most vulnerable groups and minimise public and private asset risks).

4.3 Disaster risk management

As discussed above, Fiji tends not to invest sufficiently in DRR or allocate sufficient resources for disaster response, recovery and rehabilitation programs. One reason for this could be that it almost expects to receive assistance from development partners in times of disasters, creating what is called a 'moral hazard' problem. Under a moral hazard situation, governments do not allocate adequate resources to DRR because they know external assistance would be forthcoming in times of disasters (World Bank 2006). Even for disaster relief efforts, the government may only make only a nominal resource allocation, as reflected in the 2009 Budget (annex 2). This strategy is rational when government resources are limited, but only as long as donors continue to generously respond to disasters regardless of whether preventative measures have been taken.

Despite this, the Government of Fiji in 2005 has endorsed the regional DRR&DM Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters. The framework calls for a broad range of actions under five key thematic areas (table 16), including the establishment of appropriate mechanisms to develop and promote DRR&DM, and to conduct regular reviews of all DRR&DM arrangements. The government has nevertheless not fully acted on these commitments.[14] Many development partners have supported the Fiji Government to help address different aspects of disaster risk reduction and disaster management (see Annex 3). These could be better coordinated, if Fiji developed a national action plan for disaster risk reduction and disaster management. The donors, too, could better sequence their development assistance to complement national DRR&DM efforts.

Recommendation 6: Urgently complete the review of the National Disaster Management Plan of 1995 and the NDMA, and develop a national action plan for DRR&DM, reflecting the regional framework of actions for disaster risk management and climate change.

- Urgently develop and implement a DRR&DM national action plan linked to national development plan and budget processes, meeting the Fiji Government's commitment to the Pacific Islands Forum Leaders to systematically implement the Pacific regional framework for DRR&DM (and the Pacific Island Framework for Action on Climate Change).
- Develop appropriate DRR&DM policies and legislation that set appropriate institutional arrangements for ensuring the coordination of DRR initiatives across all sectors and across all levels of government, as well as appropriate DRR&DM strategies, decision making processes and initiatives.
- Develop a funding strategy for addressing a prioritised and appropriately sequenced set of actions, which the national action plan will articulate, and which will reflect a programmatic approach explained in both the Paris Principles of Aid Effectiveness and the Forums Principles of Aid Effectiveness.
- Strengthen the operating guidelines of the Budget and Aid Coordinating Committee and the Development Sub-committee to include DDR&DM considerations in all development projects.
- Encourage development partners to help strengthen DDR efforts.

[14] Although the National Disaster Management Plan of 1995 and the NDMA have been under review for several years.

Table 16: Key themes of the Pacific DRR&DM Framework for Action 2005–2015

Themes	Explanatory notes
Governance—organisational, institutional, policy and decision-making frameworks	National governments have the key responsibility for DRR&DM policy development and planning, ensuring they reflect the principles of good governance and also security within the context of sustainable development.
Knowledge, information, public awareness and education	Capacity building for DRR&DM is facilitated by information gathering, storage and dissemination leading to knowledge acquisition and management, education, training and professional development programs, and information management systems and technologies that underpin the successful implementation of policies and plans.
Analysis and evaluation of hazards, vulnerabilities and elements at risk	Developing a better understanding of hazards, together with analysing and evaluating vulnerabilities and risks, enables people to be well informed and motivated to establish a culture of prevention and resilience.
Planning for effective preparedness, response and recovery	While all hazards cannot be eliminated, or some even substantially mitigated, improving disaster preparedness, response and recovery can significantly reduce their devastating impacts on vulnerable communities.
Effective, integrated and people focused early warning systems	Warnings must be timely and understandable to those at risk, accounting for the demographics, gender, cultural and livelihood characteristics of target audiences, and supporting effective operations by decision makers.
Reduction of underlying risk factors	Risk factors relating to changing social, economic and environmental conditions need to be addressed in national sustainable development strategies or similar documents, as well as in sectoral development policies, plans and programs, to provide a broader basis for effective DRR&DM.

Source: SOPAC 2008.

4.4 Data

To develop and implement targeted DRR&DM and human development strategies, good quality data are critical. Fiji has limited quality data on poverty, hazards, hazard prone areas and disaster impacts, including coverage of disaster events and their effects on household welfare, sectoral activities and national economy.

Recommendation 7: Improve the coverage and quality of data on poverty, hazards (including hazard maps) and on the impacts of disasters on human livelihood and wellbeing at household, sectoral and national levels.

- Develop time series information on determinants of natural disasters to support the forecasting of disaster events.
- Compile time series information on household income and expenditure, the human poverty index and human development index, and their key determinants to inform both development policies.
- Develop a geographic information system (GIS) based disaster information system, including maps of hazard and disaster prone areas, the geographic distribution and socioeconomic characteristics of the poor, disaster records and disaster impact assessments, to help improve DRR&DM.

5. IMPLICATIONS FOR OTHER PACIFIC ISLAND COUNTRIES

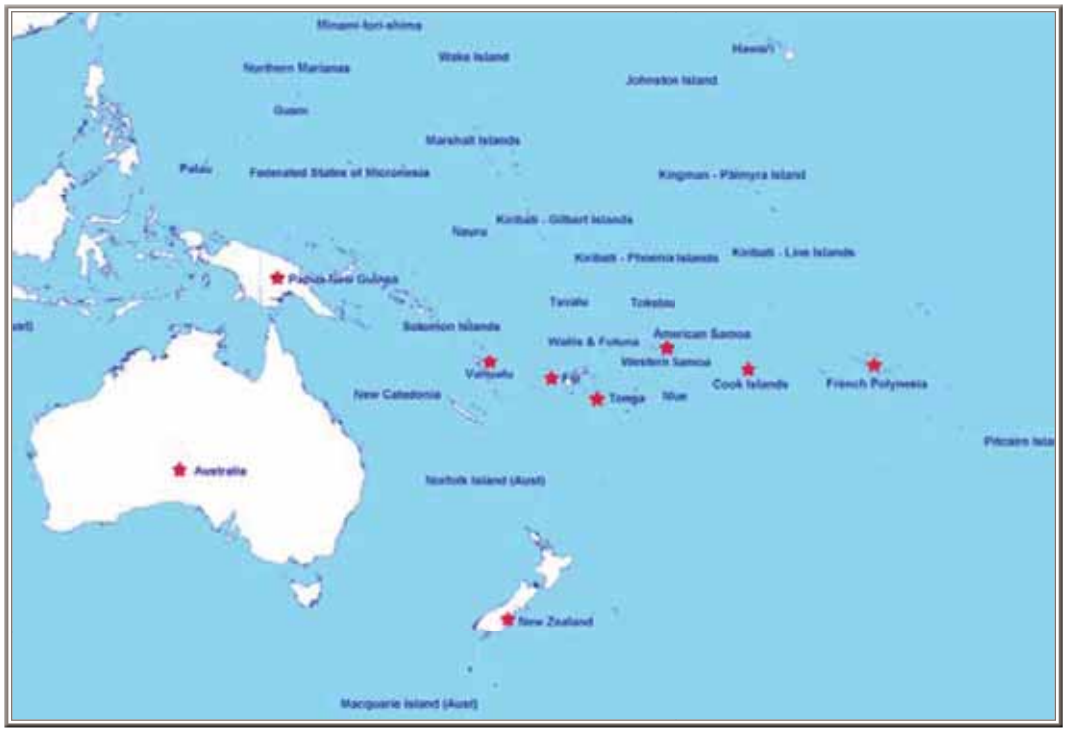
No Pacific island country or territory is immune to natural disasters, although the frequency and types of natural disasters may vary considerably across the Pacific. Melanesian countries generally suffer the largest number of disaster events, although smaller countries such as Tonga and Samoa, too, experience high economic and social shocks during disaster years. The economic cost of disasters is also highly variable, with the costs determined by not only the intensity of events but also countries' economic and social status, preparedness and ability to respond effectively and efficiently.

Although the specific empirical relationship may be different, the general conclusion from the Fiji case study about the two-way relationship between disaster and poverty would equally apply to the other small island developing states. That is, people living in poverty conditions in other Pacific island countries and territories are also likely to be more sensitive to the effects of disaster, and the degree of those effects increases with an increase in the poverty level as measured by the human development index (HDI). Conversely, the conclusion that disaster events negatively affect economic wellbeing, measured in terms of the gross domestic product (GDP) and the HDI, could also equally apply to other Pacific countries. These relationships are even expected to be more marked in other Pacific island countries and territories, which are made more vulnerable by, for example, their lower economic development status, greater reliance on fewer commodities, and lower household economic status compared with Fiji.

5.1 Geographic characteristics

Many of the Pacific island countries fall within the geographic location along the equatorial belt, like Fiji (map 2). The geophysical nature of the Pacific is fundamental to the occurrence and scale of impact of many natural disasters in the Pacific. The region is circumscribed by a 'Ring of Fire', which is a nearly continuous series of oceanic trenches, volcanic arcs and volcanic belts and/or plate movements surrounding the Pacific islands (figure 14). The rim of the Pacific Ocean and the movement of the intercontinental plates in the Pacific are the scene of much earthquake and tsunami activity.

Map 2: The Pacific island countries



Countries such as Papua New Guinea and Vanuatu are also exposed to geological hazards, such as earthquakes and/or volcanoes. Being located along the equatorial belt, most of the Pacific island countries, including the low lying atoll nations (such as the Republic of the Marshall Islands, Tokelau, Tuvalu and Kiribati), regularly face hydro-meteorological disasters

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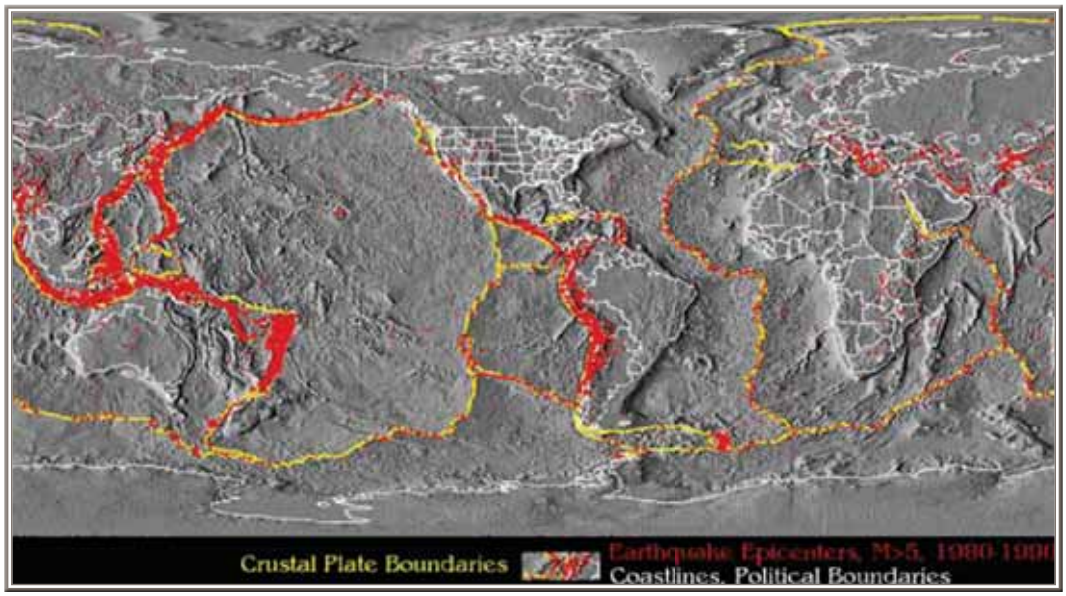
Figure 14: Pacific 'Ring of Fire'



Source: US National Oceanic and Atmospheric Administration, US National Environmental Satellite Data and Information Service, and US National Geophysical Data Center.

Figure 14 shows that many volcanoes exist around the rim of the Pacific Ocean. Since the 1950s, the Pacific island countries (including Fiji) have reported 207 disaster events, affecting almost 3.5 million people and costing a reported US$6 billion plus (table 17).

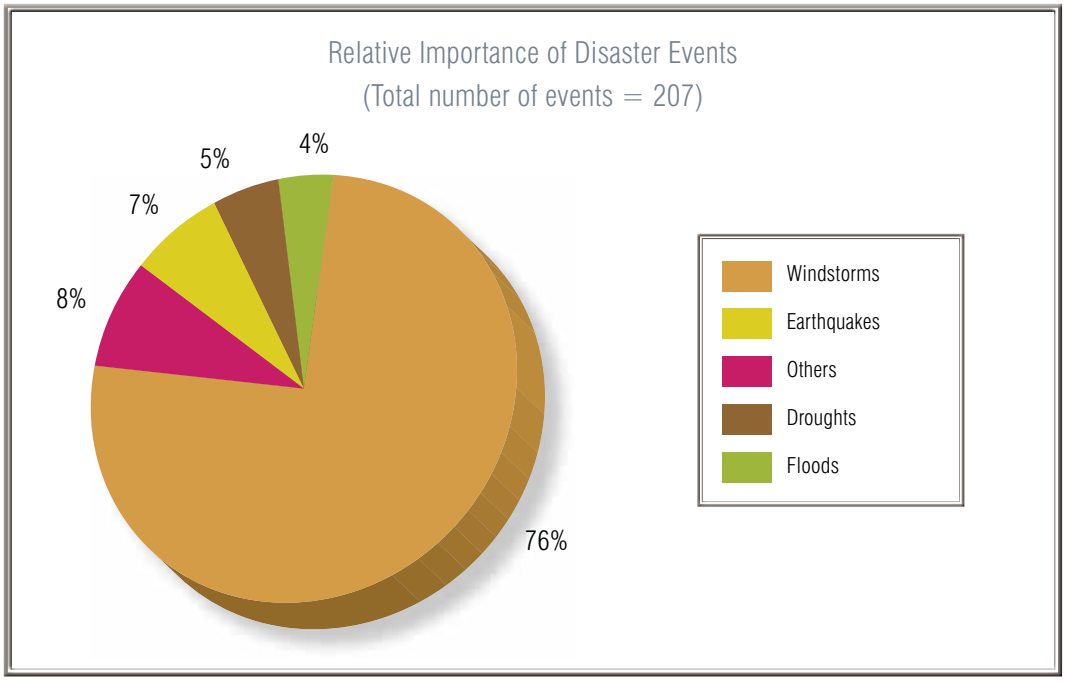
Table 17: Reported disasters in the Pacific islands, 1950–2004

	Number	Reported fatalities	Population affected[1]	Reported cost losses (2004 US$ million)
Windstorms [2]	157	1 380	2 496 808	5 903
Droughts	10	0	629 580	137
Floods	8	40	246 644	95
Earthquakes	17	53	22 254	331
Others [3]	15	274	21 520	60
Melanesia	110	1 130	2 115 332	1 655
Polynesia	71	494	1 041 012	1 797
Micronesia [4]	26	123	260 662	3 074
Total Pacific	207	1 747	3 417 006	6 526

Source: World Bank 2006a, citing data from EMDAT: the Office of US Foreign Disaster Assistance/Center for Research on the Epidemiology of Disaster's International Disaster Database for 1950–2004 data, adjusted by SOPAC (2005) for 1994–2005 data.

Cyclones and floods alone accounted for 80 per cent of these reported events, accounting for almost 82 per cent of total costs and 81 per cent of the fatalities from the hydro-meteorological related natural disasters (figure 15). Floods generally cause more fatalities and general devastation, given the concurrent effects of violent winds, high waves and storm surges (Terry et. al. 2008).

Figure 15: Relative importance of disaster events



Sources: Various.

[1] Fatalities plus total population affected. All data exclude Papua New Guinea.
[2] Cyclones, tidal surges and storms.
[3] Landslides, tsunami, volcano eruptions, wild fires and epidemics.
[4] Data for Micronesia are distorted by Guam, which is prone to costly cyclones. EMDAT considers disasters are 'situations or events which overwhelm local capacity, necessitating a request to national or international level for external assistance'.

The costs of disasters in Pacific island countries have been highly significant relative to the GDP of these countries. The 2007 earthquake and accompanying tsunami that hit the Solomon Islands cost the country around SI$700 million, or around 90 per cent of the 2006 recurrent government budget (ADB 2007). Cyclone Val to Samoa in 1991 cost the country an equivalent of more than twice the GDP (Fairbairn 1996). Cyclone Heta, which hit Niue in 2004, generated immediate losses that exceeded the 2003 value of the GDP by over five times.[15] Such cost estimates usually cover only the direct (and preliminary) costs of disasters and are based on immediate losses, such as the destruction of buildings, infrastructure and crops. Such impacts have a major effect on economic growth as well. In Papua New Guinea, for example, cyclones and drought in 1997 resulted in negative economic growth in 1998. In Samoa, cyclones in 1990, 1991 and 1992 resulted in national economic growth falling by 7.5, 27.5 and 4.3 per cent respectively (see McKenzie et al. 2005a).

The World Bank (2006) estimated that the Pacific island countries incur, on average, an annual cost of 2–7 per cent of their GDP in both disaster and non-disaster years. Computer modelling of extreme weather events, for example, in the capital cities of Fiji, the Solomon Islands, Vanuatu, Samoa and Tonga predicts potential economic losses of up to 60 per cent of those countries' GDP in the event of a one-in-100 year cyclone.

5.2 Status of Pacific island countries' economies

The Pacific island countries are also highly sensitive to natural disasters because of their small economies, long distance from major markets, scattered population separated by large distances, poor infrastructure, and limited natural, environmental and human capitals. Pacific island states have sovereign claim over 98 per cent of the 38.5 million square kilometres of the Earth's surface. However, they have a small land area compared with the area covered by their 200 mile exclusive economic zone.

Table 18: Key characteristics of Pacific island countries

Country	Land area (square kilometres)	Exclusive economic zone (square kilometres)	Ratio of ocean to land area	Population	Population density (persons per square kilometre)	GDP (2006US$ million)	Labour force	Unemployment (%)
Fiji	18 376	1 290 000	70	837 271	51	1 684.23	369 300	6.4
Kiribati	726	3 550 000	4 890	110 356	152	52.78	36 970 (2005)	6.1
Papua New Guinea	462 840	2 402 288	5	5 931 769	13	5 346.45	N/A	N/A
Samoa	2 944	127 950	43	217 083	74	365.11	55 300	1.3
Solomon Islands	29 785	1 340 000	45	581 318	20	273.26	N/A	N/A
Tonga	696	700 000	1 006	119 009	171	193.05	36 500 (2003)	5.2 (2003)
Vanuatu	12 189	680 000	56	215 446	18	332.57	N/A	N/A
Cook Islands	180	3 550 000	4 890	18 000	100	140.79	6 800 (2001)	13.1 (2001)

Sources: SPC 1999, Gillet, Preston and Associates1996.

[15] Total damage inflicted by Cyclone Heta was estimated at NZ$89.1 million (Government of Niue 2004). The Niue GDP statistics are not available for 2004 (Statistics Niue, pers. comm., June 2008) but are reported as having been NZ$17 252 000 in 2003 (Statistics Niue n.d. www.spc.int/prism/country/nu/stats/Nu_Economics_new/Niue_GDP.htm).

Pacific communities rely heavily on the Pacific Ocean for their wellbeing and security. As well as being large ocean states, most Pacific island countries are inherently coastal, with most of their populations residing at the land–sea interface and depending on the resources there. The vulnerability of rural populations to natural disasters in the Pacific is particularly acute because most Pacific communities depend on a limited resource base (table 19).

Table 19: Main economic activities of selected Pacific island countries

Country	Main economic activities	Share of GDP (%)		
		Primary sector	Manufacturing	Tertiary sector
Melanesia				
Fiji	Sugar, tourism, copra, gold, silver, clothing, timber, fish processing, cottage industries	23 (1996)	15 (1996)	62 (1996)
Papua New Guinea	Copra crushing, palm oil processing, plywood production, woodchip production, mining of gold, silver, and copper, crude oil production, construction, tourism, timber, coffee, cocoa, seafood	54 (1995-96)	8 (1995-96)	3 (1995-96)
Solomon Islands	Timber, fish, palm oil, cocoa, copra	23.4 (1996)	N/A	N/A
Vanuatu	Fishing, offshore financial services, tourism, food and fish freezing, wood processing, meat canning, coconuts, cocoa, coffee	N/A	N/A	N/A
Polynesia				
Cook Islands	Fruit processing, tourism, finance, copra, citrus fruits, clothing, coffee, fish, pearls and pearl shells, mining, handicrafts	18.8 (1995)	2.7 (1995)	78.5 (1995)
Samoa	Fishing, tourism, timber, food processing, coconut oil and cream, copra, beer	N/A	N/A	N/A
Tonga	Tourism, fishing, squash, fish, vanilla, root crops, coconut oil	N/A	N/A	N/A
Tuvalu	Fishing, tourism, copra, stamps/coins	N/A	N/A	N/A
Kiribati	Fishing, handicrafts, copra	39.9 (1992)	10.8 (1992)	49.3 (1992)
Nauru	Phosphate mining, financial services, coconut products	N/A	N/A	N/A
Micronesia				
Federated States of Micronesia	Tourism, construction, fish processing, craft items (shell, wood, pearls), garments, bananas, black pepper	N/A	N/A	N/A
Marshall Islands	Copra, fish, tourism, craft items (shell, wood, pearls), offshore banking (embryonic), coconut oil, trochus shells	N/A	N/A	N/A
Palau	Tourism, craft items (shell, wood, pearl), commercial fishing, agriculture	24.4 (1996)	0.8 (1996)	74.8 (1996)

a. Primary sector includes agriculture, forestry, fishing and mining
b. Tertiary sector includes all services and construction

Sources: ADB 2004 based on ADB annual reports, the ABC World Fact Finder and the SPC Pocket Statistical Summary 1998.

Throughout the region, there is a strong reliance on subsistence for food, particularly in rural areas (more so than in Fiji). The value of subsistence farming far exceeds the value of commercial production throughout the region (McGregor, et al. 2008) (table 20).

Table 20: Importance of subsistence production to household wellbeing

	Samoa	Kiribati	Tonga	Solomon Islands	Federated States of Micronesia	Palau	Tuvalu
Subsistence agricultural production as a % contribution to the GDP	11%	48%	7%	n/a	22%	N/A	13%
Subsistence production as % of household income	26%	21%	17%	37%	23%	3%	55%
Sales of own produce as % of income	3%	11%	14%	6%			2%
Range of % contribution of home production (subsistence and sales) to income	7–42%	19–50%	14–36%	7–71%	15–36%	N/A	30–65%

Figures for Fiji are not available

Source: (McGregor, Bourke et al. 2008) quoted in Lal et al. 2009.

The high reliance on subsistence agriculture, limited resources and poorer infrastructure in most Pacific island countries, compared with Fiji, make them particularly sensitive to natural disasters. In some cases, disasters can also affect their basic survival (box 15)

Box 15: Sensitivity of rural economies that rely on narrow resources for their subsistence livelihood

Two cyclones of intense magnitude in 1985 and 1986 in Vanuatu caused considerable economic hardship among the affected rural communities. Many families on the island of Tangoa, South Santo-which predominantly depend on copra for their economic wellbeing-had no income for about two years because their coconut trees failed to produce coconuts (Warrick 2007). Similarly, in the Guadalcanal island in the Solomon Islands, Weathercoast communities face a food shortage after cyclones so often that they call these 'time blong hungry' (Jackson, et al. 2006). Such rural communities, to meet the basic costs of everyday living (such as education fees, medical costs and even the costs of feeding the family) have to rely on their families and "Wontok" (extended family who live in town or abroad) for assistance (SPREP n.d). However, with modernisation and the weakening of traditional ties, families are finding they cannot always rely on such social relationships and traditional safety nets (Warrick 2007). The effects of disasters, therefore, can be long lasting and keep people below the poverty line.

Source: Lal et al. 2009

5.3 Recent trends in increasing vulnerability

With the recent trend in urbanisation in the Pacific, excluding Papua New Guinea, almost one in two persons now live in urban areas, and the proportion is growing rapidly. As rural–urban migration in search of economic opportunities increases beyond the capacity of urban infrastructure, people are forced to live in poor conditions (Haberkorn and Lal 2007). Urban populations, like in Fiji, largely depend on salaries and wages, while the urban poor mainly rely on the informal sector. The United Nations Development Programme (UNDP 2002) noted that disaster risks are expected to grow with urbanisation. This is particularly true for most countries in the Pacific where land is communally owned and access to such land and affordable housing is limited, forcing people into squatter and informal settlements without any titles. These squatter areas usually have poor or no access to safe water, electricity and sanitation.

Recent reviews of the country performance against their millennium development goals highlight that other Pacific island countries, compared with Fiji, are lagging in many areas (table 21).

Table 21: Pacific island countries' performance in regards to key millennium development goals

Indicator	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6
	Poverty and hunger reduction	Universal primary education	Gender equality in education	Reduced child mortality	Reduced maternal mortality	Access to water and sanitation
	% population under-nourished	Children reaching grade 5 as a percentage of grade 1 pupils	Secondary school enrolment ratio	Deaths per 1000 live births	Deaths per 1 000 000 births	% rural population with access to improved water
Melanesia						
Fiji	4	95.8	1.07	18	75	51
Papua New Guinea	13	58.2	0.79	74	300	32
Solomon Islands	20	78.0	0.83	29	130	65
Vanuatu	12	70.6	0.86	38	32	52
Polynesia						
Cook Islands	–	–	1.02	20	–	88
Niue	–	–	0.95	–	–	100
Samoa	4	95.9	1.12	29	15	87
Tonga	–	94.6	38	–	100	–
Tuvalu	–	62.6	0.93	38	–	82
Micronesia						
Federated States of Micronesia	–	–	–	–	–	–
Kiribati	6	81.4	1.13	65	–	53
Marshall Islands	–	–	1.05	58	–	96
Nauru	–	25.4	1.07	30	–	-
Palau	–	–	1.08	11	–	94

– No data available.

Note: Yellow panels are areas of concern.

Source: UNESCAP/ADB/UNDP 2007.

Further, while abject poverty such as that found in other parts of the world may be limited in the Pacific, the poverty of opportunities and the hardships in meeting basic needs are common (Abbot and Pollard 2004), even increasing. HDI and human poverty index (HPI) statistics suggest most Pacific countries have a poor development status, indicating high vulnerability at the national level to disasters (tables 22 and 23).

Table 22: HDI values for the Pacific, 2007

Country	HDI value	Life expectancy index	Education index	GDP index	HDI rank
Tonga	0.819	0.797	0.928	0.735	55
Samoa	0.785	0.763	0.903	0.688	77
Fiji	**0.752**	**0.722**	**0.879**	**0.685**	**92**
Vanuatu	0.674	0.738	0.705	0.580	120
Solomon Islands	0.602	0.633	0.669	0.503	129
Papua New Guinea	0.530	0.532	0.518	0.541	145

Source: United National Development Programme (2007).

A lower HDI and higher HPI indicate the poverty situation is worse than that in other countries. The HPI is higher for countries such as Vanuatu, Papua New Guinea and the Solomon Islands, compared with Fiji, suggesting a high sensitivity and vulnerability to disasters. On the other hand, countries such as Tonga and Samoa have a relatively higher HDI and lower HPI than Fiji, so their poverty levels are considered to be lower than Fiji's.

Table 23: HPI for Pacific island countries

Country	% of people not expected to survive to age 40 (P1)	% of adults who are illiterate (P2)	% of people without access to safe water (P3)	% of children >5 years who are under weight (P3)	HPI value
Tonga	5.0	1.1	0	2	-.0
Fiji	6.9	7.1 (2004)	53	7.9	21.2
Samoa	6.6	1.4	12	-	-
Vanuatu	8.8	26.0	40	20	24.6
Solomon Islands	16.1	23.4	30	21	22.4
Papua New Guinea	20.7	42.7	61	35	40.3

Source: United National Development Programme (2007).

In summary, the types of hazard experienced throughout the Pacific are similar to those found in Fiji, although the frequency and intensity varies across countries according to geographic location. Sensitivity to natural disasters is more acute for most Pacific island countries than for Fiji because they have lower economic and social development, as reflected by key development and poverty indicators (above). The broad conclusions of the two-way empirical analysis of Fiji, therefore, could equally apply to most of the other Pacific island countries; the challenges for reducing disaster risk and disaster management are also likely to be very similar.

5.4 Disaster risk reduction and disaster management challenges

Pacific island countries face similar challenges to that of Fiji in reducing their risk and managing disasters. Various presentations made at the 14th Regional Disaster Managers Meeting in Fiji in 2008 confirmed key challenges facing the countries, including:

- regular exposure to natural hazards affecting the countries' capacity to meet their economic and social development needs
- low national economic capacity to adequately respond to and recover from natural disasters
- common treatment of disasters as a humanitarian issue, with the focus on disaster management, rather than consideration of disasters also as a development and social issue
- limited institutional coordination across government agencies for disaster management
- a national disaster management office that has limited political and institutional reach and is poorly resourced
- disaster risk reduction (DRR) strategies that are not integrated into development efforts
- DRR and disaster management (DM) that are not mainstreamed (integrated) into national planning and budgetary processes
- limited early warning capabilities and weak end-to-end warning systems.

In addition, most of the Pacific island countries and territories have many DRR&DM projects supported by development partners. The effectiveness of these projects could be increased if the projects were developed, implemented and coordinated in the context of national action plans on DRR&DM.

Accepting the two-way relationship between natural disasters and poverty-that is, poverty increases disaster impacts, and disasters reduce economic and social wellbeing-countries urgently need to focus on addressing disaster as both a humanitarian issue and an economic and social development issue.

Pacific island countries have, at least in principle, acknowledged the importance of taking a DRR&DM approach that focuses on preventative measures to minimise risks, on preparedness in the event of a hazardous event, and on effective and timely post-disaster response and rehabilitation. As mentioned, the Pacific Islands Forum Leaders in 2005 signed the Pacific DRR&DM Framework for Action 2005–2015. They have also called for this regional framework, as well as a related Pacific islands Framework for Regional Action on Climate Change (PIFACC) to be operationalised at the national level.

Both these regional frameworks outline key principles and strategies for DRR&DM (including adaptation to climate change), emphasising the importance of:

- incorporating natural hazard risk management and adaptation to disasters into economic and social planning and budgetary processes (that is, into the national sustainable development strategies or equivalent)
- strengthening interdepartmental cooperation and public–private sector and public–community partnerships in DRM
- strengthening risk management instruments such as regulations on disaster proofing infrastructure, financial insurance policies and land use planning policies (about where to establish growth centres, roads, other infrastructure etc.)
- adopting adaptation measures and encouraging the use of traditional methods of coping with natural disasters.

Many countries have made efforts to implement these commitments, and some (including Vanuatu, Republic of the Marshall Islands and the Cook Islands) have developed a prioritised national action plan for DRR&DM. But their commitments and efforts to implement the national action plans have been constrained by limited domestic resources. Donors, too, have not always had the resources to adopt programmatic approaches to DRR&DM. Lack of domestic and partner resources have thus prevented the countries from systematically implementing their national action plans.

In some cases, countries have attempted to strengthen key components of their DRR&DM. In Tonga, for example, a recent project (funded by a World Bank loan and co-financing from AusAID and the European Union) addressed activities such as (Takai 2008):

- a revised emergency management plan
- establishment of an emergency management centre
- implementation of a public information and management plan
- establishment of a geographic information system (GIS) to support risk management
- a RANET communication project.

While such projects go some ways towards strengthening a country's capacity, Takai (2008) noted 'there is still much that needs to be done to achieve the ultimate goals of saving peoples, lives, properties and resources'. Some of the key reasons noted are similar to the ones identified earlier; in short, government is yet to embrace mainstreaming of DRR&DM. It is also imperative that countries adopt a single plan of DRR&DM strategies, regardless of whether a disaster is due to climate change or other natural causes. The DRR&DM Framework of Action and the Pacific Islands Framework for Regional Action on Climate Change (PIFRAC) articulate similar principles, strategies and actions for reducing risk and adapting to disasters, and the efforts need to be coordinated across departments dealing with disasters due to climate change or other natural hazards. Funding, too, must address prioritised and appropriately sequenced actions articulated in the national action plan, and must reflect the programmatic approach articulated in both the Paris Principles of Aid Effectiveness and the Forums Principles of Aid Effectiveness.

6. CONCLUDING REMARKS

Poverty levels in the Pacific are increasing, and disasters are common throughout the region and expected to increase in frequency and extremity as the effects of climate change become more prominent. Consequently, countries are likely to struggle to meet the basic needs and aspirations of their people, not to mention the humanitarian consequences of disasters. In some cases, countries may even experience a reversal in hard earned improvements in their economic and human development.

Poverty and disaster outcomes are inextricably linked. Poverty increases the sensitivity of the people to disasters, as well as the effects of disaster on their wellbeing. Disasters reduce human wellbeing and increase poverty. The outcomes of the two-way relationship between poverty and disasters, however, are influenced by many factors, and the empirical relationship between poverty and disaster will depend on the complex web of economic, environmental, social and political forces. The strong empirical two-way relationship between human development conditions and disasters suggests a multifaceted approach focused on reducing poverty and decreasing the sensitivity of communities to hazards is needed in the Pacific island countries to increase the resilience of the people.

The Pacific DRR&DM Framework of Action and the Pacific Islands Framework for Regional Action on Climate Change articulate similar principles, strategies and actions for reducing risk and adapting to disasters, and the efforts need to be coordinated across departments dealing with disasters due to climate change or other natural hazards. By jointly developing and implementing a DRR&DM national action plan (linked with pro poor development strategies), communities and stakeholders take ownership of their destiny, with the support of development partners where necessary. Funding, too, must address prioritised and appropriately sequenced actions articulated in the national action plan, and reflect a programmatic approach (as articulated in both the Paris Principles of Aid Effectiveness and Forums Principles of Aid Effectiveness).

To reduce the risks from natural disasters, therefore, Fiji and other Pacific island countries must implement (with coordinated input from development partners) strategies that reflect a pro poor development approach that targets poor communities living in hazard prone areas. Fiji and other Pacific island countries must also integrate disaster risk reduction considerations in all development planning and approval processes, as well as community based initiatives, supported by a robust geographic information system (GIS). Ultimately, improved hazards monitoring and a strengthened end-to-end warning system, together with the prompt and well coordinated response to and management of disaster, will help reduce human suffering and minimise the economic and social costs.

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ANNEX 1: GLOSSARY

acceptable risk the level of potential losses that a society or community considers acceptable given existing social, economic, political, cultural, technical and environmental conditions

adaptation the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities

basic needs poverty line the minimum level of income required to obtain sufficient amounts of food, water, shelter, clothing, education and health care to meet the basic needs

biological hazard a process or phenomenon of organic origin or conveyed by biological vectors—including exposure to pathogenic micro-organisms, toxins and bioactive substances—that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage

capacity the combination of all the strengths, attributes and resources available within a community, society or organisation that can be used to achieve agreed goals

capacity development the process by which people, organisations and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including through improvement of knowledge, skills, systems, and institutions

coping capacity the ability of people, organisations and systems, using available skills and resources, to face and manage adverse conditions, emergencies or disasters

disaster a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources

disaster risk the potential disaster losses, in lives, health status, livelihoods, assets and services, that could occur to a particular community or a society over a specified future time period

disaster risk management the systematic process of using administrative directives, organisations, and operational skills and capacities to implement strategies, policies and improved coping capacities to lessen the adverse impacts of hazards and the possibility of disaster

disaster risk reduction the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, the lessened vulnerability of people and property, the wise management of land and the environment, and improved preparedness for adverse events

early warning system the set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organisations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss

emergency management the organisation and management of resources and responsibilities for addressing all aspects of emergencies, particularly preparedness, response and initial recovery steps

exposure people, property, systems or other elements that are present in hazard zones and thereby subject to potential losses

extensive risk the widespread risk associated with the exposure of dispersed populations to repeated or persistent hazard conditions of low or moderate intensity, often of a highly localised nature, which can lead to debilitating cumulative disaster impacts

geological hazard a geological process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, and/or environmental damage

hazard a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, and/or environmental damage

hydro-meteorological hazard a process or phenomenon of atmospheric, hydrological or oceanographic nature that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, and/or environmental damage

intensive risk the risk associated with the exposure of large concentrations of people and economic activities to intense hazard events, which can lead to potentially catastrophic disaster impacts involving high mortality and asset loss

natural hazard a natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, and/or environmental damage

preparedness the knowledge and capacities developed by governments, professional response and recovery organisations, communities and individuals to effectively anticipate, respond to, and recover from the impacts of current, imminent or likely hazard events or conditions

recovery the restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster affected communities, including efforts to reduce disaster risk factors

residual risk the risk that remains in unmanaged form, even when effective disaster risk reduction measures are in place, and for which emergency response and recovery capacities must be maintained

resilience the ability of a system, community or society exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions

response the provision of emergency services and public assistance during or immediately after a disaster to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected

risk the combination of the probability of an event and its negative consequences

risk transfer the process of formally or informally shifting the financial consequences of particular risks from one party to another, whereby a household, community, enterprise or state authority will obtain resources from the other party after a disaster occurs, in exchange for ongoing or compensatory social or financial benefits provided to that other party

trade ratio the addition of exports and imports as a ratio of gross domestic product

vulnerability the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard

ANNEX 2: POVERTY ALLEVIATION AND DISASTER RISK MANAGEMENT PROJECTS IN FIJI

Table A1: Poverty alleviation projects in Fiji—summary of allocations, 2000–08

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
		($m)	($m)	($m)	($m)	($m)	($m)	($m)	($m)	($m)	($m)
1	Local government and environment										
	Upgrading of squatter settlement and existing subdivisions	0.70	0.80	1.00	1.50	0.98	0.17	1.00	1.50	3.00	2.00
	Grant to housing authority	1.70	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	–
	Housing Assistance Relief Trust (HART) support	0.25	0.49	1.00	1.00	2.00	1.90	1.00	1.00	2.00	1.00
	Rental subsidy—Public Rental Board	0.36	0.36	0.69	1.00	1.00	1.00	1.00	1.00	1.00	–
	Subtotal	3.01	3.65	4.69	5.50	4.98	4.07	4.00	4.50	7.00	3.00
2	Commerce										
	Micro finance	1.00	1.00	1.00	1.00	0.50	0.50	0.66	0.70	0.34	0.50
	Northern Development Programme	–	–	–	–	–	–	–	–	–	3.00
	Subtotal	1.00	1.00	1.00	1.00	0.50	0.50	0.66	0.70	0.34	3.50
3	Agriculture										
	Farming assistance	7.33	5.00	3.00	4.00	6.00					
	Infrastructure development	0.00	3.98	5.00	2.50	1.00	1.00	0.80			
	Land purchase		1.89	2.00							
	Farm improvement and land resettlement						7.70	4.00	1.00	1.00	
	Subtotal	7.33	10.87	10.00	6.50	7.00	8.70	4.80	1.00	1.00	21.4
4	Multi-ethnic affairs										
	Multi-ethnic scholarships	1.50	2.00	2.50	3.00	3.15	4.00	4.00	4.23	5.50	5.50
	Subtotal	1.50	2.00	2.50	3.00	3.15	4.00	4.00	4.23	5.50	5.50
5	Education										
	Remission of fees	1.43	0.20	0.50	0.80	0.80	0.80	0.40	0.40	0.40	
	Building grant	0.85	0.85	2.20	1.60	1.80	1.90	1.90	1.20	1.70	
	Compulsory education	0.78	2.05	1.88	1.45	1.08	0.80	0.80	0.80	0.40	
	Tuition fee free education	10.83	11.13	11.15	11.00	13.17					
	Tuition fee free education [primary]						4.80	4.80	4.10	4.20	
	Tuition fee free education [secondary]						10.60	11.40	11.37	11.66	
	Subtotal	13.89	14.23	15.73	14.85	16.85	18.90	19.30	17.87	18.36	

6	Fijian affairs										
	Development assistance for Fijians and Rotumans	1.50	1.50								
	Subtotal	1.50	1.50								
7	Regional development										
	Multi-ethnic scholarships	1.50	2.00	2.50	3.00						
	Subtotal	1.50	2.00	2.50	3.00						
8	Social welfare										
	Poverty alleviation projects	1.50	1.50	2.00	2.50	2.50	3.00	4.00	1.00	1.00	1.00
	Grant to voluntary organisations	0.23	0.10	0.38	0.63	0.63	0.63	0.63	0.25	0.50	0.40
	Family Assistance Scheme	7.10	8.26	11.00	12.00	12.00	15.00	16.00	18.00	18.00	20.00
	Care and Protection Allowance	0.21	0.21	0.00	0.00	0.35	0.30	0.30	0.30	0.22	0.40
	Others										0.60
	Subtotal	9.04	10.07	13.38	15.13	15.48	18.93	20.93	19.55	19.72	22.4
9	Women										
	Women's Plan of Action						0.26	0.30	0.30	0.30	
	Subtotal	0.00	0.00	0.00	0.00	0.00	0.26	0.30	0.30	0.30	
10	Youth development										
	Rural sporting facilities						0.34	0.38	0.20	0.20	
	Subtotal						0.86	0.98	0.80	0.80	
11	Miscellaneous									.	
	Grant to Public Rental Board	2.00	2.00	1.97	1.97	1.97					
	Student Loans Scheme	1.00	1.00	1.00	1.50	1.50	1.50	1.50	1.50	1.50	
	Fiji Development Bank (FDB)—interest subsidy (loan for other ethnic groups)	1.50	1.50	0.30	0.84	0.84	0.84	0.84			
	FDB—interest subsidy (loan for Fijians and Rotumans)	4.00	4.00	5.00	4.22	4.00	4.00	4.00	4.00	4.00	
	FDB—interest subsidy (Northern Division projects)						1.00	1.00	0.55	0.55	
	Village Improvement Scheme	0.00	0.50								
	Small Business Equity Scheme (for Fijians and Rotumans)	1.00	1.50								
	Small Business Equity Scheme (for Fijians)							5.56	5.56		
	Small Business Equity Scheme (for other ethnic groups)	0.50	0.50	0.30							
	Small and Medium size Enterprise development					0.20					
	Hospital fees			0.10	0.10						
	Government subsidy for business operators (new)								2.50	3.50	
	Subtotal	10.00	11.00	8.67	8.63	8.51	7.34	9.84	14.11	15.11	
	Total	48.77	56.32	58.47	57.61	56.47	63.57	64.81	63.06	68.13	

Table A2: Disaster risk management projects in Fiji

Organisation	Project name	Type (DRR, DM, DRM, other)	Brief description (incl. outcomes and outputs)	Start date (if available)
Bureau of Meteorology (BOM) (Australia)	Pacific Islands Climate Prediction Project	DRR	Improving long range forecasts for multi-sector applications but including severe weather	2003
BOM	Tsunami warning systems	DRR	Assessing requirements for capability building	2005
BOM	South Pacific Sea Level and Climate Monitoring Program Phase IV	DRR	Providing accurate records of sea level variance and establishing methods for use of readily available data on sea level behaviour on climatologically time scales Complementing other global and regional efforts to build and maintain long term data sets	2006
BOM	RANET	DRR	Prototyping communication systems for remote areas	2007
BOM	Improving early warning (weather) services in the Pacific	DRR	Supporting the forecasting centre in Nadi with training and information technology systems in Fiji, Vanuatu, Samoa and Tonga	May 2007
BOM	Severe Weather Forecast Demonstration Project	DRR	Trialling forecast computer guidance products from advanced weather centres with the aim of developing of improved services to the public and emergency services to enhance community preparedness (increasing the lead time for warnings, graphical displays of the tropical cyclone paths for television and web, etc.)	Late 2008
BOM	Review of current arrangements for early warning systems for weather and climate	DRR	Establishing a technical working group and producing a policy paper (with options to be more detailed and costed), which was adopted at the World Meteorological Organization 12th session of the Tropical Cyclone Committee meeting in 2008. The policy paper was tabled at the SIS Leaders meeting 2008, which called for the Pacific Islands Forum Secretariat, the South Pacific Regional Environment Programme and SOPAC to coordinate the urgently required strengthening of regional services delivered by the Regional Specialised Meteorological Centre (RSMC) Nadi and the Fiji Met Service. The Forum Leaders have asked SPREP to identify feasible options for strengthening the regional delivery of climate and weather related services.	1 March 2008
Department of Foreign Affairs and Trade (DFAT) (Australia)	Response to Tropical Cyclone Gene	DRM	Replenishing Fiji Red Cross emergency supplies (A$50 000) and rehabilitating the agricultural sector damaged during the cyclone (A$450 000)	14 April 2008
DFAT	Caritas: Building Disaster Response and Preparedness of Caritas Partners in the Pacific	DRR	Building strong organisational systems and increasing the technical capacity of Caritas partners in disaster preparedness and response in Samoa, Vanuatu, Fiji, Kiribati and the Pacific region	February 2008
DFAT	SOPAC: Strengthen Pacific DRM through AusAID NAP Facility	DRM	Supporting the development of Disaster Risk Reduction and Disaster Management National Action Plans (NAPs)	January 2008
DFAT	National Council of Churches of Australia (NCCA): the Pacific Community Focused Integrated DRR Project	DRR	Mainstreaming integrated DRR strategies into sustainable development practices, using local faith based organisations in Fiji, Solomon Islands, Tonga and Vanuatu	July 2007

DFAT	UNICEF: Strengthening humanitarian emergency response management for children and women in the Pacific	DRM	Strengthening the pre-positioning, management and distribution of humanitarian response supplies (especially health) for children and women. Enhancing national and subnational capacity in emergency management planning, disaster assessment and response monitoring for children and women in the Solomon Islands, Vanuatu, Kiribati, Fiji and Samoa	January 2008
DFAT	Australian Red Cross: Design for an enhanced strategic engagement program	DM and DRM	Developing a design for an enhanced strategic engagement program (ESEP) to strengthen the Australian Red Cross's DRM capacity in the Pacific, leading towards a partnership arrangement between AusAID and Red Cross valued up to A$3.3 million over three years	May 2008
DFAT	Australian Red Cross: strategic engagement	DRM and DRR	Developing the capacity of targeted Red Cross national society DM programs to respond effectively to disasters, and ensuring a coordinated response with other agencies	July 2004
DFAT	Pacific Tsunami Warning System (PTWS)	DRM	Building the capacity of communities and nationals and regional organisations in the Pacific to respond to tsunami threat information, through support to SOPAC's Strategy for Enhanced Early Warning for Pacific island countries	2005
DFAT	April 2007 Tsunami Reconstruction and Recovery Program	DM	Supporting community infrastructure rehabilitation (clinics, schools), water and sanitation, disease prevention and food distribution in Choiseul Province and on Gizo Island	5 April 2008
DFAT	Support for the Disaster Management Program	DRR, DRM, DM	Offering support to strengthen the operational capacity of the National Disaster Centre (NDC); strengthening development partner and stakeholder coordination through co-funding of UNOCHA presence and activities in Papua New Guinea; establishing and funding a prepared communities grant program administered by NDC; conducting a strategic engagement program with the Australian Red Cross to strengthen the DM capacity of the Papua New Guinea Red Cross and reduce community vulnerability; establishing and training an AusAID Papua New Guinea Emergency Response Team to be deployed in first phase response operations in field monitoring, reporting and coordination roles; providing emergency response support in the form of technical and logistics assistance, provision of relief supplies etc. in the event of a disaster Outputs/outcomes: a more effective DM network, greater community awareness, more efficient and transparent management, relief supplies readily available, reliable emergency communications, improved donor coordination, effective support for a Papua New Guinea disaster response	10 June 2003
European Union (EU) –SOPAC	Pacific HYCOS (Hydrological Cycle Observing Systems)	DRR	Installing monitoring systems to collect water resource data, which are fundamental to any water resource related project: - water resources assessment for major rivers - water resources databases - flood monitoring and forecasting - drought monitoring and forecasting - groundwater monitoring and assessment - water quality monitoring and assessment	2007

EU–SOPAC	DRM advocacy in Pacific countries	DRM	Advocating at the highest political and bureaucratic levels within Pacific governments to obtain support for mainstreaming DRR and DM internally within government and linked planning and budgeting systems. The advocacy effort currently focuses on obtaining support for the development and implementation of DRM national action plans.	January 2005
EU–SOPAC	3rd Annual Meeting of the Pacific DRM Partnership Network	DRM	The Partnership Network was established in February 2006 in response to a call by Pacific leaders for regional and international organisations that had a stake in disaster risk management capacity building in the Pacific to work co-operatively and collaboratively in the interests of reducing the risks faced by Pacific countries to disasters. The Partnership Network is coordinated by SOPAC.	July 2008
EU–SOPAC	Inaugural Pacific Regional Disaster Risk Management Meeting for Pacific CEOs of Finance/Planning and Disaster Management		To ensure an improved effort to address DRR, SOPAC (working with partner organisations) has advocated extensively for the upper echelon of Pacific public service jurisdictions to help ensure risk considerations are given a greater prominence in planning and budgeting systems within government and at each level of the national economy.	July 2008
EU–SOPAC	Development of a reporting tool for the Regional DRM Framework	DRM	Developing a reporting tool to enhance understanding of how and to what extent Pacific countries are supporting implementation of the Regional DRM Framework, which Pacific leaders endorsed in October 2005	May 2008
EU–SOPAC	Support for the PIEPSAP web portal	Energy	Coordinating and assisting the development of the PIEPSAP web portal	February 2008
Institute of Geological and Nuclear Sciences (GNS)	Accelerograms for Natadola, Viti Levu, Fiji	DRR	Recommending earthquake records for design analyses of a resort complex	2007
GNS	Traditional disaster reduction in Pacific island communities	DRR	Studying traditional disaster responses in the Pacific island countries and territories, to build knowledge of 'cultural understandings and traditional mitigation' in Pacific island cultures. The purpose of the report is to bring together information showing the measures that were traditionally used in the Pacific island region around the time of initial European contact and the colonisation that followed.	2007
GNS	Tsunami objective; geological hazards and society program; New Zealand Foundation for Research Science and Technology	DRR	Establishing numerical models of trans-Pacific tsunami and gathering historical records of trans-Pacific tsunami. See Power, WL, Downes, GL & Stirling, MW 2007. 'Estimating the tsunami hazard in New Zealand due to South American earthquakes'. Pure and applied geophysics, vol. 164, nos 2/3, pp. 547–64.	2004
International Strategy for Disaster Reduction (ISDR)	Disaster Poverty Interface Study in Pacific Island Countries	DRR	Developing and piloting a method to examine the microeconomic and macroeconomic links between poverty and disaster vulnerability in the Pacific, and to understand the extent to which these variables are interdependent. The method will be piloted in Fiji, with the aim of subsequent application across the region.	June 2008
ISDR	Asia and the Pacific: regional stocktaking and mapping of DRR interventions	DRR	Aiming for regional stakeholders to provide coherent support to the DRR efforts of national governments, to address more effectively cross-border/regional DRR challenges. The project will prepare a comprehensive overview of regional DRR interventions that is presented in the wider context of the regional DR profile of Asia and the Pacific.	Jun-08

Japan International Cooperation Agency (JICA)	Rescue training	DM	Training firefighters in Fiji in rescue techniques, with the support of a fire station in the local city of Japan. The training is a combination of one month training in Japan (two participants from Fiji) and one month in Fiji (two experts from Japan), once a year, for three years. For the second and third years, the course focused on the rescue technique in the cases of floods.	2006
JICA	Meteorology training	DRR	Supporting the training course held by the Department of Meteorology in Fiji. The training course is designed for the meteorology staff in the Pacific countries and accommodates around 10 participants each year. The course focused on the Automatic Weather Station Network in 2006 and operational forecasting in 2007.	2006
JICA	Operation of Earthquake Observation Network (Fiji and Tonga)	DRR	Supporting the setting up of the observation network, the capacity building of earthquake observation officers, the promotion of collaborated data analysis among observation offices in Fiji and Tonga. Providing experts from Japan (three to four per year), equipment and training in Japan	November 2007
New Zealand's International Aid and Development Agency (NZAID)	Strengthening the DRM in Pacific island countries	DRM	Strengthening DRM capacity and capability in Pacific island countries through a multi-year funding arrangement with the Ministry of Civil Defence and Emergency Management	1 July 2004
NZAID	Disaster response	DRM	Coordinating New Zealand's response (including funding support and/or relief supplies to Pacific island countries) following natural disasters	Ongoing
NZAID	FRANZ	DRR	Undertaking coordination with other development partners ie., France and Australia. Includes participation in annual meetings and biannual desktop exercises.	1992
NZAID	OCHA	DRM	Funding and policy engagement with OCHA to support coordinated approaches to disaster response.	Ongoing
NZAID	SOPAC	DRM	Funding SOPAC, including its Community Risk Programme. Objectives are to strengthen resilience to disasters, to mitigate the effects of hazards and to mainstream DRM.	Ongoing
NZAID	SOPAC	DRM	Actively participating in the Pacific DRM Partners Network, to achieve the enhanced alignment, coordination and effectiveness of DRM across the region	2004
NZAID	International Search and Rescue Advisory Group (INSARAG)	DRM	Possibly helping fund Pacific urban search and rescue (USAR) training	2008
NZAID	Various	DRM	Establishing arrangements with various agencies to support an effective response to disaster—for example, telecommunications support, radio coverage and weather forecasting	2004
United Nations Office for the Coordination of Humanitarian Affairs (OCHA)	Coordination of inter-agency contingency planning for humanitarian assistance in the Pacific	DM	Facilitating an inter-agency preparedness planning process at regional and national levels. Outcomes: strengthened coordination mechanisms in the Pacific at regional and national levels; improved preparedness measures; cluster coordination and agreed cluster leadership—that is, a regional inter-agency contingency planning process for humanitarian assistance in the Pacific	July 2008
OCHA	Coordination of information management for emergencies	DM	Facilitating inter-agency work on information management, data preparedness and the development of agreed rapid assessment methods and tools	

OCHA	Coordination of United Nations Disaster and Coordination (UNDAC) team	DM	Being the UN support tool for affected countries in terms of disaster assessment, coordination and information management	
OCHA	Coordination of USAR training	DM	Facilitating USAR training in partnership with regional partners	
OXFAM	Fiji/Pacific Centre for Peace Building	DRR	Contributing to the creation of a Pacific Centre for Peace Building to provide training and expert advice in peace building in the region	
OXFAM	Fiji/Youth Peace and Development Program	DRR	Supporting young people in promoting peace and development in Fiji	
Pacific Red Cross Movement	Container Program	DP/DM	Maintaining and stocking National Society containers and supporting National Society logistics systems across the Pacific to ensure preparedness to respond to disaster	2008
Pacific Red Cross Movement	Regional DRM training	DRM	Coordinating and delivering standard training in emergency response (ERT), regional disaster response (RDRT) and DRR to National Societies in the Pacific	2008
Pacific Red Cross Movement	Emergency Management Core Group	DRM	Providing a regular forum for National Societies to discuss regional issues on DRM and to develop and maintain protocols for National Societies in performing their auxiliary role for national governments in disaster preparedness, response and risk reduction within the region	2008
Pacific Red Cross Movement	Community awareness programs	DRM	Developing and implementing community awareness programs on disaster preparedness and DRR, including adaptation to climate change	2008
Pacific Red Cross Movement	Community pilot projects	DP/DRR	Increasing community awareness of DP/DRR and local vulnerabilities and capacities; increasing community capacity to identify projects to address vulnerabilities and mobilise resources; developing best practice in DRR at the community level	2008
Pacific Red Cross Movement	Integrated disaster preparedness/risk reduction and community based health training	DP/DRR	Developing and implementing training modules on community health that incorporate awareness of the links between climate change and community health, and of the relevance of disaster preparedness to maintaining community health	2008
Pacific Red Cross Movement	Communications and advocacy	DRM	Substantially increasing knowledge and awareness among regional partners, national governments and communities of Red Cross operating principles and work in disaster response, preparedness and risk reduction (including adaptation to climate change) using available regional and national networks, media and international events	2008
SOPAC Community Lifelines Program (CLP)	Water Quality Monitoring Capacity Building Programme	Other	Aiming to build sustainable national capacity for Pacific island countries' labs to test accurately their drinking water and coastal water quality. Some outputs: 1. Identifying gaps in knowledge, resources and equipment, and problem areas 2. increasing local capacity to carry out water quality monitoring 3. supporting nongovernment organisations to carry awareness raising campaigns on water quality and health	18 May 2006
SOPAC CLP	Sustainable Integrated Water Resources and Wastewater Management Project in Pacific island countries	DRR	Aiming to improve water resource and wastewater management and water use efficiency in Pacific island countries, to balance overuse and conflicting uses of scarce freshwater resources through policy and legislative reform and the implementation of applicable and effective integrated water and resources management and water use efficiency.	2008

SOPAC CLP	Water demand management for Pacific island countries	DRR	Improving the capacity for water demand management in Pacific urban water utilities, including: 1. having water demand management teams established, trained and functioning with increased capacity within utilities 2. developing and implementing water demand management plans for individual utilities 3. promoting and sharing the experience of successful water demand initiatives between utilities	2006
SOPAC CLP	Water Sanitation and Hygiene (WASH) Programme	other	Supporting the sectors of water, sanitation and hygiene so as to help improve rural and urban communities' capacity to plan and manage their own water, sanitation and hygiene sectors effectively	2008
SOPAC CLP	Water Safety Plans (WSP) Programme	RM	Via the existing Pacific Water Safety Plan Programme, aiming to identify risk and develop a management plan or water safety plan to control these risks. By developing and implementing a water safety plan, participating water authorities will identify weaknesses in their system and the improvements needed to reduce or eliminate those risks.	2008
SOPAC CLP	Support to Pacific island countries in information management systems	Asset management	Developing, through the use of geographic information systems and remote sensing, a digital platform, data and information database system to manage and plan utility operations	Ongoing
SOPAC Community Risk Programme (CRP)	DRM Mainstreaming Guideline	DRM	Aiming, via the application of this mainstreaming guideline, to enhance regional and national efforts to mainstream hazard risk considerations into national planning and budgeting systems. The guideline will consist of identified processes and tools to facilitate mainstreaming.	November 2007
SOPAC CRP	Finalization of new DRM arrangements and legislation in Fiji	DRM	Finalising the new national arrangements and supporting legislation that was initially drafted in 2006	June 2006
SOPAC CRP	Support to Pacific island country representatives to attend regional and international conferences and meetings	DRM	Helping facilitate Pacific island countries' participation in meetings and conferences that will contribute to the strengthening of national institutions for DRM	January 2008
SOPAC CRP	Scholarships for professional qualifications in DM	DM	Sponsoring Pacific island country representatives who have successfully completed the core courses under The Asia Foundation/Office of US Foreign Disaster Assistance Training (TAF/OFDA) Programme, and who aspire to professional qualifications in disaster management, for the Post Graduate Certificate in Disaster Management at the Swinburne University of Technology, Melbourne, Australia	January 2008
SOPAC CRP	Development of an accredited DRM training course with the University of the South Pacific	DRM	Developing a post graduate certificate level DRM training course within a suitable faculty at the University of the South Pacific (USP) to facilitate professional qualifications for Pacific islanders. Such a course is managed by the Swinburne University of Technology in Melbourne, Australia, and the proposal is to develop a regional course with the USP.	

SOPAC CRP	DM training for Pacific countries	DM - DRM	Supporting TAF/OFDA training programmes that address skills development in disaster management. Six courses are conducted at regional and national levels for Pacific countries' training and capacity development.	January 2008
SOPAC CRP	14th Regional Disaster Managers Meeting	DRM	Conducting the annual event at which Pacific representatives (National Disaster Management Offices) discuss issues and share experiences in relation to DRR and DM	July 2008
SOPAC CRP	Disaster Awareness Planning Guide	DM	Assisting Pacific countries to plan and undertake disaster awareness activities	January 2008
SOPAC CRP	Tsunami capacity assessments for Pacific countries	DRM	Gauging the capacity of Pacific countries to manage effectively all facets of early warning for tsunami	April 2007
SOPAC CRP	Implementation of the Regional Early Warning Strategy (REWS)	DRM, DRR, DM	Undertaking actions to address improved early warning capacity and capability in Pacific countries for a range of natural hazards, principally tsunami and cyclones. The actions are intended to achieve the following outcomes: 1. robust, effective national and regional monitoring and early warning systems established and strengthened for all hazards, incorporating traditional knowledge and appropriate technology and tools 2. community, national and regional warning systems that are integrated into the global network and that support early warning and vice versa, to improve safety and security against disasters 3. effective communication and awareness raising as part of these community focused early warning systems.	November 2007
SOPAC CRP	Support to Pacific Islands national fire agencies	DM	Supporting capacity building for various national fire services in the Pacific. This largely involves the costs of supporting technical experts from counterpart fire authorities in Australia and New Zealand to conduct specialised training; the participation of fire service personnel at training courses in overseas countries; and the deployment of ex-Australia/New Zealand fire service equipment and vehicles to Pacific countries.	January 2006
SOPAC CRP	Support for the International Day for Disaster Reduction (IDDR)	DRM	Supporting the IDDR in Pacific countries with funding to facilitate awareness activities at national and community levels	Ongoing each year
SOPAC CRP	Strengthening of the National Disaster Management Office's (NDMO) information systems	DRM	Supporting the capacity of the NDMO's information systems by providing technical advice, the procurement of relevant hardware and software applications, and the conduct of related training	Ongoing each year
SOPAC CRP	Implementation of Pacific Disaster Net	DRM	Providing relevant data and information management for a web portal and database system to support DRM capacity building	January 2006
SOPAC CRP	Development of a web search tool	DRM	Facilitating dedicated and regular web searches of DRM sites to provide an ongoing stream of information to Pacific countries on opportunities in relation to training, awareness, education materials and other relevant data/ information	December 2007
SOPAC CRP	Development of a DRM National Action Plan for the Solomon Islands	DRM	The DRM National Action Plan is the outcome of extensive research and consultations resulting in the identification of key DRR and DM actions to address hazard risk and reduce the vulnerability of communities.	August 2008

SOPAC CRP	Implementation of Comprehensive Hazard and Risk Management (CHARM) in Pacific countries	DRR	CHARM is a decision making tool that was developed to assist the process of mainstreaming disaster risk management on an 'all hazards' basis across the region, and to improve the capacity of individual Pacific island countries and communities to reduce their vulnerability and manage disasters when they occur.	January 2002
SOPAC CRP	Support for the GFDRR regional stocktake and country assessments in Pacific countries	DRR	Supporting the World Bank to assess the extent to which DRR and climate change adaptation activities are being implemented in the Pacific, to identify opportunities for investment. The country assessments were conducted for: Papua New Guinea, the Solomon Islands, Fiji, Kiribati, Tuvalu and Vanuatu.	January 2008
UNICEF	Strengthening the humanitarian emergency response management for children and women in the Pacific	DRR	Helping national partners in the program countries to be better prepared and better able to help protect the basic rights of children and women, and to ensure their essential needs are met effectively, dependably and in a timely manner in times of disaster, thereby reducing the impact of disasters when they occur Output 1: The prepositioning, management and distribution of humanitarian response supplies (especially health) for children and women will be strengthened. Output 2:National and subnational capacity in emergency management planning, disaster assessment and response monitoring for children and women will be enhanced.	January 2008
World Health Organisation (WHO)	WHO emergency and humanitarian action	Health preparedness and response for disasters	Producing outputs that include: (1) public health sector disaster management training courses (Fiji, Vanuatu, Tonga and Solomon Islands in 2008), (2) Pacific health sector emergency response manual (draft status in 2008), (3) Health Cluster Tool Kit 2008 and (4) technical support to health sector in disasters	

Source: Mosese Sikivou, Manager Community Risk Programme, SOPAC, personal communication, 2009.