



Economic Impacts of Natural Hazards on Vulnerable Populations in Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga, and Vanuatu



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List of abbreviations

ADB	Asian Development Bank
AUD	Australian dollar
AusAID	Australian Agency for International Development
CFE-DM	Center for Excellence in Disaster Management & Humanitarian Assistance
CRED	Centre for Research on the Epidemiology of Disasters
CSIRO	Commonwealth Scientific and Industrial Research Organisation
ECHO	European Civil Protection and Humanitarian Aid Operations
EM-DAT	Emergency Events Database
ESCAP	Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization of the United Nations
FJD	Fiji dollar
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IASC	Inter-Agency Standing Committee Reference Group on Risk, Early Warning and Preparedness
IDMC	Internal Displacement Monitoring Centre
IFPRI	International Food Policy Research Institute
IFRC	International Federation of Red Cross and Red Crescent Societies
ILO	International Labour Organization
IMF	International Monetary Fund
INFORM	Index for Risk Management
IOM	International Organization for Migration
MAFF	Ministry of Agriculture, Food, Forests and Fisheries (Tonga)
MSME	Micro-, small-, and medium-sized enterprises
NDMO	National Disaster Management Office (Vanuatu)
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
OECD	Organisation for Economic Co-operation and Development
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
PGK	Papua New Guinea kina (unit of currency)
SBD	Solomon Islands dollar
SPC	Secretariat of the Pacific Community

TC	Tropical Cyclone
TOP	Tongan pa'anga (unit of currency)
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNFPA	United Nations Population Fund
Unicef	United Nations Children's Fund
USD	United States dollar
VUV	Vanuatu vatu (unit of currency)
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme
WST	Samoan tala (unit of currency)
WTO	World Trade Organization

Executive summary

Hazard and Exposure

Pacific island countries are widely regarded as experiencing the highest risks in the world associated with natural hazards. Pacific Island countries are exposed to a wide range of natural hazards because of their geographical locations, their populations are vulnerable due to their dispersion across a large number of geographically remote islands with poorly developed infrastructure, and many have limited coping capacities. Across the region, weather-related events cause the majority of economic losses, with cyclones being the most serious hazard. All six countries reviewed in this report (except Samoa, the smallest country in area) experience an average of one or more cyclones per year, which brings high winds, heavy rain, and both coastal and inland

flooding. Climate models forecast that most Pacific Island countries are likely to experience a decrease in the frequency of cyclones by the end of the century, but an increase in wind speeds and rainfall amounts. All six countries reviewed in this report also experience risks of earthquakes, tsunamis, and volcanoes, which cause localized but severe damage when they occur. Significant earthquakes occur in Papua New Guinea, Solomon Islands, and Vanuatu every 13 to 20 months, on average, but are much less frequent in the other countries reviewed. All six countries experience risk of drought as a result of natural climatic cycles; droughts are infrequent but cause widespread harm to subsistence agriculture which is the dominant source of livelihood in most of these countries.

Vulnerability and Impacts

Natural hazards disproportionately affect poor people, workers in the informal economy, and women. Poor people tend to be more exposed to hazards than wealthier people and are more severely affected by hazards, and have fewer resources available to cope when disasters do occur. In all six countries examined in this report, poverty is a significant issue and there are high levels of informal and vulnerable employment and subsistence economic activity, which are insecure and particularly vulnerable to natural hazards. Gender equality is a major problem across the region, with traditional social norms excluding women and girls from political and economic participation and contributing to high levels of gender-based violence. Disasters affect women and girls more severely than men and boys because their traditional domestic roles tend to become more difficult and time-consuming under disaster conditions, their livelihoods tend to be less secure and more

severely affected by damage to natural resources, and gender-based violence often increases in crisis. Education is disrupted by natural hazards which damage schools and other infrastructure, displace people, and cause students to be withdrawn from school, but there is little evidence about the resulting impacts on educational outcomes. Youth employment is a significant challenge across the region, with youths suffering from a lack of formal employment opportunities and often remaining unemployed or under-employed in the informal or subsistence economy, but there is a lack of evidence about how natural hazards affect employment prospects, other than generally inhibiting economic growth.

The economies of all six countries reviewed in this report, and the livelihoods of the majority of their populations, are vulnerable to damage and loss caused by natural hazards. Subsistence agriculture, which is vulnerable to

all types of hazards, plays a very important role in people's livelihoods across all six countries. Fiji is the least dependent on subsistence agriculture, but in the other countries 75% to 97% of the population depends on subsistence agriculture for livelihoods. Most of the countries in the region have very small manufacturing sectors, but many people work in small-scale, informal, and home-based trading activities with limited resources to cope with shocks inflicted by natural hazards. Tourism, a significant industry in four of the six countries, is largely nature-

based and dependent on coastal and marine ecosystems and coastal infrastructure which are vulnerable to natural hazards and the impacts of climate change. Most of the population in these countries, with the exception of Papua New Guinea, lives in coastal areas where they are more highly exposed to cyclones, tsunamis, and flooding than inland populations. Housing in all six countries is often not robust enough to withstand hazards, usually because of poor construction standards especially in informal settlements and rural areas.

Adaptive Social Protection

Scaling up social protection schemes quickly by providing cash payments or vouchers to people affected by humanitarian crisis is increasingly common worldwide and across the Pacific region.

International experience has shown that a cash-based response is efficient and effective, enables recipients to identify and prioritise their own needs, supports the dignity of recipients, can be more timely and flexible than other types of assistance, and supports the recovery of local markets. In the Pacific, cash-based programming has not been widely used until quite recently, but it is now becoming more accepted. Cash transfers are more feasible in crisis situations in countries that have prior experience of using them in social protection programs and have well-developed financial services and a high degree of financial inclusion.

Most of the countries reviewed in this report do not have formal social protection schemes that are able to scale up in crisis situations to support disaster relief and recovery. Fiji and Tonga are exceptions: after recent tropical cyclones, they distributed supplementary cash payments through existing social protection systems and distributed electronic vouchers or cash for home repairs. The other countries reviewed in this report have very limited formal social protection systems which are mostly limited to contributory pension schemes for people in formal employment, and no significant experience in providing cash payments for disaster relief and recovery purposes.

Financial Inclusion

Worldwide, financial inclusion is an important contributor to development, poverty reduction, and disaster resilience. Access to financial services enables and incentivizes people to accumulate savings, smooth consumption over time, obtain loans, start businesses, receive remittances and other payments, obtain insurance, and improve resilience to financial shocks while reducing reliance on negative coping strategies and predatory lending. Evidence from multiple countries shows that financial inclusion contributes to poverty

reduction, improves food security, and helps preserve capital.

In most of the six countries reviewed in this report, there is little evidence that financial inclusion contributes significantly to disaster resilience. The exception is Fiji, where a relatively high-level of financial inclusion appears to support disaster resilience by facilitating the distribution of relief funds, receipt of remittances, and accumulation of savings. Financial inclusion in all six countries is broadly

comparable to countries at similar income levels elsewhere in the world, but financial inclusion in remote islands and rural areas is much lower than in the main urban areas.

Across the Pacific region, experts recommend that financial inclusion should be increased.

Various experts recommend promoting greater access to and use of financial services including developing more access points, agent networks,

digital payment platforms, and mobile money systems. In the long-term, efforts could be made to increase financial literacy and awareness, develop regulatory frameworks that accommodate poorer households, improve consumer protection to increase trust in the financial system, and incentivize the private sector to develop financial services that are resilient in crisis.

Insurance

Worldwide, insurance is an important tool for managing risks associated with natural hazards, but the Pacific region is one of the least insured regions in the world. Barriers to uptake of insurance include affordability, inadequate disaster risk mitigation measures, insufficient baseline information for designing insurance products, limited availability of reinsurance, consumer awareness and cultural issues, lack of trust, inadequate building codes and certification mechanisms, lack of public asset registers, aid dependence, and weak mechanisms for distributing pay-outs. There is limited demand for and limited availability of insurance products in the region, and many communities have limited access to financial institutions. Micro-, small-, and medium-sized enterprises are often overlooked by insurance companies and regulators, and it is rare for insurance products to be tailored to the specific needs of the smallest businesses. Insurance may not be cost-effective for the poorest of the poor, and is not an appropriate approach for frequently recurring events or for slow-onset, highly predictable events. Microinsurance is often considered unsuitable for covering risks associated with natural hazards which affect many people simultaneously, because of the large capital reserves required and the high cost of assessing claims.

In all six countries reviewed in this report, the majority of people and small businesses have no insurance coverage for natural hazards.

Property insurance coverage is very limited in

all of the countries, and is essentially absent in rural areas. Crop insurance is not available. Insurance is unaffordable to low-income people across the region, and many people are unfamiliar with insurance. Insurance markets in all six countries are small, have limited capacity, and have difficulty obtaining reinsurance coverage for major hazards. Low standards for building construction across the region limit insurers' willingness to cover properties without expensive certification.

Uptake of insurance coverage could potentially be increased by raising awareness and developing products tailored to local circumstances.

Demand could potentially be stimulated by increasing financial, insurance and risk management literacy and awareness among beneficiaries, insurers, distribution channels and governments, by supporting the development of a wider range of products, and by increasing access to financial services through channels such as mobile phones. The insurance industry requires support to develop new products tailored to local market conditions including better local risk data. However, the most vulnerable people cannot afford insurance at market prices and may require some form of support. Parametric or index-based insurance could potentially be simpler, more transparent, and cheaper than indemnity insurance, but requires considerable technical capacity, data, communications capacity, and public awareness and education.

Migration

Globally and across the Pacific, migration is recognised as a positive adaptation strategy in response to natural hazards and environmental change. Voluntary, well-managed migration of individuals and communities can enhance the adaptive capacity of the migrant-sending community by generating remittances, reducing population pressure, and transferring knowledge and skills. Some countries have suffered “brain drain” from the loss of skilled workers where migration has been permanent rather than temporary or seasonal.

There are marked differences in migration patterns among the six countries reviewed in this report. Samoa, Tonga, and Fiji have high rates of emigration, ranking among the top 15 migrant-sending countries in the world by proportion of their population, and in all three countries migration is supported by government policies. In Samoa and Tonga, migration is a well-developed strategy for seeking economic opportunities for unskilled workers. In Fiji, better-developed education and training systems have enabled the country to access more opportunities for skilled migrant workers. Papua New Guinea, Solomon Islands, and Vanuatu have been less successful in accessing opportunities for migrant workers.

There is a consensus that migration should be supported, managed, and integrated into environmental, climate change, and urban planning policies. Governments have been urged to prioritise labour mobility schemes, invest in education and training, harmonise standards for qualifications, invest in marketing strategies to obtain opportunities for workers, and seek opportunities within and beyond the Pacific region. Countries that receive migrant workers should ensure that migration policies support development in source countries, expand opportunities for low-skilled workers, improve integration for new migrants, and increase opportunities for migrants from countries particularly threatened by sea-level rise. Governments have also been urged to mitigate potential negative social impacts on families and communities, incentivize migrants to return home rather than settle permanently abroad, and work to mitigate potential “brain drain” that could negatively affect countries sending skilled workers overseas. There is a general lack of knowledge about migration and climate change across the Pacific and there is a need for better data on migration.

Remittances

Remittances are an important source of income for many low-income countries, both in normal times and following disasters. Worldwide, remittances amount to more than three and a half times the total value of official development assistance, with unrecorded remittances sent through informal channels possibly even greater. Remittances tend to be more stable than other international financial flows, and often increase following disasters. Households that receive remittances are better able to respond to and recover from disasters than those that do

not receive them, including rebuilding more quickly, avoiding negative coping strategies, and maintaining consumption during crisis. There is debate in the literature about whether remittances contribute to reproducing existing inequalities and about how well they support disaster preparedness.

Remittances benefit the countries reviewed in this report that have significant populations of migrant workers and overseas diasporas. In Fiji, Samoa, and Tonga, remittances are

important sources of income, make significant contributions to welfare in normal times, and support recovery from the impacts of natural hazards. Remittances have had limited impacts on disaster resilience in Papua New Guinea and Solomon Islands, but have been increasing in importance in Vanuatu, particularly following tropical cyclone Pam in 2015. There is limited evidence about how remittances contribute to disaster resilience, as most research focuses on their impacts on development generally.

Recommendations for improving the amount and impact of remittances focus on reducing transaction costs and administrative barriers, and incentivizing investment in long-term

development. Many experts have called for the costs of sending remittances to be reduced, particularly during and after crisis. Some experts recommend offering training to migrants and to recipients of remittances (and increasing access to financial institutions) to encourage saving and longer-term investment. Other recommendations include increasing migrants' access to financial services in host countries, ensuring that systems are in place to enable people to identify themselves (including providing temporary identification papers if needed) and supporting the tracing and contacting of family members affected by disasters.

Resettlement of Communities at Risk

Relocation of settlements at extreme risk of natural hazards is generally considered a last resort with potentially severe social and cultural impacts. Across the Pacific, risks associated with relocation of settlements relate to land, loss of identity, culture, livelihoods, family ties and community cohesion, as well as conflict and governance issues around customary land rights. Residents typically resist the idea of relocation, and prefer in-place adaptation and sustainable management practices.

Attempts to relocate communities at risk in the countries reviewed for this report have often turned out to be problematic, but each

initiative is unique and depends on specific local circumstances. Recommendations for resettlement initiatives emphasise the importance of community participation and empowerment, providing community services in the new location, and preserving livelihoods and cultures. Access to land and natural resources are major barriers to relocation in most cases, and resettled populations often end up in conflict with their new neighbors after relocation. Vanuatu and Fiji are considered leaders in this area due to their policies on relocation that recognise displaced peoples' rights and provide guidance for participatory planning processes.

Community-Based Support

Globally and across the Pacific, informal, community-based coping mechanisms are a common way to reduce risk in rural and poor communities. Community-based mechanisms rely on reciprocal exchange and trust in tight-knit social networks, and are well-suited to coping with relatively small-scale natural hazards that affect only a few community members at a time. Across the Pacific, there are strong traditions of informal social protection and sharing of resources within extended families and with the broader community, which play a critical role in coping with disasters. However, community-based mechanisms can be overwhelmed by large-scale, long-term, or frequent events.

All of the countries reviewed in this report have strong cultures of community-based support, traditional knowledge, traditional governance systems, and faith-based organizations that

contribute to disaster resilience. Many examples from all six countries show that traditions of reciprocal support in times of crisis are deeply embedded in local cultures. In some cases, mutual support obligations extend only as far as members of the same cultural or ethnic group, and can lead to conflicts arising with members of other groups. Churches are also extremely important in everyday life and in leading disaster resilience efforts in all of the countries reviewed. Governance institutions based on local traditions (such as tribal, clan, and village chiefs) provide leadership, coordination, and information during crisis, working alongside modern state governance systems but responding more quickly to local needs. Traditional knowledge, such as construction techniques and methods of preserving foods and preparing for hazards, also contribute to disaster resilience.

1. Exposure to natural hazards

1.1. Overview

Pacific Island countries are widely regarded as experiencing the highest risks in the world associated with natural hazards. Pacific Island countries are among the countries most severely affected by natural hazards in the world, both in terms of casualties per capita and economic damage (Day, Forster, Himmelsbach, Korte, Mucke, Radtke, Thielbörger, & Weller, 2019; ECHO [European Civil Protection and Humanitarian Aid Operations], 2019, p. 1; Lee, Zhang, & Nguyen, 2018, p. 3). Economic losses on an annualized basis due to natural disasters in the Pacific “far exceed those in almost all other countries in the world” (World Bank, 2016b, p. 15). Geography exposes Pacific Island countries to a wide variety of natural hazards, their populations are vulnerable due to remoteness and dispersion across a large area, and many Pacific Island countries have limited coping capacities (ADB, 2018a, p. 2; Day et al., 2019; Utz, 2017, p. 81). Across the region, weather-related events cause the majority of economic losses, with cyclones being the most serious hazard, while geological hazards (earthquakes, tsunamis, and volcanoes) are the major cause of human loss (Utz, 2017, p. 81). Different agencies, using different methodologies, provide different assessments of risk.

- **WorldRiskReport**¹ ranks countries on the basis of their exposure to earthquakes, cyclones, floods, droughts, and sea-level rise, and on their coping capacities. The ranking process uses 27 indicators and assigns countries scores ranging from 0 (least risk) to 100 (greatest risk) (Day et al., 2019, pp. 43–44, 56).

Natural hazards

Natural hazards are naturally occurring physical phenomena that have the potential to cause harm to people, damage to property or to the environment, or economic losses, depending on how they interact with the environmental, social, and economic context in which they occur (Bokwa, 2013, p. 711). Natural hazards cause damage or loss when a population is **exposed** to a hazard, is **vulnerable** or susceptible to it or lacks protection from it, and lacks **capacity to cope** with its effects (Bokwa, 2013, pp. 711–713; Cardona, Aalst, Birkmann, Fordham, McGregor, Perez, Pulwarty, Schipper, & Sinh, 2012, pp. 69–70). High vulnerability and exposure are mainly a result of development processes including environmental mismanagement, demographic change, unplanned urbanization, and inadequate livelihood options for the poor (Cardona et al., 2012, p. 70). Severe damage or loss resulting from the interaction of hazard, vulnerability, and coping capacity may be described as a disaster (Bokwa, 2013, pp. 712–713).

¹Developed by Ruhr University Bochum and Bündnis Entwicklung Hilft.

- **INFORM (Index for Risk Management)**² assesses the relative risk of countries experiencing humanitarian crisis, taking into account exposure to natural hazards (earthquakes, tsunamis, droughts, floods, cyclones, and epidemics), conflicts, vulnerability of the population, and coping capacity (IASC [Inter-Agency Standing Committee Reference Group on Risk, Early Warning and Preparedness], 2020).
- **ThinkHazard**³ provides an overview of natural hazards at national and local levels (GFDRR [Global Facility for Disaster Reduction and Recovery], 2020).
- **The Internal Displacement Monitoring Centre (IDMC)**⁴ models the risk of future population displacements (IDMC, 2019).

Agencies that record past disasters diverge on their assessments of the hazards that have caused the greatest damage and economic losses in Pacific Island countries.

- **DesInventar**⁵ and the Emergency Events Database, **EM-DAT**⁶, are the two main global datasets of disasters related to natural hazards. They use different inclusion criteria, data sources, and reporting practices, so they are not necessarily comparable. In particular, DesInventar includes significantly more events than EM-DAT, especially high-frequency, low-impact events; EM-DAT tends to show lower estimates of impacts and to lack estimates of damages in smaller countries; data collection practices in both datasets appear to vary from one country to another and may not always be comparable between countries; and both datasets appear to cover flooding inadequately (Edmonds & Noy, 2018, pp. 482–484).

Natural hazards are typically classified according to the way in which they are caused, for example (IFRC, n.d.):

- geophysical (earthquakes, landslides, tsunamis and volcanic activity)
- hydrological (avalanches and floods)
- climatological (extreme temperatures, drought and wildfires)
- meteorological (cyclones, storms, and wave surges)
- biological (disease epidemics and insect or animal plagues)

This report focuses the first four types of hazards, excluding biological hazards. The report focuses on the hazards most significant to each of the countries reviewed.

- The **Pacific Catastrophe Risk Assessment and Financing Initiative** (PCRAFI) has also compiled a database cataloguing more than 600 disasters across 15 countries in the region, presenting another perspective on the events that have affected each country; the database includes some events prior to 1900 (documentation does not identify the earliest event included) through approximately 2010 (PCRAFI, 2013a, pp. 53–57).

Climate change is expected to lead to fewer but more powerful cyclones across the Pacific by the end of this century. Cyclones bring damaging winds, heavy rain, flooding, and storm surge, and are significant natural hazards for all Pacific Island countries. Climate models produce varying projections of cyclone

²Developed by the Inter-Agency Standing Committee Reference Group on Risk, Early Warning and Preparedness and the European Commission.

³Developed by the Global Facility for Disaster Reduction and Recovery (GFDRR) managed by the World Bank.

⁴Part of the Norwegian Refugee Council, a humanitarian non-governmental organization

⁵Operated by the United Nations Office for Disaster Risk Reduction (UNDRR), drawing on data from partners around the world; data for the Pacific region are provided by the Secretariat of the Pacific Community (SPC)

⁶Operated by the Centre for Research on the Epidemiology of Disasters (CRED) at the Catholic University of Louvain

formation rates, suggesting that most Pacific island countries are likely to experience a decrease in cyclone formation rates by the end of the century. Global projections suggest that maximum wind speeds could increase by 2% to 11%, which would lead to higher damage, and that rainfall within 100 km of cyclone centers could increase by around 20%; there are no projections of changes in cyclone intensity for individual countries (ADB, 2018a, p. 5; Australian Bureau of Meteorology and CSIRO [Commonwealth Scientific and Industrial Research Organisation], 2014).

Global evidence shows that the economic damage cause by cyclones is long-lasting and

cumulative. A study of the long-term economic impacts of 6,712 tropical cyclones found that the impact on gross domestic product (GDP) caused by a cyclone lasts at least twenty years, and that countries repeatedly exposed to cyclones experience a cumulative and effectively permanent loss to GDP. More powerful storms cause more long-term damage: each additional metre per second (3.6 km/h) increase in average annual wind exposure lowers per capita economic output by 0.37% twenty years later, and an increase in a country's cyclone exposure by one standard deviation lowers GDP by 3.6 percentage points twenty years later (Hsiang & Jina, 2014).

1.2. Fiji

Fiji is ranked as the 12th most hazardous country in the world by WorldRiskIndex on the basis of high exposure to natural hazards and relatively low coping capacity (Day et al., 2019). INFORM ranks Fiji 103rd out of 191 countries on exposure to natural hazards alone, implying a roughly average level of exposure by global standards (IASC, 2020). The hazards that have affected Fiji most severely have been tropical cyclones and floods. An International Monetary Fund (IMF) study estimates that Fiji has a 70% chance of suffering a significant⁷ disaster related to natural hazards each year (Lee et al., 2018, p. 7), and

the Government of Fiji forecasts that cyclones and floods are likely to cause average annual losses equal to 5.8% of GDP (Government of Fiji, 2017b, pp. 50–55). PCRAFI estimates that within the next 50 years, Fiji has a 50% chance of experiencing a loss of more than 25% of GDP due to earthquakes or tropical cyclones, and a 10% chance of a loss exceeding 50% of GDP (PCRAFI, 2011a, pp. 1–2). Climate change is likely to exacerbate all weather-related hazards in Fiji, and flood severity has already found to be increasing (UNDRR, 2019, p. 11).

⁷This analysis was based on EM-DAT, which counts disasters involving 10 or more deaths, 100 or more people affected, the declaration of a state of emergency, or a call for international assistance.

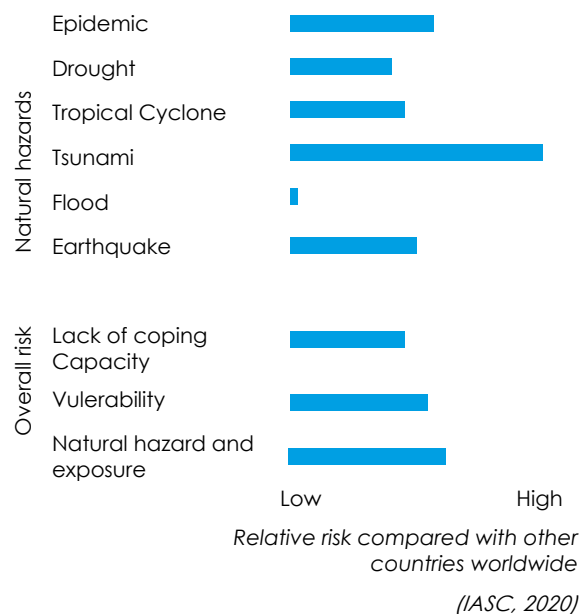
Fiji – Natural Hazards

WorldRiskReport

	Risk score	Risk quintile
Exposure	38.43	Very high
Vulnerability	46.41	Medium
Susceptibility	21.54	Medium
Lack of coping capacity	78.76	High
Lack of adaptive capacity	38.93	Medium

(Day et al., 2019)

INFORM



ThinkHazard

High risk	River flood Urban flood Coastal flood Earthquake	Landslide Tsunami Cyclone Wildfire
Medium risk	Extreme heat	
Medium risk	Extreme heat	
Very low risk	Water scarcity	

(GFDRR, 2020)

Internal Displacement Monitoring Centre

Average expected displacements per year			
Storm surge	3,614	Earthquake	75
Cyclonic wind	2,076	Tsunami	1

(IDMC, 2019)

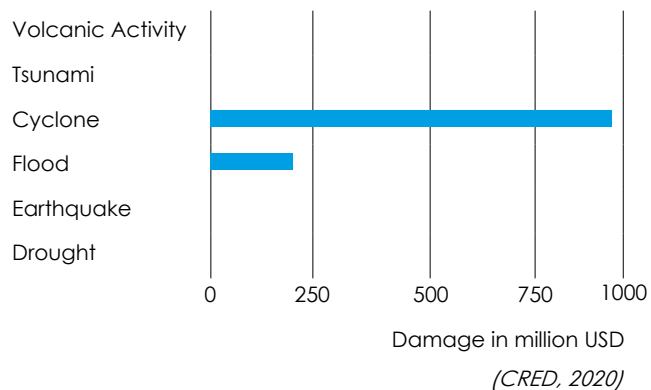
Government of Fiji

EM-DAT: Damage, 1990-2020

Average annual asset losses

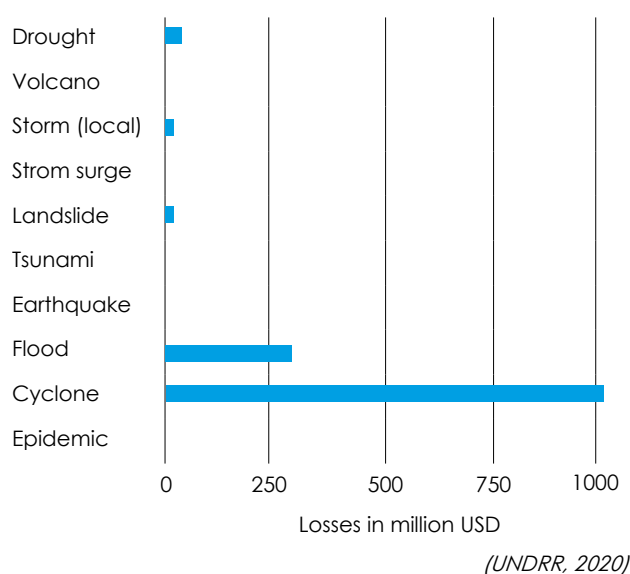
	FJD million	% GDP
Tropical cyclones	152	1.6%
Fluvial floods (rivers)	250	2.6%
Pluvial floods (surface water)	154	1.6%
Earthquakes and Tsunamis	5	<0.1%

(Government of Fiji, 2017b, pp. 50–55)



DesInventar: Losses, 1990-2020

PCRAFI: number of recorded disasters



Tropical cyclone	71
Flood	30
Earthquake	13
Severe local storm	10
Landslide	5
Storm surge	0
Tsunami	0

(PCRAFI, 2013a, p. 57)

Fiji experiences, on average, one cyclone per year, resulting in FJD 152 million in asset losses annually; losses from 100-year return period cyclones are estimated at around 11% of GDP, and the losses from Tropical Cyclone (TC) Winston are consistent with those from a 200-year event (Government of Fiji, 2017b, p. 50). The country has experienced two record-breaking tropical cyclones this decade: TC Evan, a category 4 storm⁸ in 2012, and TC Winston, a category 5 storm in 2016 which was the most intense storm ever recorded in the Southern Hemisphere (Schimel, 2020, p. 39). The death toll for both storms was low, with only two deaths recorded for Evan and 44 for Winston (CRED, 2020; Government of Fiji, 2016, p. 10) but the economic losses were heavy, amounting to 2.6% of GDP for Evan and approximately 20% of GDP for Winston (Schimel, 2020, pp. 39–40). The two storms had similar impacts at the sectoral level, with agriculture, forestry, commerce, hotels and restaurants accounting for 87% of total losses (WTO [World Trade Organization], 2019, p. 41). By 2050, extreme weather events may cause up to a 6.5% loss of Fiji's GDP annually (Schimel, 2020, p. 39).

Fiji is severely and regularly affected by floods that cause loss of life, damage to housing and infrastructure, and economic disruption.

Coastal floods are a result of a combination of mean sea level, astronomical tides, storm surges due to low pressure and wind action, and wind-driven waves (Government of Fiji, 2017b, p. 50). Inland, flooding can occur as a result of cyclones and other storms: fluvial floods occur when rivers burst their banks as a result of sustained or intense rainfall, and pluvial floods occur when heavy precipitation saturates drainage systems, particularly in flat and urban areas (Government of Fiji, 2017b, p. 51). Such floods are a regular occurrence during the

monsoon season (November to April), usually alongside cyclones and tropical storms which bring in high intensity rainfall (UNDRR, 2019b, p. 11). Much of the country's population lives on river floodplains subject to long-duration flooding and in smaller catchments prone to flash flooding (Government of Fiji, 2017b, p. 51). All major rivers that discharge to the ocean and delta areas can be affected by elevated sea levels during high tides or storm surges (Government of Fiji, 2017b, p. 51). Fiji has experienced, on average, more than one flood each year for the past 40 years. A significant fraction of these floods are high-frequency, low-intensity events that may not be recorded in disaster databases but are frequent enough to generate large cumulative losses (Government of Fiji, 2017b, p. 51). Average annual flood losses are estimated at more than FJD 400 million, or 4.2% of GDP (Government of Fiji, 2017b, p. 51).

Climate change is expected to increase both the frequency and intensity of extreme rainfall events by the end of the century. Rainfall events that occur once in 20 years may increase in magnitude by 5 to 7mm by 2030 and by 6 to 36mm by 2090, and what is currently a 20-year event may occur every 4 to 9 years by 2090, depending on CO₂ emission levels (Government of Fiji, 2017b, p. 51). Without adaptation measures, asset losses would increase correspondingly, reaching 5% of GDP annually by 2050. The increase in flood losses arises more from the increase in the frequency of smaller events than from the rarer large floods (Government of Fiji, 2017b, p. 54). Climate change models produce varying projections of cyclone formation rates, with a majority suggesting a likely decrease of 20% to 40% in cyclone formation by the end of the century (Australian Bureau of Meteorology and CSIRO, 2014, p. 106).

⁸Tropical cyclones are classified into categories numbered 1 through 5 based on maximum sustained wind speed, with category 5 being the most powerful.

Droughts in Fiji are infrequent, and usually short and seasonal, with an average duration of a few months or less (Government of Fiji, 2017b, p. 47,54). Almost all droughts are associated with the El Niño⁹ phenomenon, which have the potential to reduce annual rainfall by up to 50%, although not all El Niños lead to droughts (Government of Fiji, 2017b, p. 54; UNDRR, 2019b, p. 11). Droughts are infrequent – only six major droughts were recorded between 1970 and 2016 (Government of Fiji, 2017b, p. 47) – but when they occur they affect an average of 20% to 30% of Fiji's land area (Government of Fiji, 2017b, p. 54). Impacts of droughts include decreased agricultural production, mortality of livestock, shortages of drinking water, forest fires, and saline water intrusions as a result of reduced flows in rivers (Government of Fiji, 2017b, p. 54). In 1997-98, for example, one of the strongest El Niños on record led to widespread food and water shortages, school closures, a halving of the sugarcane harvest, and one of the worst recessions in Fiji's history (OCHA [United Nations Office for the Coordination of Humanitarian Affairs], 2015, p. 3). Another El Niño-induced drought in 2015 similarly led to about 13% of the population receiving emergency water deliveries and reduced harvests (OCHA, 2015). The impact of climate change on the risk of drought is unclear. Different climate models project different changes in precipitation patterns and there does not appear to be a consensus around the implications for drought in Fiji (Government of Fiji, 2017b, p. 54).

Fiji is exposed to earthquakes and tsunamis that affect all countries in the region and has two active volcanoes (PCRAFI, 2011a, p. 3; UNDRR, 2019b, pp. 6, 10). Fiji has experienced seven significant earthquakes¹⁰ since 1980, or

slightly less than two earthquakes per decade on average (National Geophysical Data Center / World Data Service (NGDC/WDS), 2020), although earthquakes and tsunamis have had limited impacts and the last major earthquake in a built-up area occurred in 1953 (PCRAFI, 2015a, p. 17). Studies have suggested a 20% to 40% chance of experiencing a significant earthquake at least once in the next fifty years (Government of Fiji, 2017b, pp. 47, 55; UNDRR, 2019b, p. 10). Overall, Fiji is expected to incur an average of FJD 5 million per year in losses due to earthquakes and tsunamis (Government of Fiji, 2017b, p. 55), making this a relatively small risk compared to other natural hazards. Climate change could potentially lead to increased tsunami risk, primarily through sea-level rise but also through damage to coral reefs; there is evidence that these coastal ecosystems can offer some protection against tsunamis, depending on local conditions (Dilmen, Titov, & Roe, 2015, p. 3570; Shao, Liu, Gao, & Ning, 2019, p. 85).

Steep slopes, unstable volcanic soil, heavy precipitation, and high winds contribute to a significant risk of landslides in Fiji (Drazba, Yan-Richards, & Wilkinson, 2018; UNDRR, 2019b, p. 6). There is a lack of data on landslide occurrences and impacts in Fiji but they are often triggered by rainfall and are believed to pose a substantial threat (Drazba et al., 2018, p. 1337; Government of Fiji, 2017b, p. 47). The frequency of landslides is likely to increase with climate change as a result of increased precipitation and more intense tropical cyclones but land use, deforestation, and slope management are also contributing factors (Government of Fiji, 2017b, p. 54).

⁹El Niño is a naturally occurring warming of the eastern tropical Pacific Ocean which is observed every two to seven years, leading to weakening of the prevailing trade winds, reduced ocean upwelling and altered ocean currents, and changes to wind, sea surface temperature and precipitation patterns; La Niña is its counterpart, during which the ocean surface waters cool (Australian Bureau of Meteorology and CSIRO, 2014, pp. 347–349).

¹⁰Defined as meeting at least one of the following criteria: caused deaths, caused moderate damage (approximately \$1 million or more), magnitude 7.5 or greater, Modified Mercalli Intensity X or greater, or the earthquake generated a tsunami (National Geophysical Data Center / World Data Service (NGDC/WDS), 2020).

1.3. Papua New Guinea

Papua New Guinea is ranked as the sixth most hazardous country in the world by the WorldRiskIndex on the basis of its high exposure to natural hazards and relatively low coping capacity (Day et al., 2019). INFORM ranks Papua New Guinea 15th out of 191 countries on exposure to natural hazards, similarly placing it among the most exposed countries in the world (IASC, 2020). Papua New Guinea is exposed to earthquakes, volcanic eruptions, and cyclones; the highlands are subject to heavy rains, floods, droughts, frost, and landslides, and coastal areas are extreme weather events, tsunamis, inundation, sea-level rise, and coastal erosion (CFE-DM [Center for Excellence in Disaster Management & Humanitarian Assistance], 2019, p. 28; GFDRR, 2016a, p. 1; UNDRR, 2019a, p. 9). An IMF study estimates that Papua New Guinea has a 81% chance of suffering a significant (based on EM-DAT data) disaster related to natural hazards each year (Lee et al., 2018, p. 7). PCRAFI estimates that cyclones, earthquakes, and tsunamis

cause average annual damage and losses equivalent to 0.9% of GDP, and that within the next 50 years, Papua New Guinea has a 50% chance of experiencing a loss due to cyclones, earthquakes, or tsunamis valued at more than 7% of GDP and a 10% chance of experiencing a loss exceeding 15% of GDP (PCRAFI, 2011b, pp. 1, 5). The country typically experiences two or three national level disasters per year as well as numerous smaller local incidents (CFE-DM, 2019, p. 28). The effects of climate change by the end of this century are expected to include continued El Niño and La Niña events, rising annual mean temperatures and maximum daily temperatures, increased average rainfall and more extreme rain events, reduced frequency of droughts, continued ocean acidification and increased coral bleaching, continued sea-level rise, and slightly decreased frequency of cyclone formation but increased maximum wind speeds (Australian Bureau of Meteorology and CSIRO, 2014, pp. 220, 231).

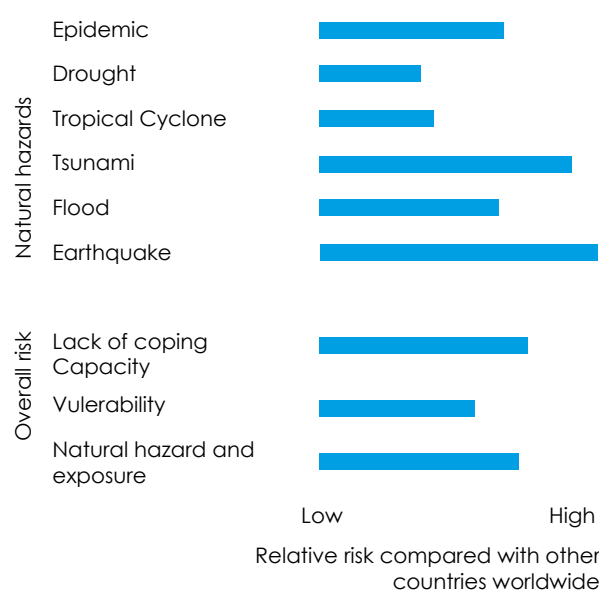
Papua New Guinea – Natural Hazards

WorldRiskReport

	Risk score	Risk quintile
Exposure	32.54	Very high
Vulnerability	68.18	Very high
Susceptibility	55.45	Very high
Lack of coping capacity	86.21	Very high
Lack of adaptive capacity	62.88	Very high

(Day et al., 2019)

INFORM



(IASC, 2020)

ThinkHazard

High risk	River flood Urban flood Coastal flood Earthquake Landslide	Tsunami Volcano Cyclone Wildfire
Medium risk	Extreme heat	
Very low risk	Water scarcity	

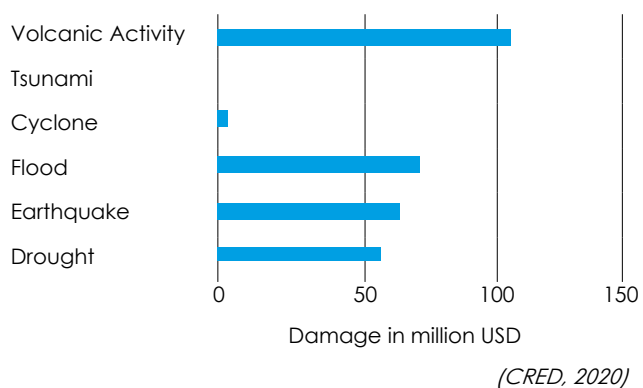
(GFDRR, 2020)

Internal Displacement Monitoring Centre

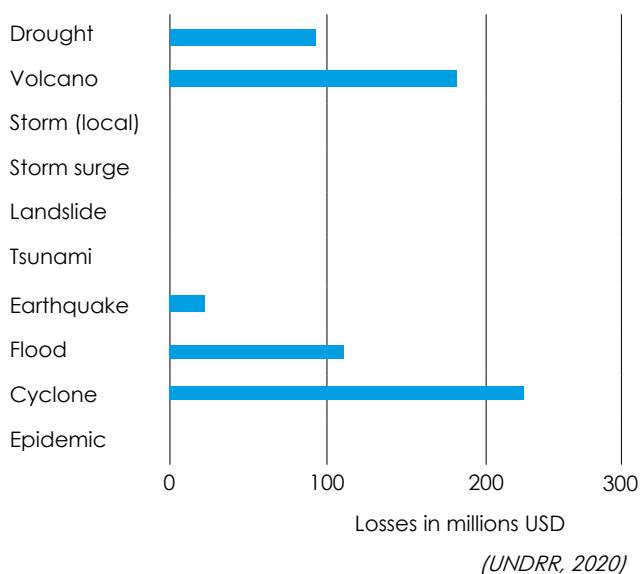
Average expected displacements per year	
Flood	23,774
Earthquake	6,769
Storm surge	233
Tsunami	159
Cyclonic wind	34

(IDMC, 2019)

EM-DAT: Damage, 1990-2020



DesInventar: Losses, 1990-2020

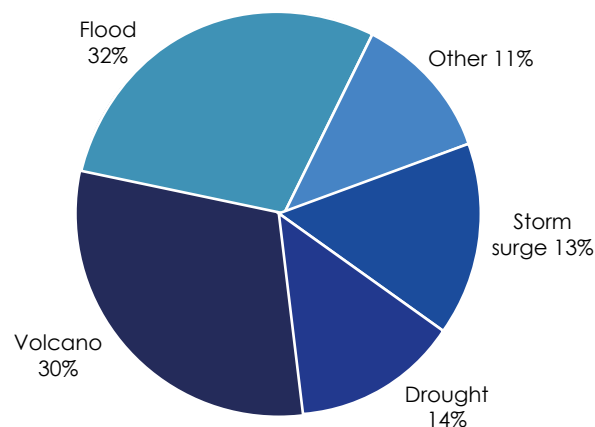


PCRAFI: number of recorded events

Earthquake	78
Flood	32
Landslide	17
Severe local storm	7
Tropical cyclone	6
Tsunami	3
Storm surge	2

(PCRAFI, 2013a, p. 57)

Center for Excellence in Disaster Management & Humanitarian Assistance: economic losses 1990-2014



(CFE-DM, 2019, p. 30)

Earthquakes occur frequently in Papua New Guinea and are among the most serious natural hazards facing the country. Papua New Guinea ranks in the top six countries worldwide for percentage of population exposed to earthquake hazards (GFDRR, 2016a, p. 1). The country has experienced 36 significant earthquakes since 1980, or about 0.9 per year on average; 16 of these were accompanied by tsunamis (National Geophysical Data Center / World Data Service (NGDC/WDS), 2020). Papua New Guinea has a 40% chance of experiencing a significant earthquake that could cause moderate to heavy damage to well-engineered buildings within the next 50 years (PCRAFI, 2011b, p. 3). On average, the country is expected to incur average annual losses amounting to 0.7% of GDP due to earthquakes and tsunamis (PCRAFI, 2011b, p. 5). For example, in 2018 a series of earthquakes with hundreds of aftershocks struck the Highlands, damaging approximately 54,000 homes, displacing approximately 26,000 people, and requiring humanitarian assistance

for more than 270,000 people (CFE-DM, 2019, p. 29; National Disaster Centre, 2018, pp. 1–4). In 1998, a tsunami struck the northern coast, killing 1,636 people and displacing 10,500; at the time, this was the worst tsunami-related disaster in the world since 1933, although subsequent tsunamis have caused even greater damage (Davies, Simeon, Hope, Petchey, & Davies, 2019, p. 1020).

Papua New Guinea has 16 active volcanoes, six of which are considered high risk, meaning that they have had explosive eruptions recently and are considered at risk of future explosions (CFE-DM, 2019, p. 28; IOM, 2017, p. 6). Papua New Guinea has “the highest percentage of population exposed to severe volcanic risk” in the world (GFDRR, 2016a, p. 1). In 2018, for example, the entire population of Kadovar Island (between 591 and 691 people, according to different reports) was evacuated to a nearby island when the Kadovar volcano became active, covering most of the island (estimates ranged between 50% and 80%) in ash and lava

(CFE-DM, 2019, p. 29; Ronkentuo, 2018). In 2004, about 9,000 people from Manam Island were resettled on the mainland after major volcanic eruptions (John Connell, 2012, p. 133), but many islanders have since returned, despite further eruptions which have forced smaller-scale evacuations of villages and affected food security, livelihoods and education (ACAPS, 2018; CFE-DM, 2019, p. 29).

Landslides are a significant additional hazard arising from Papua New Guinea's steeply sloping mountainous terrain combined with heavy rainfall and earthquakes (CFE-DM, 2019, p. 28; Robbins & Petterson, 2015). A project examining multiple sources of historical data documented 167 significant landslides occurring between 1970 and 2013, finding that rainfall was a triggering factor for 61% of landslides and earthquakes for 22% (Robbins & Petterson, 2015, pp. 4855, 4886–4887). Landslides typically result in highly localised impacts compared with other natural hazards and the impacts are often poorly documented (Robbins & Petterson, 2015, pp. 4873, 4877–4879). In one instance in 2016, a particularly massive landslide in the Southern Highlands linked to heavy rain and possibly to blasting at a nearby quarry completely covered two villages and killed at least 40 people (CFE-DM, 2019, p. 30).

Cyclones, bringing damaging winds, heavy rain, flooding, and storm surge, are significant natural hazards for Papua New Guinea. The country experiences an average of 1.5 cyclones per year, mainly between November and April (Australian Bureau of Meteorology and CSIRO, 2014, p. 226). The average annual loss caused by cyclones has been estimated at 0.2% of GDP (PCRAFI, 2011b, p. 5). For example, TC Ita in 2014 affected around 54,000 people, destroyed around 1,200 houses, damaged food supplies and agricultural production, contaminated water supplies, and damaged 67 classrooms (IOM, 2014; Naser, 2015, p. 44). In 2007, TC Guba brought heavy rains and high tides leading to extensive flooding; approximately 1,800 to 2,000 homes were destroyed and 9,500 people displaced (Naser, 2015, p. 44).

Climate change is expected to lead to fewer but more powerful cyclones by the end of this century. Different climate models produce varying projections of cyclone formation rates, suggesting a likely decrease of 15% to 35% in cyclone formation affecting Papua New Guinea by the end of the century. Global projections suggest that maximum wind speeds could increase by 2% to 11%, which would lead to exponentially higher damage, and that rainfall within 100km of cyclone centers could increase around 20%; there are no local projections of cyclone intensity specifically for Papua New Guinea (ADB, 2018a, p. 5; Australian Bureau of Meteorology and CSIRO, 2014, p. 231). Average annual losses due to cyclones are expected to increase by between 14% and 66%, according to various climate change projections, by the end of this century (Australian Aid 2013, cited in UNDRR, 2019a, p. 10).

River and coastal flooding in Papua New Guinea causes significant damage to buildings, infrastructure, and agriculture (CFE-DM, 2019, p. 28). Most of Papua New Guinea's land area is classified as high risk for coastal or river flooding, especially during strong El Niña events, and between 1990 and 2015, floods affected almost half a million people across the country (GFDRR, 2019 and CRED, 2019, cited in UNDRR, 2019a, p. 10). For example, heavy rains in 2016 led to flooding and landslides in two provinces that destroyed 200 homes, killed six people, and washed away crops that take nine months to mature, raising food security concerns (Muñoz, 2016). "More than half a million people living in thousands of coastal villages across the country are vulnerable to coastal erosion, king tides, cyclones and storm surges, all of which are likely to be exacerbated by climate change" (D. Clark, 2020, p. 13). The impacts of climate change are expected to include an increase in average annual rainfall of between 5% and 48% by 2090, as well as an increase in the frequency and intensity of extreme rainfall events (Australian Bureau of Meteorology and CSIRO,

2014, pp. 228–230). The main population and commercial centres of Port Moresby and Lae are also vulnerable to rising sea levels (D. Clark, 2020, p. 13), which are expected to increase by 7 to 17 cm by 2030 and 41cm to 87cm by 2090 (Australian Bureau of Meteorology and CSIRO, 2014, p. 234).

Papua New Guinea is vulnerable to drought, and to frost at high elevations, which have serious impacts on subsistence agriculture.

Droughts and frost are generally associated with the El Niño phenomenon, which affects precipitation patterns across the Pacific. Region-wide, high dependence on subsistence agriculture makes Pacific Islands vulnerable to the effects of El Niño, which include drought across the country as well as frost at high elevations (CFE-DM, 2019, p. 29; Thomalla & Boyland, 2017, p. 40). In Papua New Guinea, the

2015 El Niño caused drought, water shortages, and frost (at higher elevations), leading to crop failure, food shortages, and increased incidences of waterborne and respiratory diseases affecting about 40% of the population (Annamalai, Keener, Widlansky, & Hafner, 2015, pp. 4–5; CFE-DM, 2019, p. 29; Emilio, Warek, Poienou, Pomoso, Garalom, & Salimbi, 2015, pp. 1–12; Kuleshov et al., 2018, cited in UNDRR, 2019a, p. 9). The Ok Tedi gold and copper mine also closed due to the drying up of the nearby Fly River and lack of hydropower (Annamalai et al., 2015, pp. 4–6). Climate change is likely to lead to increased average rainfall by the end of the century, and the proportion of time spent in drought is expected to decrease in most locations under all scenarios (Australian Bureau of Meteorology and CSIRO, 2014, pp. 228–230).

1.4. Samoa

Samoa is ranked as the 94th most hazardous country in the world by WorldRiskIndex, placing it almost exactly on the median of the 180 countries ranked, on the basis of its exposure to natural hazards and coping capacity (Day et al., 2019). INFORM ranks Samoa 128th out of 191 countries on exposure to natural hazards, meaning that two-thirds of the countries in the world have higher exposure (IASC, 2020). Cyclones, bringing damaging winds, rainfall, flooding, swells, storm surge, and tornadoes, are the most significant natural hazard affecting the country. An IMF study estimates that Samoa has a 27% chance of suffering a significant (based on EM-DAT data) disaster related to natural hazards each year (Lee et al., 2018, p. 7). PCRAFI estimates that cyclones, earthquakes, and tsunamis cause average annual damage and losses equivalent to 1.7% of GDP, and that within the next 50 years, Samoa has a 50% chance of experiencing a loss due to cyclones, earthquakes, or tsunamis valued at more

than 23% of GDP and a 10% chance of a loss exceeding 62% of GDP (PCRAFI, 2011c, pp. 1, 5). The effects of climate change in Samoa by the end of this century are expected to include continued El Niño and La Niña events, rising annual mean temperatures and maximum daily temperatures, little change in mean annual rainfall but more extreme annual rainfall events, a slight decrease or no change in the incidence of drought, continued ocean acidification and increased coral bleaching, continued sea-level rise, and slightly decreased frequency of cyclone formation but increased maximum wind speeds (Australian Bureau of Meteorology and CSIRO, 2014, pp. 242, 252). In a survey of Samoans in 2011–2012, respondents cited drought, lack of drinking water, water pollution, high temperatures, and flooding by rainwater and seawater as being the environmental changes that affected their lives most (Beyerl, Mieg, & Weber, 2018, p. 33).

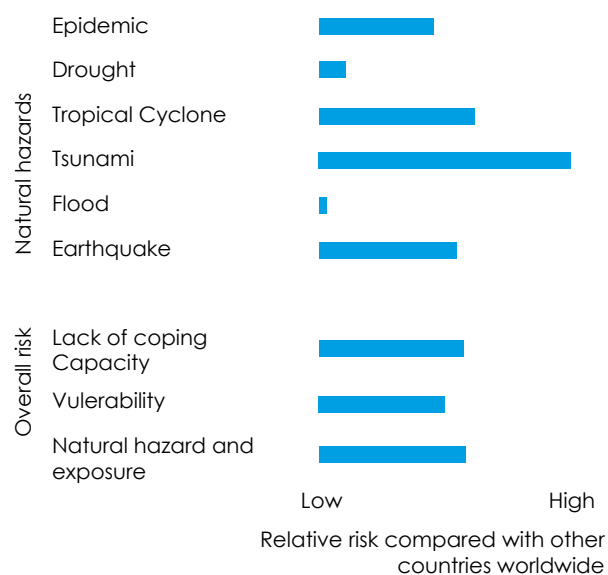
Samoa – Natural Hazards

WorldRiskReport

	Risk score	Risk quintile
Exposure	13.04	Medium
Vulnerability	47.50	Medium
Susceptibility	25.52	Medium
Lack of coping capacity	79.70	High
Lack of adaptive capacity	37.27	Medium

(Day et al., 2019)

INFORM



(IASC, 2020)

ThinkHazard

High risk	Tsunami	Cyclone
Medium risk	Coastal flood Earthquake	Extreme heat
Low risk	Landslide	Volcano
Very low risk	Wildfire	
No data	River flood Urban flood	Water scarcity

(GFDRR, 2020)

Internal Displacement Monitoring Centre

Average expected displacements per year	
Cyclone wind	1,193
Earthquake	17

(IDMC, 2019)

Ministry of Natural Resources and Environment, Samoa

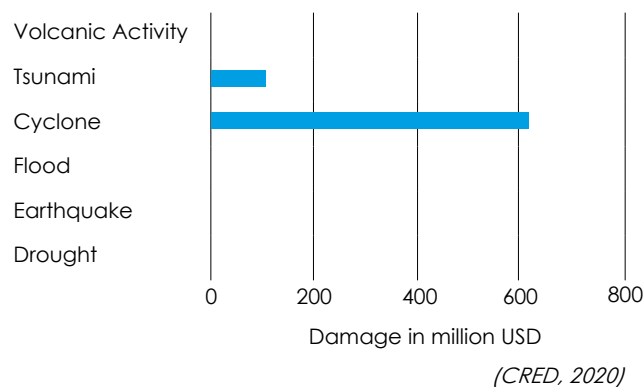
Extreme risk	Cyclone ¹ Tsunami	Volcano
High risk	Flood ² Landslide	Earthquake Forest fire
Low risk	Drought	

¹Includes high winds and storm surge causing coastal inundation

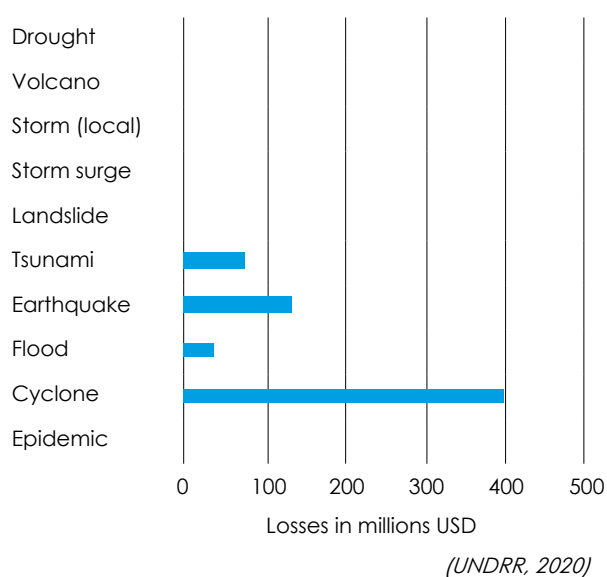
² Inland flooding due to heavy rain

(Ministry of Natural Resources and Environment, 2018, pp. 17-18)

EM-DAT: Damage, 1990-2020



DesInventar: Losses, 1990-2020



PCRAFI: number of recorded disasters

Tropical cyclone	12
Earthquake	9
Severe local storm	2
Flood	1
Storm surge	1
Tsunami	1
Landslide	0

(PCRAFI, 2013a, p. 57)

Cyclones, bringing damaging winds, rainfall, flooding, swells, storm surge, and tornadoes, are the most significant natural hazard for Samoa

(Government of Samoa, 2009, p. 1, 2013, p. 1). The country experiences an average of 0.6 cyclones per year, mainly between November and April (Australian Bureau of Meteorology and CSIRO, 2014, p. 247). The average annual loss caused by cyclones has been estimated as 1.2% of GDP (PCRAFI, 2011c, p. 5). In 2012, TC Evan brought heavy rainfall and high winds, and caused flash floods, inflicting damage and economic losses valued at approximately 29% of GDP (WST 465 million, USD 204 million) (Government of Samoa, 2013, pp. 5, 13). At least five people were killed and 4,763 displaced (Government of Samoa, 2013, p. 5). Climate models produce varying projections of cyclone formation rates, with half of the projections indicating decreases of 20% to 40% in cyclone formation affecting Samoa by the end of the century (Australian Bureau of Meteorology and CSIRO, 2014, p. 252).

Samoa is also at risk of earthquakes and tsunamis

(PCRAFI, 2011c, p. 3), which are rare but can be extremely damaging when they do occur. Samoa has experienced four significant earthquakes since 1980, or about one per decade on average (National Geophysical Data Center / World Data Service (NGDC/WDS), 2020). Samoa has a 40% chance of experiencing a significant earthquake that could cause light to moderate damage to well-engineered buildings within the next 50 years (PCRAFI, 2011c, p. 3). On average, the country is expected to incur average annual losses amounting to 0.5% of GDP due to earthquakes and tsunamis (PCRAFI, 2011c, p. 5). In 2009, an undersea earthquake triggered a tsunami that impacted 50 villages, causing damage and loss estimated at WST 310 million (USD 124 million; 22% of GDP), and killed 143 people; it took only 20 minutes for the tsunami wave to arrive following the earthquake, allowing very little time to give warning (Government of Samoa, 2009, pp. 2–3, 38).

1.5. Solomon Islands

Solomon Islands is ranked as the fourth riskiest country in the world by WorldRiskIndex on the basis of its high exposure to natural hazards and relatively low coping capacity (Day et al., 2019). INFORM ranks Solomon Islands 63rd out of 191 countries on exposure to natural hazards, meaning that two-thirds of the countries in the world have higher exposure (IASC, 2020). Tropical cyclones with accompanying heavy rain and floods, and earthquakes with accompanying tsunamis and landslides, are the principal hazards affecting Solomon Islands. Tropical cyclones with accompanying heavy rain and floods, and earthquakes with accompanying tsunamis and landslides, are the principal hazards affecting Solomon Islands. An

IMF study estimates that Solomon Islands has a 51% chance of suffering a significant (based on EM-DAT data) disaster related to natural hazards each year (Lee et al., 2018, p. 7). PCRAFI estimates that cyclones, earthquakes, and tsunamis cause average annual damage and losses equivalent to 3.0% of GDP and that within the next 50 years Solomon Islands has a 50% chance of experiencing a loss due to cyclones, earthquakes, or tsunamis valued at more than 35% of GDP and a 10% chance of a loss exceeding 78% of GDP (PCRAFI, 2011d, pp. 1, 5). Another analysis of annual losses due to natural hazards found that from 1980 to 2015, Solomon Islands suffered annual losses valued at 8.0% of GDP, the fifth highest estimated losses in the

world (Duggar et al., 2016, p. 1). A survey in five provinces found that 80% of the communities surveyed had been affected by some form of disaster within the last five years, 39% said they had received humanitarian assistance, and 41% reported waiting more than four weeks for food relief to arrive (Huber & Fischer, 2020, p. 33). The effects of climate change in Solomon Islands by the end of this century are expected to include continued El Niño and La Niña events, rising

annual mean temperatures and maximum daily temperatures, a slight increase in annual rainfall and reduction in the incidence of drought, increased extreme rainfall events, continued ocean acidification and increased coral bleaching, continued sea-level rise, and slightly decreased frequency of cyclone formation but increased maximum wind speeds (Australian Bureau of Meteorology and CSIRO, 2014, pp. 260, 272–273).

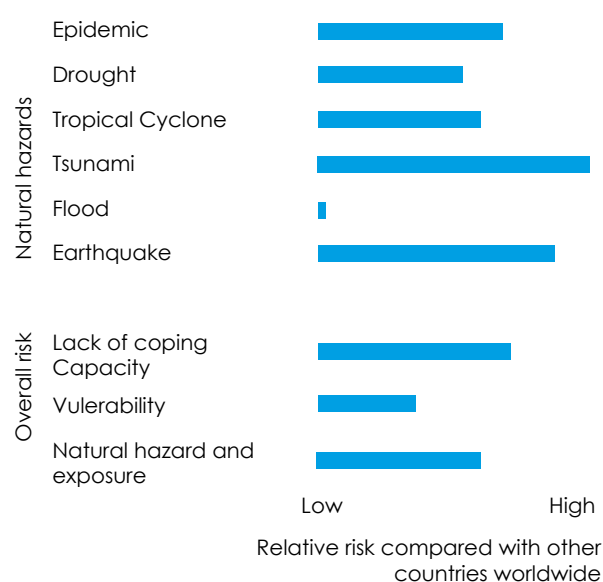
Solomon Islands – Natural Hazards

WorldRiskReport

	Risk score	Risk quintile
Exposure	48.31	Very high
Vulnerability	60.77	High
Susceptibility	46.37	Very high
Lack of coping capacity	80.95	High
Lack of adaptive capacity	55.00	Very high

(Day et al., 2019)

INFORM



(IASC, 2020)

ThinkHazard

High risk	Coastal flood Earthquake Landslide	Tsunami Volcano Cyclone
Medium risk	Urban flood Extreme heat	Wildfire
Medium risk	River flood	Water scarcity

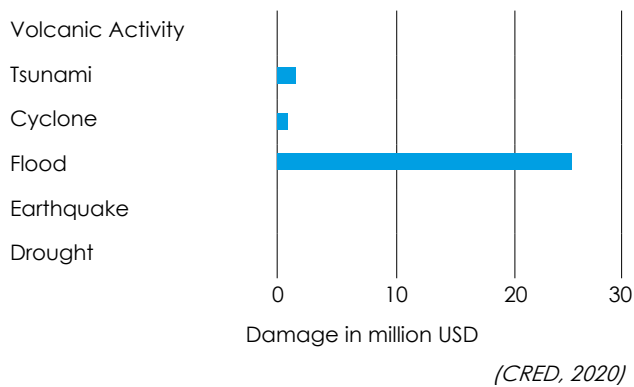
(GFDRL, 2020)

Internal Displacement Monitoring Centre

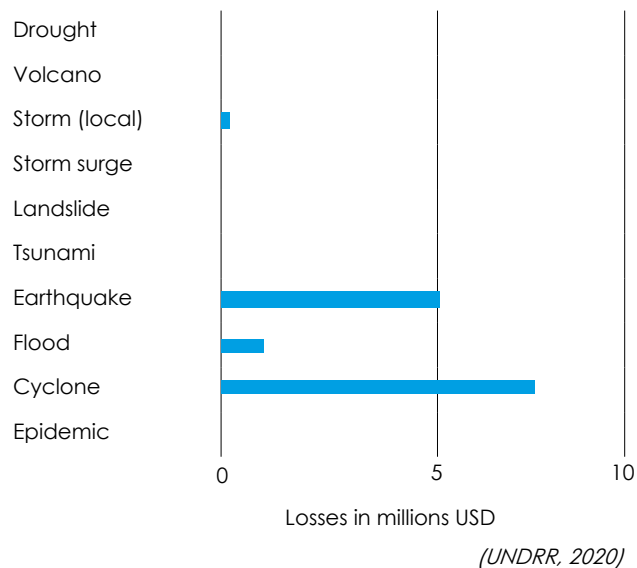
Average expected displacements per year	
Cyclonic wind	2,371
Storm surge	1,368
Earthquake	277
Tsunami	10

(IDMC, 2019)

■ EM-DAT: Damage, 1990-2020



■ DesInventar: Losses, 1990-2020



■ PCRAFI: number of recorded disasters

Earthquake	28
Tropical cyclone	25
Severe local storm	3
Flood	3
Landslide	1
Storm surge	1
Tsunami	0

(PCRAFI, 2013a, p. 57)

Solomon Islands experiences an average of 2.9 cyclones per year, mainly between November and April (Australian Bureau of Meteorology and CSIRO, 2014, p. 267). The average annual loss caused by cyclones has been estimated as equivalent to 0.9% of GDP (PCRAFI, 2013b, p. 1). Cyclones that affect the Solomon Islands are usually in the early stages of their life cycle and relatively small, but can still cause serious damage (Meteorological Services Division, n.d.). Major floods associated with cyclones or heavy rains have occurred about once every four years on average in the capital, Honiara, and the island of Guadalcanal (12 times in 48 years between 1966 and 2014) (Government of Solomon Islands, 2014, p. 2). For example, in 2014, a slow-moving storm that later developed into TC Ita caused at least 732mm of rain over four days, resulting in flash flooding in Honiara and Guadalcanal that killed 23 people, displaced 10,000 people, destroyed 675 houses and damaged 3,726, damaged or destroyed food gardens and sources of livelihoods, and caused total damage and economic loss estimated at SBD 787 million (USD 109 million, 9.2% of GDP) (Government of Solomon Islands, 2014, pp. 1, 27). In 2015, TC Raquel brought heavy rains across four provinces, with one location reporting as much as 282 millimetres of rainfall in a 24-hour period; one person died, more than 150 buildings were destroyed or damaged, and almost 40,000 food gardens were damaged (Aon Benfield, 2015, p. 8). Climate change models produce varying projections of cyclone formation rates, with a majority suggesting a likely decrease of 15% to 35% in cyclone formation affecting Tonga by the end of the century (Australian Bureau of Meteorology and CSIRO, 2014, p. 273).

Droughts have serious impacts on subsistence agriculture and on water supplies across Solomon Islands.

Droughts are generally associated with the El Niño phenomenon, which affects precipitation patterns across the Pacific, and high dependence on subsistence agriculture makes Pacific Island countries vulnerable to the effects of El Niño including drought (Thomalla & Boyland, 2017, p. 40). The drought that occurred during the 2015-2016 El Niño, for example, affected water supplies, food security, and livelihoods across the country, and led to schools and health centres closing due to lack of water (OCHA, 2015, pp. 1, 6; Solomon Islands Government, 2015, pp. 10–11). Climate change is likely to lead to the incidence of drought decreasing slightly by the end of the century. Annual average rainfall is projected to increase slightly, although there is a lack of consensus about the exact amount of change and the year-to-year variability is generally greater than the projected changes. The incidence of drought is projected to decrease slightly, although there is some uncertainty about rainfall projections and about potential changes in the El Niño phenomenon (Australian Bureau of Meteorology and CSIRO, 2014, pp. 260, 269–272).

Sea-level rise in Solomon Islands poses threats to low-lying islands and coastal areas.

Sea-level rise over the past 20 years has averaged 7-10 mm per year, which is more than three times the global average rate of 2.2mm per year (Nunn, 2013, cited in Filho, Ha'apio, Lutz, & Li, 2020, p. 180). A study in two provinces in 2014, for example, identified five reef islands that had been completely eroded away, six islands that had been reduced in area by more than 20%, and two sites where shoreline recession

had destroyed part or all of some villages and led to communities relocating inland (Albert, Leon, Grinham, Church, Gibbes, & Woodroffe, 2016). Rising sea levels also cause salt water to intrude into the water table on low-lying islands, affecting water supplies and agricultural land (Filho et al., 2020, p. 180).

Earthquakes occur frequently in Solomon Islands. The country has experienced 29 significant earthquakes since 1980, or about 0.7 per year on average (National Geophysical Data Center / World Data Service (NGDC/WDS), 2020). Solomon Islands has a 40% chance of experiencing a significant earthquake that could cause moderate to heavy damage to well-engineered buildings within the next 50 years (PCRAFI, 2011d, p. 3). On average,

the country is expected to incur average annual losses amounting to 2.2% of GDP due to earthquakes and tsunamis (PCRAFI, 2011d, p. 5). For example, in the Santa Cruz Islands in 2013, a magnitude 8.0 earthquake caused a tsunami that inundated areas up to 1km inland, killed 10 people and 15 injured, destroyed 588 houses and damaged 478, and damaged infrastructure and crops; aftershocks from the earthquake also caused landslides that buried food gardens (Government of Solomon Islands, 2013, p. 4). In 2016, an undersea earthquake of magnitude 8.0 caused ground shaking and a tsunami affecting three provinces, destroying 485 houses and damaging another 349, and damaging eleven schools and a health clinic (IFRC [International Federation of Red Cross and Red Crescent Societies], 2016a, p. 2, 2016b).

1.6. Tonga

Tonga is ranked as the third most hazardous country in the world by WorldRiskIndex on the basis of its high exposure to natural hazards and relatively low coping capacity (Day et al., 2019). INFORM ranks Tonga joint 50th (tied with Vanuatu) out of 191 countries on exposure to natural hazards, meaning that approximately one quarter of the countries of the world have higher exposure (IASC, 2020). An IMF study estimates that Tonga has a 30% chance of suffering a significant (based on EM-DAT data) disaster related to natural hazards each year (Lee et al., 2018, p. 7). Tropical cyclones are the principal hazard affecting Tonga, although the country is also exposed to earthquakes and tsunamis (PCRAFI, 2015, p. 15; WFP [World Food Programme], 2012, p. 24). PCRAFI estimates that cyclones, earthquakes, and tsunamis cause average annual damage and losses equivalent to 4.3% of GDP, and that within the next 50

years, Tonga has a 50% chance of experiencing a loss due to cyclones, earthquakes, or tsunamis valued at more than 49% of GDP and a 10% chance of a loss exceeding 120% of GDP (PCRAFI, 2011e, pp. 1, 5). The effects of climate change by the end of this century are expected to include fewer but more powerful cyclones, continuing El Niño and La Niña events, more extreme rainfall events, increased ocean acidification, increased coral bleaching, continued rising sea levels, and rising daily temperatures with greater extremes (Australian Bureau of Meteorology and CSIRO, 2014, p. 282; Government of Tonga, 2018a, p. 18). A survey of Tongans' perceptions of weather-related hazards indicated that cyclones, heavy rainfall, flooding with rainwater and seawater, soil erosion (particularly in coastal areas), lack of drinking water, and high temperatures were seen as significant impacts of climate change (Beyerl et al., 2018, p. 33).

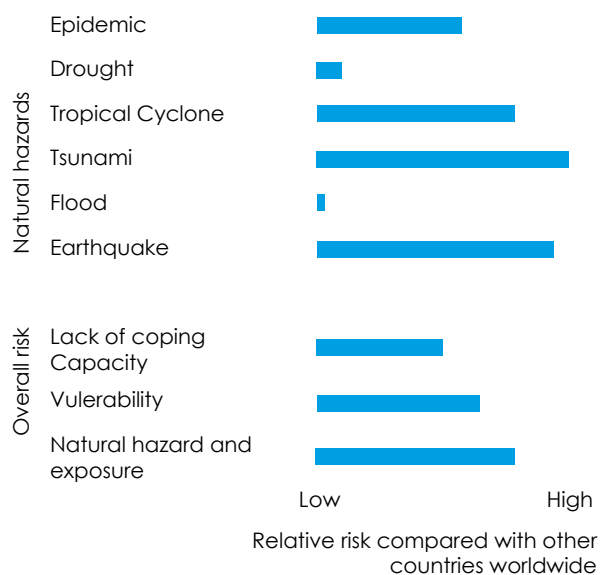
Tonga – Natural Hazards

WorldRiskReport

	Risk score	Risk quintile
Exposure	69.95	Very high
Vulnerability	47.86	Medium
Susceptibility	28.19	Medium
Lack of coping capacity	79.92	High
Lack of adaptive capacity	35.47	Medium

(Day et al., 2019)

INFORM



(IASC, 2020)

ThinkHazard

High risk	Earthquake	Tsunami
Medium risk	Coastal flood Landslide	Volcano Extreme heat
Low risk	n/a	Water scarcity
Very low risk	Wildfire	
No data	River flood* Urban flood	Cyclone Water scarcity

* There are no rivers in Tonga

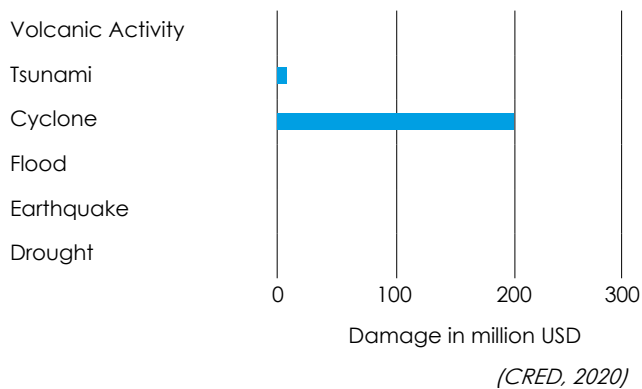
(GFDRR, 2020)

Internal Displacement Monitoring Centre

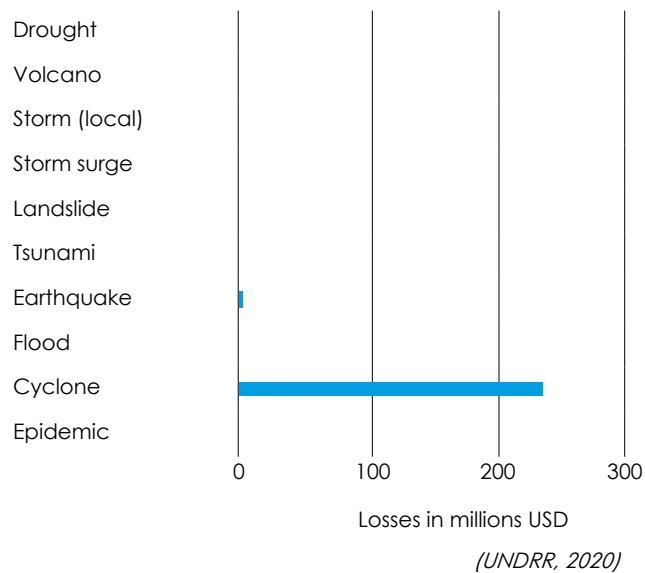
Average expected displacements per year	
Cyclonic wind	1,051
Earthquake	168
Tsunami	10

(IDMC, 2019)

■ EM-DAT: Damage, 1990-2020



■ DesInventar: Losses, 1990-2020



■ PCRAFI: number of recorded disasters

Tropical cyclone	33
Earthquake	8
Severe local storm	3
Flood	1
Landslide	0
Storm surge	0
Tsunami	0

(PCRAFI, 2013a, p. 57)

Cyclones, bringing damaging winds, heavy rain, and storm surges, are the most significant natural hazard for Tonga. Since 1960, Tonga has been hit by an average of 1.6 tropical cyclones per year (Government of Tonga, 2018a, p. 3; Kingdom of Tonga, 2019, p. 9). The average annual loss caused by cyclones is estimated as 2.7% of GDP (PCRAFI, 2011e, p. 5). Two major cyclones have hit Tonga in the past ten years: in 2014, TC Ian caused damage and loss equivalent to 11% of Tonga's GDP; and in 2018 TC Gita caused damage and loss worth between 30% and 38% of GDP and reduced GDP growth in 2018 from an anticipated 3.0% to only 0.3% (Ministry of Finance and National Planning, 2018, p. 11; World Bank, 2018c, p. 8, 2020e; WTO, 2019b, p. 1). The death toll for both storms was very low, with only one death attributed to Ian and none to Gita (CRED, 2020; UNDRR, 2020).

Most settlements in Tonga are in low-lying coastal areas vulnerable to flooding when heavy rain, storm surge, tides and sea swell combine (Kingdom of Tonga, 2019, pp. 97–99). Most of the urban area of the capital, Nuku'alofa, is less than two metres above sea level and is subject to periodic flooding during heavy rain (Kingdom of Tonga, 2019, p. 99). The most severe storm surge, caused by TC Isaac in 1982 in combination with a high spring tide, reached 1.6 metres, inundating 30% of the island of Tongatapu (WFP, 2012, p. 10).

Surface flooding can occur as a result of heavy rainfall, but does not usually pose high risks (WFP, 2012, p. 10). Flooding can cause damage to agriculture, buildings, and infrastructure, but Tonga's islands are small with no rivers, and soils are relatively free-draining, so surface water is not concentrated and dissipates within two or three days (WFP, 2012, p. 10). Most of Nuku'alofa is less than two metres above

sea-level and is subject to frequent flooding (Kingdom of Tonga, 2019, p. 184). A community survey carried out as part of an ADB project found that flooding in Nuku'alofa occurs every year, with approximately 10% of the properties in the city every time it rains, and about 50% flooded after heavy rains (Gildea & Carmine, 2018, p. 6; Kingdom of Tonga, 2019, p. 184).

Climate change is expected to lead to an increase in the frequency and intensity of extreme rainfall events, and a trend of more rainfall in the rainy season and less in the dry season (Kingdom of Tonga, 2019, p. 85). Rainfall events that currently occur once in 20 years are projected to occur three to four times per 20-year period by 2055 under the low carbon emissions scenario, and five times per 20-year period by 2090 under the high emissions scenario (Kingdom of Tonga, 2019, p. 87). Sea level is also expected to continue to rise by between 3cm and 17cm by 2030, and between 9cm and 31cm by 2055, which will increase the impact of storm surges and coastal flooding (Kingdom of Tonga, 2019, p. 87). Climate change models produce varying projections of cyclone formation rates, with a majority suggesting a likely decrease of 10% to 40% in cyclone formation affecting Tonga by the end of the century (Australian Bureau of Meteorology and CSIRO, 2014, p. 294).

Droughts in Tonga are infrequent, but can have serious impacts on agriculture, ecosystems, water resources, emergency management, and disease when they do occur (Kingdom of Tonga, 2019, p. 11; WFP, 2012, p. 18). Four major droughts occurred between 1983 and 2015 (Government of Tonga, 2018a, p. 9; WFP, 2012, p. 18). Droughts are generally associated with the El Niño phenomenon, during which areas of warmer ocean surface temperatures, which support cloud formation, shift eastwards

(WFP, 2012, p. 18). Past droughts have affected harvests of coconuts, fruits, and root crops that are traditional staples, adversely affecting food security, customary obligations, and the country's economy (Government of Tonga, 2018a, p. 9; WFP, 2012, p. 18). Droughts in 1998 and 2014, for example, reduced squash exports by 52% and 69%, respectively (Government of Tonga, 2018a, p. 10). Droughts also affect drinking water supplies, as most Tongans depend on collecting rain water; during the 1997-98 El Niño, for example, the government had to ship water to some islands in the Ha'apai group (WFP, 2012, p. 18). Climate projections for the end of the century indicate a likely increase in precipitation during the rainy season and a decrease in precipitation during the dry season, but "there is uncertainty around rainfall projections" and "drought projections are inconsistent" (Kingdom of Tonga, 2019, pp. 86–88).

Tonga is also at risk of earthquakes and tsunamis (PCRAFI, 2011e, p. 3). Such events are rare, but can be extremely damaging when they do occur. Tonga has experienced five significant earthquakes since 1980, or about one per decade on average (National Geophysical Data Center / World Data Service (NGDC/ WDS), 2020). A tsunami that struck the island of Niuatoputapu in 2009 killed nine people and destroyed 31% of all houses on the island, the water and sanitation system and most other public utilities, most government buildings including the island's hospital, and most boats, as well as damaging other houses and buildings (Kingdom of Tonga, 2009, p. 6). Tonga has a 40% chance of experiencing a significant earthquake that could cause heavy damage to well-engineered buildings within the next 50 years (PCRAFI, 2011e, p. 3). On average, the country is expected to incur damage amounting to 1.7% of GDP due to earthquakes and tsunamis (PCRAFI, 2011e, p. 5).

1.7. Vanuatu

Vanuatu is ranked as the most hazardous country in the world by WorldRiskIndex on the basis of its high exposure to natural hazards and relatively low coping capacity (Day et al., 2019). INFORM ranks Vanuatu joint 50th (tied with Tonga) out of 191 countries on exposure to natural hazards, meaning that approximately one quarter of the countries of the world have higher exposure (IASC, 2020). Tropical cyclones and earthquakes are the principal hazards affecting Vanuatu, although the country is also exposed to volcanoes, tsunamis, and droughts. An IMF study estimates that Vanuatu has a 57% chance of suffering a significant (based on EM-DAT data) disaster related to natural hazards each year (Lee et al., 2018, p. 7). PCRAFI estimates that cyclones, earthquakes,

and tsunamis cause average annual damage and losses equivalent to 6.6% of GDP, and that within the next 50 years, Vanuatu has a 50% chance of experiencing a loss due to cyclones, earthquakes, or tsunamis valued at more than 45% of GDP and a 10% chance of a loss exceeding 74% of GDP (PCRAFI, 2011f, pp. 1, 5). The effects of climate change in Vanuatu by the end of this century are expected to include continued El Niño and La Niña events, rising annual mean temperatures and maximum daily temperatures, continued ocean acidification and increased coral bleaching, continued sea-level rise, and slightly decreased frequency of cyclone formation but increased maximum wind speeds (Australian Bureau of Meteorology and CSIRO, 2014, pp. 320–339).

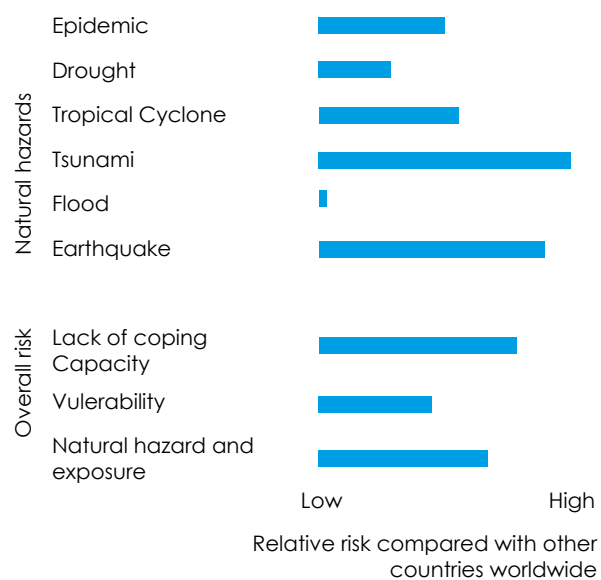
Vanuatu – Natural Hazards

WorldRiskReport

	Risk score	Risk quintile
Exposure	99.88	Very high
Vulnerability	56.78	High
Susceptibility	35.32	High
Lack of coping capacity	84.36	High
Lack of adaptive capacity	50.66	High

(Day et al., 2019)

INFORM



(IASC, 2020)

ThinkHazard

High risk	Urban flood Coastal flood Earthquake Landslide	Tsunami Volcano Cyclone
Medium risk	Extreme heat	
Very low risk	River flood Water scarcity	Wildfire

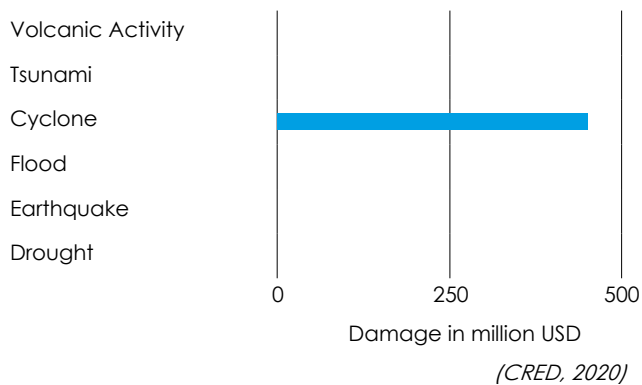
(GFDRR, 2020)

Internal Displacement Monitoring Centre

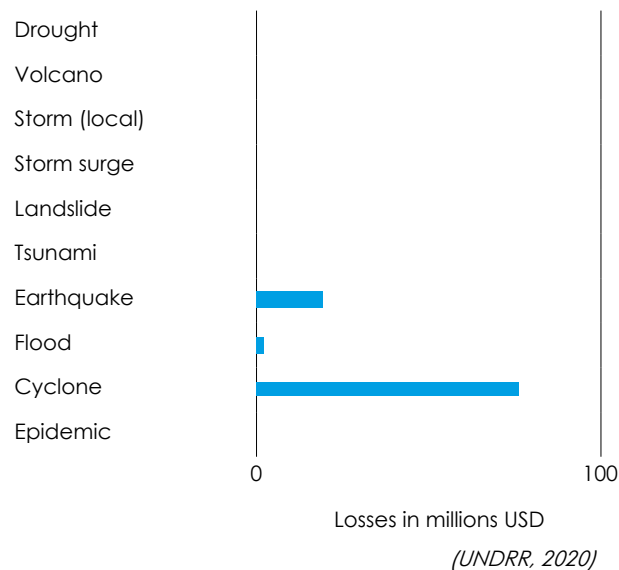
Average expected displacements per year	
Cyclonic wind	2,134
Storm surge	1,125
Earthquake	417
Tsunami	1

(IDMC, 2019)

EM-DAT: Damage, 1990-2020



DesInventar: Losses, 1990-2020



PCRAFI: number of recorded disasters

Tropical cyclone	50
Earthquake	26
Severe local storm	2
Flood	3
Landslide	1
Storm surge	0
Tsunami	0

(PCRAFI, 2013a, p. 57)

Cyclones, bringing damaging winds, heavy rain, flooding, and storm surge, are the most significant natural hazard for Vanuatu. The country experiences an average of 2 to 2.4 cyclones per year, mainly between November and April (Australian Bureau of Meteorology and CSIRO, 2014, p. 320; Handmer & Iveson, 2017, p. 60). Storm surges associated with cyclones, and flooding due to heavy rains, are common occurrences (Jackson, McNamara, & Witt, 2017, p. 365). Landslides are also occasionally triggered by precipitation from cyclones (Jackson et al., 2017, p. 365). The average annual loss caused by cyclones has been estimated as 5.0% of GDP (PCRAFI, 2011f, p. 5). Climate change models produce varying projections of cyclone formation rates, with a majority suggesting a likely decrease of 15% to 35% in cyclone formation affecting Vanuatu by the end of the century (Australian Bureau of Meteorology and CSIRO, 2014, p. 333).

In 2015, Tropical cyclone Pam, the most intense cyclone in the country's history, caused widespread damage and economic loss. The storm caused damage and loss estimated at 64% of GDP, temporarily displaced 65% of households in affected areas (mostly finding shelter with friends, family, or community shelters in their local areas), destroyed crops on a large scale leading to food security issues and reliance on emergency food aid, damaged and contaminated water supplies, damaged 81% of homes in affected areas, and "compromised the livelihoods of at least 80%

of Vanuatu's rural population" (Government of Vanuatu, 2015b, pp. ix, 3; Handmer & Nalau, 2019, p. 374; SPC [Secretariat of the Pacific Community], 2016, pp. 6, 11; WFP, 2016, pp. 5–6). Heavy rain and storm surge led to coastal and fluvial flooding, and damage to buildings and other infrastructure in some areas (Government of Vanuatu, 2015b, pp. 34, 56, 62; Rey, Le Dé, Leone, & Gilbert, 2017, pp. 263–266). Only 11 people were killed as a result of the cyclone, which is low considering the extensive damage to property that it inflicted; the low death toll is attributed both to government preparedness and to the resilience of the Ni-Vanuatu¹¹, who are experienced at dealing with cyclones (Dornan & Newton Cain, 2015, p. 24). A study on Efate island indicated that recovery from TC Pam at the local village level could take anywhere from five months to three years: some respondents reported that crops and fruit trees could take a year and a half to be re-established, and that rebuilding most houses took two to three years with some houses still not fully repaired up to four years after the cyclone, while other respondents reported that food supplies were fully available within one to two months, that communities had essentially recovered in four to five months, and that most houses were rebuilt within one year (Jennings, Manlutac, Gonzales, Kenni, Schweizer, & Giardina, 2020, p. 29). Estimates of the decrease in the country's GDP growth rate attributable to the cyclone vary from 2.0 to 2.8 percentage points (Lee et al., 2018, p. 22; WTO, 2019b, p. 1).

¹¹The people of Vanuatu.

Livelihood disruptions resulting from TC Pam

	Activity	Profitability	Post-cyclone status and issues	Anticipated time to recovery
Activities primarily undertaken by men	Fishing (tuna, marlin, reef fish)	High	Cannot be easily located	3 months
	Trapping lobster and coconut crabs	High	Cannot be located, may be gone	6 months
	Sandalwood farming	High	Some seedlings destroyed, but trees mainly intact	3 months
	Kava cultivation	High	Largely wiped out	4 years
	Copra cultivation	High	Largely wiped out	12 months
Activities primarily undertaken by women	Sales of Prepared Foods (local)	Low	Not possible in current conditions	6 months
	Weaving handicrafts	Medium	Pandanus all destroyed	12 months
	Sewing (for local sale)	Low	Sewing machine damaged and lost	Variable
Activities undertaken by men and women	Vegetable and fruit sales (to Vila and Tanna)	Medium	Mainly destroyed	6 months
	Tourist services	Medium	Interrupted due to damage and lack of transport	Variable
	Work in guesthouses and restaurants	Medium	Many damaged and closed	Variable
	Cultivation of other crops	Medium	Only root crops left in most locations	3–6 months

(Government of Vanuatu, 2015b, p. 97)

Droughts have serious impacts on subsistence agriculture and on water supplies, which in Vanuatu are heavily dependent on rainwater harvesting.

Droughts are generally associated with the El Niño phenomenon, which affects precipitation patterns across the Pacific. Region-wide, high dependence on subsistence agriculture makes Pacific Islands vulnerable to the effects of El Niño conditions including drought (Thomalla & Boyland, 2017, p. 40). In Vanuatu, the drought that occurred during the 2016 El Niño led to shortages of drinking water, hindered the regrowth of crops damaged by TC Pam the previous year, and required emergency food distribution targeting 90,000 people (Eriksson et al., 2017, p. 52; OCHA [United Nations Office for the Coordination of Humanitarian Affairs], 2015, p. 4). The impact of climate change on the risk of drought is uncertain: the incidence of drought may remain approximately unchanged under most carbon emissions scenarios, and may decrease slightly under conditions of high emissions, but these projections carry a low degree of confidence because there is a lack of consensus on projections of average rainfall and on potential changes in the El Niño phenomenon, which directly influences drought (Australian Bureau of Meteorology and CSIRO, 2014, pp. 331–332).

Vanuatu is also at risk of earthquakes and tsunamis (PCRAFI, 2011f, p. 3).

Vanuatu has experienced 24 significant earthquakes since 1980, or about 0.6 per year (National Geophysical Data Center / World Data Service (NGDC/WDS), 2020). The most recent non-volcanic earthquake, of magnitude 7.0, occurred in Malampa province in April 2016 and led to coastal uplift with associated coral death, loss of fishing grounds and reduced sea access for fishing but no significant damage to crops or property (Eriksson et al., 2017, p. 52).

Vanuatu has a 40% chance of experiencing a significant earthquake that could cause heavy damage to well-engineered buildings within the next 50 years (PCRAFI, 2011f, p. 3). On average, the country is expected to incur damage amounting to 1.5% of GDP due to earthquakes and tsunamis (PCRAFI, 2011f, p. 5).

Most of Vanuatu's islands are volcanic in origin, and there are six active volcanoes in the country which have triggered humanitarian relief efforts and large-scale evacuations several times in recent years.

Mount Yasur on Tanna Island (population approximately 29,000), for example, is an almost continuously active volcano that emits gases, smoke, ash, and frequent bursts of lava (Nimau, Ungaro, Crowley, Korisa, Garaebiti, & Cevuard, 2019, pp. 7, 11–12). Ash, in particular, routinely affects large areas of the island, with larger eruptions sometimes prompting significant humanitarian interventions. An eruption in 2013 damaged most of the vegetation across the Whitesands district and led to a humanitarian relief effort costing about VUV 47 million (approximately USD 493,000), mostly funded by the Vanuatu government with some assistance from China and New Zealand (Nimau et al., 2019, pp. 12–15), and another ash fall in 2016 affected 20,000 people and led to a humanitarian relief effort costing at least VUV 150 million (approximately USD 1.4 million) (PCRAFI, 2018, p. 1). More recently, eruptions of the volcano Manaro Voui on Ambae Island led to evacuating the entire population, approximately 11,000 people, to other islands in 2017 for a month, and then again in mid-2018 for approximately six months (IDMC, 2018, p. 31; IOM, 2019; PCRAFI, 2018, pp. 2–5; WTO, 2019b, p. 27).

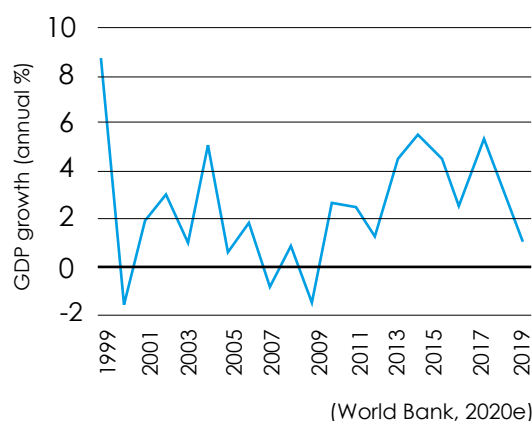
2. Vulnerability and Impacts

2.1. Economic Profile

Fiji

Fiji has a relatively large economy with a particularly strong tourism industry and significant agriculture and textile industries. Fiji ranks 98th out of 189 countries on the Human Development Index and falls within the 'high human development' category (UNDP [United Nations Development Programme], 2019, p. 301). Fiji's economy is the second-largest of the six countries reviewed in this report, after Papua New Guinea, but the largest in terms of GDP per capita (World Bank, 2020e). Its location enables it to serve as a regional hub for the rest of the Pacific (Government of Fiji, 2017b, p. 41; UNDRR, 2019b, p. 6). Tourism is responsible for about 34% of GDP and contributes more than any other sector to foreign exchange earnings, with remittances, sugar, and textiles also being important foreign exchange earners (Government of Fiji, 2016, 2017b; Reserve Bank of Fiji, 2016; World Bank, 2017c; World Travel &

Fiji GDP annual change



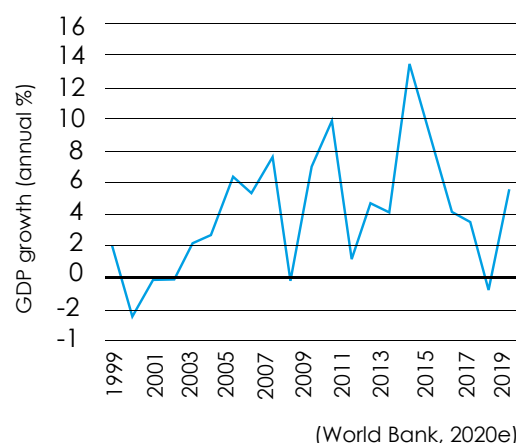
Tourism Council, 2020). Economic growth has been strong during the last decade, with credit growth, remittances, improved labour market conditions, infrastructure spending, and the strong tourism industry contributing to growth (Government of Fiji, 2016, p. 19), alongside the return to democratic elections and normalisation of international relations in 2014 (World Bank, 2017c, p. 7).

Papua New Guinea

Papua New Guinea's economy is dominated by mining, oil and gas, and subsistence agriculture.

Papua New Guinea ranks 155th out of 189 countries on the Human Development Index, falling within the 'low human development' category (UNDP, 2019, p. 302). The country's economy is dominated by the mining, oil and gas industries, which contribute 28% of GDP and the majority of export earnings but make only a small contribution to employment, and by agriculture, forestry, and fishing, which contribute 18.5% of GDP and employ about 82% to 85% of the population, mostly in subsistence-oriented and informal work (CFE-DM, 2019, pp. 15, 22; ILO [International Labour Organization], 2017a, p. viii; National Statistical Office, 2019, p. 12; World Bank, 2020d). The country's main exports are gold, copper, nickel, palm oil, cocoa, logs and liquefied natural gas (CFE-DM, 2019, p. 22). Papua New Guinea is unusual

Papua New Guinea GDP annual change



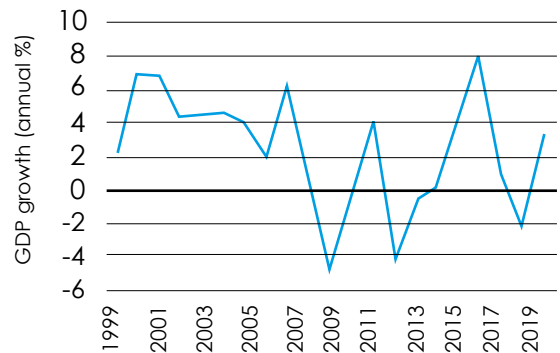
among Pacific island countries in having substantial mineral resources, which provide two-thirds of the country's export earnings, but the mining, oil, and gas industries tend to operate in enclaves and are highly capital-intensive, creating few jobs, and susceptible to automation (CFE-DM, 2019, p. 22; ILO, 2017a, p. viii).

Samoa

Samoa's relatively small economy is centered on tourism and subsistence agriculture.

Samoa ranks 111th out of 189 countries on the Human Development Index, falling within the 'high human development' category (UNDP, 2019, p. 302). The formal economy is driven primarily by tourism, agriculture, fisheries, and forestry products; its manufacturing sector mainly processes agricultural products and about 90% of the volume of exports are agricultural and fisheries products (John Connell, 2015, pp. 123–125). Tourism is the largest industry by share of GDP and by share of export earnings (see section 2.4). Subsistence agriculture is very widespread, with 97% of all households involved in some form of agricultural production, mostly in combination with other income-earning activities (Samoa Bureau of Statistics, 2016, p. 1). Exports have generally been in decline, with "overseas aid and remittances becoming more

■ Samoa GDP annual change



(World Bank, 2020e)

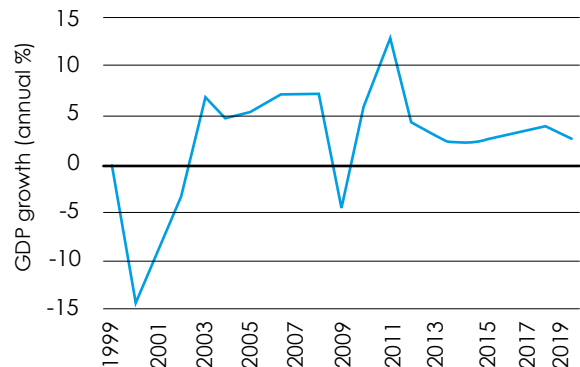
significant as mainstays of the economy" (John Connell, 2015, p. 125). The country is highly dependent on imports to meet basic needs, as domestic production is limited (Government of Samoa, 2013, p. 99). The economy is highly vulnerable to external shocks caused by international crises and natural hazards (Government of Samoa, 2013, p. 99).

Solomon Islands

In GDP terms, the economy of the Solomon Islands is composed of a large service sector with agriculture, fisheries, forestry making significant contributions, but subsistence agriculture is the main economic activity for the vast majority of Solomon Islanders.

Solomon Islands ranks 153rd out of 189 countries on the Human Development Index, falling within the 'medium human development' category (UNDP, 2019, p. 302). Economic growth is hampered by the country's small and dispersed population, remoteness and isolation from external markets, weak transportation infrastructure and high transportation costs, high levels of subsistence and poverty with low purchasing power, weak government capacity, and susceptibility to natural hazards (ADB, 2019a, p. 1; Huber & Fischer, 2020, pp. 10, 20; World Bank, 2017d, p. x). In GDP terms, the economy is dominated by a broad service sector that contributes 56% of GDP,

■ Solomon Islands GDP annual change



(World Bank, 2020e)

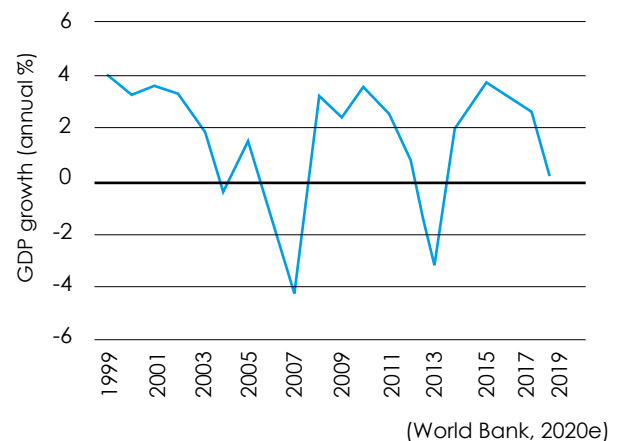
with agriculture and fisheries contributing 22%, forestry 13%, and other industries 11% (Central Bank of Solomon Islands, 2019). Agriculture, mostly on a subsistence basis, is the dominant economic activity for most Solomon Islanders, with 75% to 87% of the population engaged in subsistence farming (Government of Solomon Islands, 2013, p. 30; Huber & Fischer, 2020, p. 10).

Tonga

Tonga's relatively small economy is dominated by remittances from abroad and by subsistence agriculture, which underpins the livelihoods of most people.

Tonga ranks 105th out of 189 countries on the Human Development Index, falling within the 'high human development' category (UNDP, 2019, p. 301). Tonga's remoteness, small size, geographic dispersion, and limited natural resources push up the cost of economic activity, limit competitiveness in world markets, and limit the ability to develop economies of scale (Government of Tonga, 2018b, p. 18; WTO, 2019b, p. 18). Remittances (see section 3.3) were equal to 41% of GDP in 2018 (World Bank, 2020e). The vast majority of households (86%) engage in some form of agricultural production, which is almost entirely subsistence-oriented (Government of Tonga, 2018b, p. 42). Only 57% of the economically active population is in paid employment (Tonga Statistics Department, 2017a, pp. 10–14) and many employed people also still rely on small-scale agriculture for part of their livelihoods (MAFFF [Ministry of Agriculture, Food, Forests and Fisheries], 2015, p. 34). The services sector, including commerce, trade, tourism, public services, and finance, contributes approximately 60% of GDP¹² and 47% of employment; construction and manufacturing industries contribute 17% of GDP and 29% of employment; and agriculture, forestry, and fishing contribute 17% of GDP and 24% of employment (Government of Tonga, 2018b, p. 51; World Bank, 2020e). Tourism is a small but growing subsector, with estimates of its contribution to GDP ranging between 3.2% and 12.1% of GDP (Government of Tonga, 2018b, p. 61; World

Tonga GDP annual change



Travel & Tourism Council, 2020). Agriculture and tourism are both particularly vulnerable to natural hazards (PCRAFI, 2015d, p. 6).

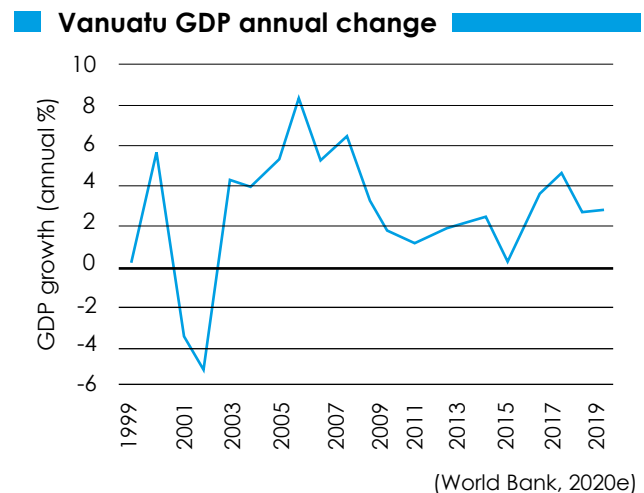
Tonga has high levels of informal employment and subsistence economic activity.

The labor force participation rate is 40%, but only 57% of this group works in paid employment, with 26% undertaking subsistence work, unpaid family work, or volunteer work, and 16% classified as unemployed (Tonga Statistics Department, 2017a, pp. 10–14). Tonga's 2015-16 Household Income and Expenditure Survey reports that 30% of adult Tongans consider their main economic activity to be related to formal employment; 51% undertake unpaid, home-based work, 14% are students, and 5% are elderly, disabled, or non-working for other reasons (Tonga Statistics Department, 2017b, pp. 182, 192). Most households undertake some form of agricultural production or home-based economic activity: 70% of households raise livestock, 63% grow crops, 39% produce handicrafts and home processed foods, and 13% participate in fisheries (Tonga Statistics Department, 2017b, p. xv).

¹² Data shown here for contribution to GDP and employment by sector are taken from the World Bank Open Data portal (<https://data.worldbank.org>), but the World Bank does not provide data for the contribution of services to GDP for Tonga, so the figure shown for services is taken from the Government of Tonga's Post-Disaster Rapid Assessment for Tropical Cyclone Gita (Government of Tonga, 2018b, p. 51). Because these figures draw on different sources, they do not add up to 100%.

Vanuatu

Vanuatu's relatively small economy is dominated by a large and growing tourism industry and subsistence agriculture. Vanuatu ranks 141st out of 189 countries on the Human Development Index, falling within the 'medium human development' category (UNDP, 2019, p. 302). Economic development is hampered by its geographical remoteness, widely dispersed islands, high costs of public service provision and of transportation and trade, and vulnerability to external economic shocks, notably those resulting from natural hazards (Government of Vanuatu, 2015b, p. 2; WTO, 2019b, p. 25). Its relatively small size means that domestic markets tend to be too small for industries to benefit from economies of scale (Government of Vanuatu, 2015b, p. 2). Economic activity is concentrated in the two most populous urban centres, Port Vila (the capital) and Luganville (Rust, 2019, p. 10). The formal economy is narrowly based, driven primarily by tourism, agriculture, international aid, and construction (Government of Vanuatu, 2015b, p. 2; Handmer



& Iveson, 2017, p. 61; PCRAFI, 2015e, p. 7; WTO, 2019b, p. 25). Tourism is the largest industry by share of GDP and by share of export earnings (see section 2.4), but agriculture, mostly carried out on a subsistence basis, is the dominant economic activity, with approximately 80% of the population relying to some degree on subsistence farming for livelihood and food security (VNSO [Vanuatu National Statistics Office], 2013, cited in Government of Vanuatu, 2015b, p. 16).

2.2. Agriculture and Fisheries

Fiji

Agriculture and fisheries are extremely important to Fiji, both as commercial and subsistence activities. Agriculture has declined in importance in relation to GDP as tourism and textiles have grown (Wehrhahn, Oza, Savage, Walsh, Veisamasama, & Pascual, 2019, p. 28), but it still provides 36% of all employment (World Bank, 2020e). Women make up about 37% of those employed in agriculture (Government of Fiji, 2016, p. 47). Sugarcane is the dominant cash crop, accounting for 18% of Fiji's exports and directly or indirectly supporting nearly one-quarter of the population; it is grown by almost 13,700 farmers on small farms averaging 2.8 hectares in size, mostly on western Viti Levu and northern Vanua Levu (Government of Fiji, 2016, p. 48; A. Singh, 2020, p. 66; Wehrhahn et al.,

2019, pp. 28–29). However, the sugar industry has been in decline for the past decade due to low productivity, labour shortages, high production costs, ageing and inefficient sugar mills, and the withdrawal of preferential price arrangements with the European Union (Government of Fiji, 2017b, p. 83; A. Singh, 2020, pp. 67–69). Subsistence livestock production is widespread, constituting a small percentage of total output but generating income for many rural households and contributing to food security and meeting customary obligations (Government of Fiji, 2016, p. 48). The fishery sector is comprised of offshore tuna fishing, which accounts for around 43% of the value of production, commercial coastal fisheries (30%), and subsistence commercial fisheries (23%)

(Government of Fiji, 2017b, p. 84). Half of all rural households are involved in coastal subsistence fishing (Government of Fiji, 2016, p. 48).

Cyclones and floods regularly cause extensive damage to crops, trees, livestock, equipment, and infrastructure (Government of Fiji, 2017b, p. 84; Wehrhahn et al., 2019, p. 30), and it is essentially infeasible to protect crops against these hazards (Gawith, Daigneault, & Brown, 2016, p. 2115). Flooding “can inundate crops, leading to failed harvests and the death of livestock, and it can also damage or destroy agricultural assets and infrastructure” (Government of Fiji, 2017b, p. 84). Many farms have expanded into areas that are prone to flooding or that have a high risk for landslides (UNDRR, 2019b, p. 14). Sugarcane is grown in coastal areas which are exposed to cyclones and storm surges (PCRAFI, 2015a, p. 8). In the fisheries sector, cyclones and storm surges cause damage to boats, equipment, and aquaculture infrastructure and stock, as well as causing ecosystem damage to coral reefs, mangroves, and other fish habitats. Flooding can also damage aquaculture ponds, cause siltation, and harm fish and seafood stocks (Government of Fiji, 2017b, p. 84).

The impact of natural hazards on agriculture is intensified for poor people. Almost half of those living below the national poverty line¹³ rely on agriculture for at least part of their income (Government of Fiji, 2017b, p. 23). Most farms in Fiji are small – in 2009, 44% of all farms had an area of less than 1 hectare (Department of Agriculture, 2009, p. 33) – and more than 80% of the country's farms are classified as subsistence farms (Ministry of Agriculture, 2018, cited in Wehrhahn et al., 2019, p. 30). Small-scale

farmers (both commercial and subsistence) are vulnerable to natural hazards because they cannot achieve economies of scale or build up financial buffers to absorb economic shocks, so losses inflicted by natural hazards have greater impact than they would for larger-scale farmers (Wehrhahn et al., 2019, p. 30). In the aftermath of extensive flooding in 2009, for example, almost 50% of the affected farming families with livelihoods tied to sugar farming¹⁴ were expected to fall below the poverty line and 40% were estimated not to be able to meet basic nutritional needs; these farmers had reduced coping capacities because they were likely to have had pre-existing debts and limited savings, and their incomes were already reduced due to global market conditions for sugar (Lal, 2011, cited in UNDRR, 2019b, p. 10).

Tropical cyclone Winston caused extensive damage, loss of production, and harm to livelihoods in the agriculture sector. Damage was valued at FJD 40.6 million, with additional future production losses estimated at FJD 241.2 million. Sugarcane accounted for 62% of the total damage and loss (Government of Fiji, 2016, p. 50). High winds, flooding and storm surges caused substantial damage to permanent plantations which will need to be replanted, as well as damage to mangrove forests and coral reefs (Government of Fiji, 2016, p. 11). TC Winston also caused extensive damage to food crops, which seriously affected household income, food security and nutrition. Many poor households lost their own food supplies following the cyclone, and market prices for vegetables and root crops increased significantly – by as much as double in the case of cassava, a local staple (Government of Fiji, 2016, p. 50).

¹³ Fiji's national poverty line, derived from the country's 2013-14 Household Income and Expenditure Survey, is set at household income of FJD 29.89 per day in 2013-14 (Government of Fiji, 2017b, p. 41), or approximately USD 16.24 per day in 2013. Fiji also defines poverty lines for adults at FJD 7.87 per day for urban areas and FJD 7.07 per day for rural areas (Fiji Bureau of Statistics, 2015, p. 2), or approximately USD 4.28 and USD 3.84 per day respectively. These income levels are higher than the World Bank's USD 1.90 per day international poverty line, and comparable with the World Bank's USD 3.20 and 5.50 per day poverty lines for lower- and upper-middle-income countries.

¹⁴ Most sugarcane farmers are small-scale growers with an average landholding of 2.8 hectares (Insurance Holdings (Pacific) Limited 2016, cited in Wehrhahn et al., 2019, p. 28), who allocate the majority of their land to sugarcane and use only a small proportion of their land to grow other cash and food crops and raise subsistence livestock (A. Singh, 2020).

In some cases, agricultural production will not return to pre-cyclone levels for five to ten years, depressing people's incomes and livelihoods significantly in the affected areas (Government of Fiji, 2016, pp. 12, 50–51). The cyclone was estimated to cause personal income losses of FJD 351.6 million, 85% of which was in the agriculture sector. Across all sectors, women lost about half as much income as men (FJD 119.6 million and 232.0 million respectively), but this understates the significance of the losses, since fewer women than men are employed and women's incomes are lower to begin with (Government of Fiji, 2016, p. 102).

In the fisheries sector, TC Winston had major impacts on artisanal fisheries and commercial aquaculture through extensive damage to fisheries assets and to coral reefs, mangroves, and other fish habitats (Government of Fiji, 2016, p. 47). Direct damage to the fisheries sector was estimated at FJD 40.7 million, with the value of lost production estimated at FJD 165.9 million; 72% of the losses are attributed

to subsistence fishing (Government of Fiji, 2016, pp. 47–50). It was expected that the aquaculture sector would recover in one or two years, but that subsistence and commercial fisheries could take 12 years to return to pre-cyclone production levels, provided that good resource management practices are followed and no other disasters occur in the meantime (Government of Fiji, 2016, p. 50). A study of mud crab fishers in Bua Province, for example, found that two to three months after the cyclone, 52% of the fishers had stopped harvesting crabs, largely because fallen trees and other debris blocked access to mangroves, or because of bad weather, being busy with village repairs or babysitting, damage to mud crab habitat, or the declaration of a tabu (a temporary no-take area) (A. S. Thomas, Mangubhai, Vandervord, Fox, & Nand, 2019, p. 702). The fishers reported reduced seafood consumption at home as well as loss of income, and those who continued fishing reported catching fewer and smaller crabs and harvesting less frequently (A. S. Thomas et al., 2019, pp. 703–704).

Papua New Guinea

The majority of Papua New Guinea's population is supported by rural livelihoods through subsistence and semi-subsistence agriculture (Gwatirisa, Pamphilon, & Mikhailovich, 2017, pp. 395–396). Agriculture, forestry and fishing contributed 18.5% of GDP in 2017 (National Statistical Office, 2019, p. 12), and about 82% to 85% of the population is engaged in subsistence agriculture (CFE-DM, 2019, pp. 15, 22). The agriculture sector is dominated by subsistence-oriented smallholders who also often grow cash crops for income (ILO, 2017a, p. 24, 2018, p. 2). Cash crops, which are mostly exported, include palm oil, tea, coffee, cocoa, vanilla, copra, and fisheries (CFE-DM, 2019, pp. 2, 22; ILO, 2017a, p. 24, 2018, p. 2). Some larger agricultural enterprises exist, but macroeconomic policies have contributed to the decline of large estates and formal agricultural employment and to smallholder farms becoming increasingly

important (Parker et al., 2012, cited in ILO, 2017a, p. 24). For example, 95% of the workers involved in coffee production are smallholder semi-commercial farmers (Hoffman, 2014, cited in ILO, 2017b, p. 139) and more than one million villagers in the highlands rely on coffee for their cash income (Morgan, 2013, cited in ILO, 2017a, p. 24).

Subsistence agriculture is particularly vulnerable to natural hazards. Smallholder farmers mostly operate in the informal economy without formal social protection systems and without business capacity, access to markets, or opportunities to diversify or increase their incomes, which makes them particularly vulnerable to the effects of natural hazards, including climate change (ILO, 2017b, p. 139). For example, Manam Island was largely self-sufficient in food production, but volcanic eruptions in 2018 caused damage to gardens and plantations in 9 out of 13 villages on the island, wiping out a season's harvest and

destroying fishing gear; there is no market on the island, and income-earning opportunities are limited so few islanders have money to purchase food (ACAPS, 2018, pp. 1–3). In another example, a study of four communities following the 2018 earthquake reported that staple crops such as sago and bananas, lost under landslides caused by the earthquake, may take years to recover to levels necessary to sustain the population (Roche, Diou, Malagian, Mupu'e, & Osake, 2018, pp. 4, 25).

The long-term impacts of climate change on agricultural yields in Papua New Guinea are uncertain and possibly mixed, but food security is likely to be threatened by population growth.

Estimating the impacts of climate change on crop yields and food security is complex, and forecasts vary significantly under different climate change scenarios, forecasting methods, and assumptions regarding adaptations. For example, studies estimate that yields of sweet potatoes could decrease from 2000 to 2050 by

50% to 59% (Boer and Rakhman, 2011, cited in ADB, 2013, p. 53), 1% to 11% (Rosegrant et al., 2013, cited in ADB, 2013, p. 54), or 11% (Rosegrant, Valmonte-Santos, Thomas, You, & Chiang, 2015, p. xxv). Yields of other crops have been forecast to decrease by 3.2% to 30.8% from 2000 to 2050 under worst-case climate change scenarios, or increase by 3.4% to 17.7% under best-case scenarios (Rosegrant et al., 2013, cited in ADB, 2013, p. 54). Another study suggests that most crops are likely to suffer decreased yields by 2050 except for rice, where yields could see a tiny increase (Rosegrant et al., 2015, p. xxvi). Population growth will mean, however, that food security challenges will increase from 2000 to 2050: the baseline “no climate change” scenario forecasts that 15.4% of the population will be at risk of hunger by 2050, but this is likely to increase to 19.1% due to the effects of climate change, meaning that the number of people at risk of hunger will double from 1.3 million in 2000 to 2.6 million in 2050 (Rosegrant et al., 2015, p. 80).

Samoa

Almost all households in Samoa engage in agricultural production, mostly for home consumption, and usually in addition to other income-generating economic activities.

Agriculture and fisheries contribute about 10.1% of GDP (about half from crops and livestock, and half from fisheries (Government of Samoa, 2013, p. 17; Samoa Bureau of Statistics, 2020a, p. 2). Most production is carried out by rural households consisting of extended family units practicing small-scale, labor-intensive mixed farming on customary land (Government of Samoa, 2013, p. 17). In 2015, 97% of all households in the country grew some crops or raised some livestock, 85% of households were considered “major crop households” cultivating more than 523 m² or 20 trees, and even in the capital city, Apia, more than 90%

of households were engaged in some form of agricultural activity (Samoa Bureau of Statistics, 2016, p. 1). Most major crop households (64%) grow crops primarily for subsistence purposes, with only 4% growing crops mainly for sale, and livestock are mainly kept for home consumption and for customary ceremonies (Samoa Bureau of Statistics, 2016, pp. 2, 22). Agricultural production provides the main source of income for only 22% of households, with most households relying on other paid employment for their main source of income (Samoa Bureau of Statistics, 2016, p. 35). Twenty-one percent of all households in the country engage in fishing, mostly (70%) for home consumption (Samoa Bureau of Statistics, 2016, pp. 53–54).

Natural hazards cause extensive damage, loss of production, and harm to livelihoods in the agriculture sector. For example, TC Evan in 2012 caused damage and economic losses in the agricultural sector estimated at WST 75 million (USD 33 million; 4.3% of GDP), or about 30% of agricultural sector GDP (Government of Samoa, 2013, pp. 17, 21). In the worst-affected areas, 80% of the banana crop, 40% of breadfruit trees, and 15% of cocoa trees and fruit trees were destroyed, coconut plantations sustained significant damage, and there was extensive damage to farm buildings, roads, and equipment (Government of Samoa, 2013, pp. 17, 19–20). About 27% of canoes and half of all other fishing gear owned by artisanal fishers were damaged (Government of Samoa, 2013, p. 20). Households involved in processing food crops reported losses due to the damage to crops and to equipment (Government of Samoa, 2013, p. 20). The Government's post-disaster needs assessment estimated that many households would take a year or more to return to pre-cyclone production levels, particularly in the case of lost tree crops, while livestock production was expected to recover in about five months and fisheries in about two months (Government of Samoa, 2013, pp.

20–21). A news report five months after the cyclone indicated that farmers had “bounced back fast” and that produce was beginning to reappear in markets, although production had not yet returned to pre-cyclone levels (Radio New Zealand International, 2013). The value of economic losses may understate the significance of the impacts on subsistence farmers, who were expected to suffer a significant decrease in quality of diet due to the decreased availability and increased price of fresh fruit and vegetables (Government of Samoa, 2013, p. 21).

Climate change is expected to adversely affect agriculture and fisheries in Samoa through increased frequency of extreme weather and sea-level rise. Across the Pacific region, most cash crops are vulnerable to extreme weather, and high winds from more intense tropical cyclones severely threaten crops such as bananas, breadfruit, and coconuts (Bell, M, Amos, & N, 2016, p. 17). Agriculture in Samoa is expected to be affected by more frequent extreme rainfall events, extreme winds, high air and water temperatures, and rising sea levels (Australian Bureau of Meteorology and CSIRO, 2014, pp. 242, 251–252; Government of Samoa, 2013, p. 18).

Solomon Islands

Subsistence agriculture is the dominant economic activity for most Solomon Islanders. Agriculture and fisheries accounted for 22% of GDP in 2018 (Central Bank of Solomon Islands, 2019), but provides livelihoods for the vast majority of the population: 75% to 87% of the population is engaged in subsistence farming and around 90% of households keep pigs and chickens (Government of Solomon Islands, 2013, p. 30, 2014, p. 20; Huber & Fischer, 2020, p. 10). A significant number of rural households also grow cash crops for export (coconut, oil palm, and cocoa) or for local sale (sweet potato, cassava, banana, taro, yam, beans, and cabbage) (Government of Solomon Islands, 2014, p. 20). About 60% of Solomon Islanders are involved in fishing for their own consumption, and about

half of these also sell fish (Government of Solomon Islands, 2014, p. 20).

Subsistence agriculture is highly vulnerable to natural hazards. Smallholder farmers mostly operate in the informal economy without formal social protection systems and without business capacity, access to markets, or opportunities to diversify or increase their incomes, which makes them particularly vulnerable to the effects of natural hazards, including climate change (ILO, 2017b, p. 139). Floods in 2014, for example, caused extensive damage to food gardens (affecting mostly kumara, cassava, taro, pana, and vegetables), export crops (cocoa, copra, palm oil), fruit trees (banana), farming equipment, and roads, which was valued at USD 18 million (1.5% of GDP) and which affected

the availability and price of fresh vegetables in Honiara and other parts of Guadalcanal (Government of Solomon Islands, 2014, pp. 22–24).

The long-term impacts of climate change on agricultural yields in Solomon Islands are uncertain and possibly mixed. Estimating the impacts of climate change on crop yields is complex, and forecasts vary significantly under different climate change scenarios, forecasting methods, and assumptions regarding adaptations. One study forecasts that between 2000 and 2050, yields of sweet potatoes could decrease by 12% to 14% (Boer and Rakhman, 2011, cited in ADB, 2013, p. 53), while another forecasts a range of outcomes

from a worst case of a 15.0% decrease to a best case of a 1.5% increase (Rosegrant et al., 2013, cited in ADB, 2013, p. 53). Yields of other crops are forecast to decrease by 7.6% to 27.8% over the same time period under worst-case scenarios, while best-case scenarios forecast outcomes ranging from decreases of up to 17.9% to increases of up to 10.8% for different crops (Rosegrant et al., 2013, cited in ADB, 2013, p. 53). Climate change and population growth are expected to lead to the proportion of the population at risk of increasing hunger by 2050, from 9.7% under the baseline “no climate change” scenario to 14.0% under the climate change scenario, meaning an increase in 51 million people at risk of hunger due to the effects of climate change (Rosegrant et al., 2015, p. 80).

Tonga

Agriculture is the dominant economic activity in Tonga, but it is largely subsistence or semi-subsistence¹⁵ in nature with limited commercial-scale activity (Government of Tonga, 2018b, p. 42; MAFFF, 2015). Agriculture makes up 17% of GDP, with crops and livestock constituting the majority (Kingdom of Tonga, 2018a, p. 23). Three quarters of Tonga's domestic exports are agricultural products, with fish and other seafood making up 42% of total exports, and root crops, kava, and pumpkins making up 34% (Government of Tonga, 2018b, p. 42). Agriculture is responsible for 24% of all employment (World Bank, 2020e). About 86% of households engage in some form of agricultural production (including handicraft production), but only 5% of these do so in a commercial capacity, with 95% being engaged in subsistence and semi-subsistence activities (Government of Tonga, 2018b, p. 42) consisting largely of traditional production of root crops (Kingdom of Tonga, 2018a, p. 23).

Agricultural work is often combined with other income-generating activities: 65% of adults in agriculturally active households work in the labor force in some other capacity (MAFFF, 2015, p. 34). Fisheries, mainly focused on reef fin fish and tuna and to a lesser extent on shellfish, lobster, and sea cucumber, contribute 2.9% of GDP (Government of Tonga, 2018b, p. 43). Fishing is mostly done on a subsistence or semi-subsistence basis: about 15% of all households in Tonga engage in fishing, with 54% of these fishing for subsistence, 42% fishing mainly for their own consumption and selling some of their harvest, and only 4% of households engaged in commercial fishing (MAFFF, 2015, pp. 53–66). Forestry (mostly growing trees for building purposes) contributes just 0.4% of GDP but contributes to the livelihoods of 14% of households (most of which engage in forestry only for their own use; only 2% of all households in the country engage in forestry mainly for commercial purposes) (Government of Tonga, 2018b, p. 43).

¹⁵Tonga defines subsistence as agricultural activity in which most of the produce is consumed within the farmer's household, leaving little or nothing to be marketed, or where the area farmed is less than one acre; semi-subsistence is agriculture activity in which some of the produce is consumed by the household and some is sold to the market, or where the area farmed is between 1 and 8 acres (MAFFF, 2015, p. 217).

Cyclones cause extensive damage, loss of production, and harm to livelihoods in the agriculture sector. Estimates of damage and economic losses in the agricultural sector caused by TC Gita in 2018 range from TOP 97.5 million to 129.3 million (9.9% to 13.1% of GDP) (Kingdom of Tonga, 2018a, p. 17; WTO, 2019b, p. 14), which accounts for 82% of the total losses caused by the cyclone (Kingdom of Tonga, 2018a, p. 17). Crops were particularly vulnerable, suffering 88% of total agricultural damage and loss, while the forestry sector, livestock, and fisheries sectors suffered 7%, 3%, and 2%, respectively, of agricultural sector damage and losses (Kingdom of Tonga, 2018a, p. 23). Approximately 30% to 40% of coconut trees, 70% to 80% of fruit trees, 90% of banana trees, and 40% to 50% of root crops were damaged or destroyed (IFRC [International Federation of Red Cross and Red Crescent Societies], 2018, p. 4). Crop exports, notably root crops, plantain and coconuts, dropped by 37% (WTO, 2019b, p. 14). Similarly, TC Ian in 2014 caused TOP 97.5 million (12.1% of GDP) in damage and production losses in the agricultural sector, severely affecting local food supply and cash crops on Ha'apai island for six to ten months (WTO, 2019b, p. 14). Subsistence and commercial fisheries are also affected by cyclones, primarily through damage to boats and equipment. TC Gita in 2018 damaged fish fences¹⁶ used by subsistence fishers and approximately 40% of all fishing boats on the affected islands of Tongatapu and'Eua (IFRC, 2018b, p. 4). TC Ian was reported to have damaged virtually all fishing gear on Ha'apai island (WTO, 2019b, p. 14). As three quarters of Tonga's population live in rural areas where agriculture and fisheries are the main sources of livelihoods, cyclones severely affect the poorest and most vulnerable as well as impacting cash crop exports (Government of Tonga, 2018b, pp. 24, 41; WTO, 2019b, p. 14).

Climate change is expected to adversely affect agriculture and fisheries in Tonga through increased frequency of extreme weather events, sea-level rise, and disruption of aquatic ecosystems. Climate change is expected to lead to increased variability of weather, which makes farming less predictable, and to increased frequency and intensity of extreme weather events, which cause significant damage to crops (Government of Tonga, 2018a, p. 8). Soil erosion, associated with the clearing of land for agriculture but exacerbated by extreme weather events such as cyclones, high winds, storm surges, and intense rainfall, is a concern across 21% of Tonga's agricultural land and runoff can also harm aquatic environments (Government of Tonga, 2018a, pp. 8–11). Sea-level rise is already causing loss of agricultural land in low-lying coastal areas through erosion and inundation, and is increasing the salinity of groundwater and reducing availability of water for irrigation; under current climate change projections, 8% of the agricultural land of the country could be affected (Government of Tonga, 2018a, p. 9; Kingdom of Tonga, 2019, p. 90). Rising sea temperatures cause coral bleaching and increased algae blooms which adversely affect coastal fisheries (Government of Tonga, 2018a, p. 10). Damaged coral reefs also offer less protection to coastlines from storm-driven waves (Government of Tonga, 2018a, p. 11). Climate change adversely affects deep water fisheries by disrupting food chains fed by cold water plankton upwelling (Government of Tonga, 2018a, p. 11).

¹⁶ Fences, typically made of nets supported on wooden poles harvested from mangroves, that capture fish by funnelling them into a holding area as tides recede.

Vanuatu

Subsistence agriculture is the principal economic activity and source of livelihoods in Vanuatu. Although agriculture contributes less to GDP than the service sector, agriculture remains the principal economic activity and source of livelihood for the vast majority of ni-Vanuatu (Mackenzie-Reur & Galgal, 2018, p. 9). Agriculture makes up 25% of GDP and mostly consists of crop production (79% of the agriculture sector) with livestock (14%), forestry (5%), and fisheries (3%) making small contributions (Government of Vanuatu, 2015b, p. 16). Vanuatu's agriculture sector is dominated by semi-subsistence farmers using mostly household labor; approximately 80% of Vanuatu's population relies on agriculture (mainly crops, livestock, and fisheries) for livelihoods and for food and nutrition security, and at least 71% of the rural population derives some income from agricultural activities (VNSO, 2013, cited in Government of Vanuatu, 2015b, p. 16). In 2016, 42% of all households in Vanuatu grew coconuts as cash crops, 32% grew kava, 16% grew cocoa, and 4% grew coffee (Vanuatu National Statistics Office, 2017, p. 217). Kava production nationally has increased significantly in recent years – kava was the country's third largest export commodity in 2014 but made up 53% of all exports by the end of 2019 (Vanuatu Department of Agriculture and Rural Development, 2016, p. 11; Vanuatu National Statistics Office, 2020, p. 2) – so kava's contribution to household incomes is likely to have increased. The extent to which kava may have replaced other crops is uncertain. Nearly all households in coastal villages (32% of all households in Vanuatu) are involved in coastal fishing, mostly at a subsistence level, with about 6% of all households engaged in fishing for sale (Government of Vanuatu, 2015b, p. 17).

Cyclones cause extensive damage, loss of production, and harm to livelihoods in the agriculture sector. The total damage and economic losses in the agricultural sector caused by TC Pam were estimated at VUV 6.1 billion (approximately USD 56 million; 8.0% of GDP) (Government of Vanuatu, 2015b, pp. 16, 127), but the financial value of the crops lost does not fully represent the livelihood and food security impacts on rural households. Crops suffered 69% of the total agricultural damage and loss, followed by forestry (16%), livestock (9%), and fisheries (6%) (Government of Vanuatu, 2015b, p. 16). Most of the crop losses (58%) were in kava, a major export crop, which is fragile and vulnerable to strong winds (Government of Vanuatu, 2015b, p. 18). Approximately half of all agricultural households in the affected areas lost all or part of their crops, including crops such as kava, copra, and cocoa that will take up to a year to re-establish (potentially three to four years for kava) (Government of Vanuatu, 2015b, pp. 19, 90, 97). Across the affected areas, 85% of households were engaged in subsistence farming, and slightly more than half of these households had no other sources of income (REACH, 2015, pp. 34–35). Following the cyclone, food security was a significant problem: food prices rose dramatically in rural areas, availability of fruit and vegetables was very restricted, people in affected areas were rationing food, and about 200,000 people received emergency food aid from the government, NGOs, and the World Food Programme (Hollema, Miller, & Chong, 2015, pp. 10–16; Wentworth, 2020, pp. 78–81; WFP, 2016, pp. 5–6). Within one month of the cyclone, 85% of households had replanted their subsistence gardens, but even the fastest-growing crops needed at least three months to

reach maturity (REACH, 2015, p. 35). Fishing was badly affected for several weeks following the cyclone, but served as an alternative source of food and livelihood for many households whose crops had been damaged or destroyed, and fishing had mostly returned to normal by the time of an assessment a year and a half later, apart from the loss of some fishing areas (Eriksson et al., 2017, pp. 52–53).

Climate change is expected to adversely affect agriculture and fisheries through increased frequency of extreme weather, sea-level rise, and disruption of aquatic ecosystems.

Across the Pacific region, most cash crops are vulnerable to extreme weather, and high winds from more intense tropical cyclones severely

threaten crops such as bananas, breadfruit, and coconuts (Bell et al., 2016, p. 17). In Vanuatu, projected consequences of climate change on agriculture include reduced availability of fresh water, changes in growing seasons, increases in pests and diseases, sea-level rise, saltwater inundation and intrusion into coastal land and groundwater, ocean acidification and coral reef deterioration, reduced fisheries productivity, loss of coastal land, damage to infrastructure and equipment, and compromised food security (Government of Vanuatu, 2015a, pp. 6–7). It is possible that cacao production could be enhanced by rising temperatures (Bell et al., 2016, p. 17).

2.3. Commerce and Industry

Fiji

Fiji has a diversified economy with significant commerce and manufacturing sectors. The commerce subsector contributed 9.4% of total GDP in 2014 and includes vehicle trade, supermarkets, textile and clothes traders, hardware traders, book traders, fuel and oil traders, and other wholesale and retail product sales (Government of Fiji, 2016, p. 53). The manufacturing subsector in Fiji contributed 11.0% of total GDP in 2014 and includes food and beverage manufacturing, cigarettes, apparel, footwear, paper products, plastic and rubber products, furniture, basic metals, coachworks, concrete products, and timber and wood products (Government of Fiji, 2016, pp. 53–54). In both commerce and manufacturing, the labour force is two-thirds male and one-third female; in commerce, 55% of the women employed are in the retail sub-sector, and in manufacturing, 56% of the women employed are in the textile, clothing, and footwear industries (Government of Fiji, 2016, pp. 53–54).

The impacts of Tropical cyclone Winston on larger-scale commerce and manufacturing in Fiji have been fairly limited and short-term, although industries that depend on raw materials from agriculture, such as sugar and pearls, experienced larger and longer-term losses as a consequence of lost agricultural production that cannot be quickly recovered. TC Winston caused damage to premises, equipment, raw materials, and finished products in commerce and manufacturing industries, and caused disruption of production and sales as a result of the damage, workers' absences, interruptions to electricity supplies, and problems with road access (Government of Fiji, 2016, p. 55). Damage has been estimated at a value of FJD 72.9 million, with economic losses estimated at FJD 69.9 million (Government of Fiji, 2016, p. 53). For larger businesses, disruptions were fairly minor: in the wholesale and retail-commerce sector, sales were interrupted for an average of just four days, with some temporary lay-offs, and many larger retail outlets and the

majority of wholesalers had insurance coverage (Government of Fiji, 2016, pp. 54–56). Job losses in the formal sector were also minimal and recovered quickly: the government's post-disaster needs assessment reported only 554 job losses, which were reinstated once the electricity supply was fully restored (Government of Fiji, 2016, p. 55).

Micro-, small- and medium-sized enterprises (MSMEs) suffered damage to equipment and supplies as well as production losses as a result of Tropical cyclone Winston, particularly as a result of lost agricultural production (Government of Fiji, 2016, p. 55).

Most micro-enterprises in the affected areas rely on agricultural production, and consist of activities such as food processing, handicrafts

and weaving (Government of Fiji, 2016, p. 102). Many MSMEs are based in people's homes, which are often poorly constructed and vulnerable to damage (see section 0). Informal sector small and medium-sized manufacturing reported FJD 3.4 million in damage and FJD 11.2 million in losses, which is relatively small compared with other sectors, but 43% of all micro and small enterprises were affected (Government of Fiji, 2016, pp. 55–56) and since MSMEs have few assets and low turnovers, the effects of these losses are likely to be much more impactful than the dollar amounts suggest. Recovery for MSMEs and cooperatives is inhibited by limited access to loans, especially for women, who have greater difficulty accessing financial services than men (Government of Fiji, 2016, p. 56).

Papua New Guinea

In monetary terms, Papua New Guinea's economy is dominated by the mining, oil, and gas industries, which contributed 28% of GDP in 2017 (National Statistical Office, 2019, p. 12).

Mining has been the leading economic sector in Papua New Guinea since the country's independence in 1975, and extraction of oil and gas has been important since the 1990s, but the major mines and oil and gas projects operate in enclaves and are highly capital-intensive, offering limited employment but attracting skilled workers away from other industries (ILO, 2017a, p. 27). There are also about 60,000 artisanal miners working informally in the country (ILO, 2017a, p. 27), and although data on artisanal mining are scarce due to the informal nature of the activity, lack of oversight, and unknown levels of illegal gold sales, the amount of gold produced by artisanal miners has been estimated at between 3.7 and 5.4 tonnes per year and "it is clear that artisanal Au [gold] mining is important for local economies and communities, supporting semi and subsistence lifestyles" (Mudd, Roche, Northey, Jowitt, & Gamato, 2020, p. 5). The manufacturing sector is small, consisting of food and food canning,

soft drinks, beer, tobacco processing, furniture making, small-scale engineering and metal processing, clothing and other light industries (ILO, 2018, p. 2). In some coastal and island communities, artisans work produce ornamental handicrafts from seashells; for example, a survey conducted in the Tigak Islands in New Ireland province identified 38 artisans in a population of 3,000 people, 82% of whom were women, and found that sale of these handicrafts accounted for an average of 69% of artisans' household incomes (Simard, Militz, Kinch, & Southgate, 2019, pp. 374–378). These handicrafts are traded on a very localized basis, within 5 km of where they are produced, and 71% of sales are to locals, rather than tourists (Simard et al., 2019, pp. 377, 381).

Papua New Guinea's non-agricultural industries are susceptible to external economic shocks and natural hazards. GDP growth has fluctuated greatly due to shocks including drought, earthquakes, and international commodity price swings (WTO, 2019a, p. 178). During the 2015 drought, for example, the Ok Tedi gold and copper mine closed due

to the drying up of the Fly River and lack of hydropower (Annamalai et al., 2015, pp. 4–6). After the 2018 earthquake, ExxonMobil's PNG LNG¹⁷ liquefied natural gas plant, which supplies about 3% of global production, was closed for about two months due to damage to buildings

and an airport runway (A. Clark & Williams, 2018; ExxonMobil, 2019, p. 2). UNDRR warns that the fossil fuel industries bear secondary risks of oil and gas spills or fires that could result from damage by natural hazards (UNDRR, 2019a).

Samoa

Samoa's economy is service-sector oriented, with very little domestic manufacturing, and mostly consists of very small enterprises and informal work. The service sector (including tourism) makes up 74% of GDP, and includes commerce (30%), financial services (9%), public administration (9%), communications (7%) and other sub-sectors; the construction industry contributes 8% of GDP and manufacturing contributes 6%, the majority of which consists of food and beverage products (Samoa Bureau of Statistics, 2020a, p. 2). Constraints to economic development include a small population that makes it difficult to achieve economies of scale, a narrow natural resource base, limited infrastructure in rural areas, geographical remoteness from international markets leading to high transportation costs and high costs of imported goods, and a heavy dependence on fuel imports (ADB, 2018b, p. 170; Amosa & Samson, 2012, p. 7). Firms generally employ only a few people and are often family-owned (ADB, 2018b, p. 170). The informal economy makes up 68% of the total labor force (ILO, 2017a, pp. 4–5; Pita & Schoop, 2015, p. 6) but its production in terms of GDP is difficult to measure; for example, home-based workers and food vendors, who are mostly women, are two of the largest groups within the informal sector but “much of the income that women earn in this sector remains unaccounted for in official statistics” (Tava'a, 2015, pp. 55, 63).

Natural hazards have caused significant damage and economic losses to industry and commerce, but little evidence is available about impacts on the informal economy. TC Evan caused damage and economic losses to commerce and industry estimated at WST 39 million (USD 17 million; 2.3% of GDP), and job losses in the formal sector were expected to be limited (the post-disaster needs assessment forecast the loss of only 31 job losses in manufacturing and 226 in commerce), but impacts on the informal sector were not measured (Government of Samoa, 2013, p. 28). The 2009 tsunami caused damage and economic losses estimated at WST 2.220 million and affected about one-third of the businesses in the affected area, mostly MSMEs operated by an average of two employees or by family workers (Government of Samoa, 2009, pp. 31–32). Some retail stores reopened within three weeks, but the average recovery period was estimated at slightly more than nine weeks (Government of Samoa, 2009, p. 32). No data were available on the proportion of small businesses with insurance coverage, and funds for refinancing businesses were expected to come from remittances from relatives working overseas and from refinancing existing loans (Government of Samoa, 2009, p. 33).

¹⁷The name of the project alludes to Papua New Guinea Liquefied Natural Gas, but it is officially known simply as PNG LNG.

Solomon Islands

The economy of Solomon Islands is largely based on services, agriculture, and forestry.

Estimates for 2018 show the service sector contributing 56% of GDP, agriculture and fisheries 22%, forestry 13%, and other industries 11%; within the service sector, the largest contributors to GDP are wholesale and retail trade (8%), real estate and renting (8%), transport and storage (7%), and public administration and defense (7%) (Central Bank of Solomon Islands, 2019). Manufacturing primarily involves processing coconut and other vegetable oils and cocoa, and traditional handicrafts, including woodwork, shell inlay, mats, baskets, and shell jewelry are made for the tourist market and for export (Filho et al., 2020, p. 179). The forestry industry, which consists solely of extracting whole logs as there is no domestic timber processing industry, makes a substantial contribution to GDP but employs only around 5,000 unskilled and low-wage workers and is expected to decline due to unsustainable harvesting practices (ADB, 2019a, p. 1; ILO, 2017a, pp. 25–26). The mining industry is currently small, but is seen as a potential driver of economic growth although unlikely to create many direct jobs (World Bank, 2017d, p. xvii). The national strategy for supporting MSMEs seeks to support growth by improving the legal and institutional framework, promoting a culture of entrepreneurship, enhancing business development services and access to finance,

facilitating access to markets, promoting innovation and technology capacity; it does not, however, make any direct reference to disaster resilience or natural hazards (Ministry of Commerce Industry Labour and Immigration, 2016, p. 9).

Climate change and natural hazards are barriers to economic development

(Filho et al., 2020, p. 179). For example, in 2014 flooding in Honiara and Guadalcanal associated with TC Ita was expected to reduce GDP by as much as 5.1%, with the largest impacts (including indirect impacts on businesses supporting mine operations) coming from the closure of the Gold Ridge mine due to flood damage; the mine only reopened five years later, in October 2019 (Government of Solomon Islands, 2014, p. 10; Solomon Times, 2019). A survey of small shops and market vendors across four provinces found that disruptions to supply chains, lack of availability of goods, and lack of purchasing power were the main barriers to quick recovery, and that speed of recovery was linked to distance from the capital city: on the main island of Guadalcanal, 48% of shops and vendors were able to re-open within a week of the last disaster that they had experienced, but re-opening took longer in more remote provinces, with 33% of respondents in Makira and 39% in Western Province saying that it took them four weeks or longer to re-open (Huber & Fischer, 2020, p. 30).

Tonga

Tonga's commerce and manufacturing sectors are small and often home-based.

Tonga is hampered by geographical remoteness, high transportation costs, low diversification and connectivity, a narrow production base, and limited economies of scale (WTO, 2019b, p. 7). Manufacturing contributes about 6% of GDP and is declining in importance while imports increase; the main activities are food packing, processing and beverage production (WTO, 2019b, p. 9). Construction and infrastructure

projects, often funded by donor grants and soft loans, have also been significant drivers of economic growth in recent years, accounting for 9.5% of GDP in 2016–17 (Ministry of Finance and National Planning, 2018, p. 17; WTO, 2019b, p. 9). Thirty-nine percent of households are involved in producing handicrafts or home-processed foods, mostly for their own consumption, with 31% of these households selling some proportion of their production (Tonga Statistics Department, 2017b, pp. 187–188). Handicraft work relies on local natural

resources such as pandanus tree leaves, and is vulnerable to natural hazards and climate change (Government of Tonga, 2018a, p. 7). Exports of handicrafts in 2014-15 accounted for approximately TOP 4 million (0.5% of GDP) (Government of Tonga, 2018b, p. 42).

Tropical cyclone Gita caused widespread damage and loss to Tongan businesses and demonstrated the vulnerability of MSMEs.

Damage and economic losses to commerce and industry are estimated at TOP 55.3 million (5.6% of GDP) (Kingdom of Tonga, 2018a, p. 17). Most businesses (78%) in affected areas reported some extent of damage to their

properties or assets (Government of Tonga, 2018b, p. 51). Businesses reported that it could take between two weeks and six months to recover to pre-cyclone performance levels and overcome challenges including disruption of public utilities, slow consumer demand, and difficulty obtaining goods, raw materials, and other inputs (Government of Tonga, 2018b, p. 51). Most businesses are MSMEs and although approximately 30% of all businesses have some insurance coverage, it is not clear what proportion of the smallest businesses have coverage or whether insurance covers cyclone risk (see section 3.4) (Government of Tonga, 2018b, p. 51).

Vanuatu

Vanuatu's economy, apart from agriculture and tourism, is largely based on trade, with very little domestic manufacturing. As of 2013, commerce and industry contributed 36% of GDP, mostly in the form of retail trade (12% of GDP), finance and insurance (7%), and real estate (7%) (Government of Vanuatu, 2015b, p. 23). Manufacturing makes up only 3% of GDP (Government of Vanuatu, 2015b, p. 23). Small-scale production of handicrafts for the tourist market is an important source of livelihoods for independent producers, wholesalers, and market sellers, but the government is making efforts to encourage more local production as it has been estimated that up to 90% of souvenirs sold in Vanuatu are manufactured overseas and imported into the country to be sold to tourists (Vanuatu Department of Industry, 2017, p. 13).

Tropical cyclone Pam caused widespread damage to buildings and inputs to production.

Damage and economic losses to commerce and industry were estimated at VUV 3.3 billion (approximately USD 30 million; 4.4% of GDP) (Government of Vanuatu, 2015b, p. 22). Home-based businesses are presumed to have been badly affected, as 81% of households in affected areas reported some level of damage (REACH, 2015, p. 2), but no specific data on home-based small businesses could be located. However, despite the high frequency of natural hazards affecting Vanuatu, in a survey of MSMEs carried out in November 2016, only 1% of respondents identified natural hazards as being among their most pressing problems; most businesses identified more routine concerns such as competition from other businesses (31%) and finding customers (24%) as their most pressing problems (Reserve Bank of Vanuatu, 2016b, p. 27). MSMEs in the agriculture sector did, however, identify natural hazards and climate change as creating credit risk which inhibited borrowing (Reserve Bank of Vanuatu, 2016b, p. 46).

2.4. Tourism

Across all of the countries reviewed in this report, tourism is largely nature-based and dependent on coastal and marine ecosystems and coastal infrastructure, which are vulnerable to natural hazards and the impacts of climate change. Tourism development is expected to be negatively impacted by climate change through increased intensity of storms, increased

temperatures and extreme weather events, damage to infrastructure, beach erosion, damage to marine ecosystems, and policy responses such as carbon taxes which will increase travel costs (Van Der Veen, Calgaro, Munk Klint, Law, Jiang, de Lacy, Dominey-Howes, & Reis, 2016, p. 53).

Fiji

Fiji has a large tourism industry that brings in more than 750,000 visitors per year and contributed 34% of the country's GDP in 2019 (Government of Fiji, 2017b; World Travel & Tourism Council, 2020). Approximately 6% of people in poverty and 12% of people above the poverty line generate some part of their income from tourism (Government of Fiji, 2017b, p. 93). Tourism employment is particularly significant for women, with 12.8% of women working in the sector compared to 7.4% of men, but women are usually employed as housekeepers, receptionists and waitresses, with only one quarter of managerial and professional positions being held by women (Government of Fiji, 2016, p. 60).

The tourism industry is vulnerable to tourists' perceptions of risk and to degradation of the natural environment. Tourists avoid destinations that they perceive as hazard-prone (ILO, 2019a, p. 23). The tourism industry in Fiji relies heavily on coastal attractions, so is highly vulnerable to cyclones, storm surges, and disruptions to transportation (PCRAFI, 2015a, p. 8), and to other longer-term risks related to climate change, including damage to environmental quality and ecosystems, increasing frequency of extreme temperatures, health risks associated with changes in the natural range

and prevalence of diseases, and increases in travel costs which may occur as part of policy responses to climate change (Government of Fiji, 2017b, pp. 93–94).

Tropical cyclones Evan and Winston caused limited damage to tourist infrastructure, most of which is built to high standards. TC Evan (2012) caused limited structural damage to hotels and resorts, and most of the seriously affected hotels and resorts drew on insurance to repair or rebuild without relying on the Government for financial assistance (WTO, 2019b, p. 44). Tourist arrivals decreased by 2.5% following the storm, but the effect was temporary (Government of Fiji, 2017b, p. 93). TC Winston (2016) similarly had “minimal impact on the tourism sector” (Government of Fiji, 2016, p. 27), which was partly due to good fortune in that the storm did not affect the most popular and productive tourism regions, although it did cause damage to at least 75 of the estimated 400 tourism businesses in the country. Damage to hotels and resorts was minimal due to the generally good standards to which they were built, with a very small proportion of properties reporting the majority of damage (Government of Fiji, 2016, p. 57). Most affected businesses intended to continue operating at reduced capacity or

to reopen within a few months (Government of Fiji, 2016, p. 60). The tourism industry generally recovered quickly following the cyclone and was successful in minimising negative reporting internationally, promoting a strong “business as usual” message, and reinstating international flights only two days after the cyclone (Government of Fiji, 2016, pp. 57, 59). Businesses are estimated to have lost FJD 44 million through cancellations and lost bookings, but overall visitor numbers were only expected to decline by 0.5% (Government of Fiji, 2016, p. 58).

Papua New Guinea

Papua New Guinea’s tourism industry plays only a small part in the country’s economy, and no evidence could be found about the impacts of natural hazards on the industry.

Estimates of the economic importance of travel and tourism in Papua New Guinea range from 1% to 2.2% of GDP, and from 0.4% to 2.2% of total employment (ILO, 2017a, p. 30; Perrottet & Garcia, 2016, p. 5; World Travel & Tourism Council, 2020). Most visitors are traveling for business or work; only 26.5% of travelers in 2014 were on holiday (Perrottet & Garcia, 2016, p. 10). Papua New Guinea has diverse tourism opportunities including diving and snorkeling, surfing, cruising, cultural experiences and historic sites, nature and eco-tourism, trekking, and adventure tourism (Perrottet & Garcia, 2016, pp. 12–13). However, tourism development is hampered by distance, high costs, and security risks (Perrottet & Garcia, 2016, p. 12).

Micro- and small enterprises supplying the tourism industry were affected in the short term.

Tourism provides an important market for micro-, small-, and medium-sized enterprises (MSMEs) making handicrafts and supplying hotels and spas with flowers, artisanal products, and cosmetics (Government of Fiji, 2016, p. 60). Women’s handicraft groups in Ba Province, for example, reported their daily income declining by FJD 50 to FJD 140 in the aftermath of the cyclone (although it is not clear what proportion of their incomes this represented) (Government of Fiji, 2016, p. 60).

Samoa

Samoa has a large tourism industry which is extremely important to the country’s economy.

Tourism earnings made up 23.7% of GDP in 2019 (Ministry of Finance, 2020, p. 4)¹⁸, generates the majority of export earnings (Perrottet & Garcia, 2016, p. 4), and generates 7% to 18% of formal employment (Samoa Tourism Authority, 2009, cited in Jiang, Calgaro, Klint, Dominey-Howes, DeLacy, & Noakes, 2015, p. 239; South Pacific Tourism Organization, 2014, and Government of Samoa, 2010, cited in Perrottet & Garcia, 2016, pp. 4–5; Pita & Schoop, 2015, p. 6). Most tourism businesses are small and owned by local people, with the most common type of tourist accommodation being the beach hut (*fale*) offering a “traditional” Samoan lifestyle experience (Parsons, Brown, Nalau, & Fisher, 2018, p. 647; Perrottet & Garcia, 2016, p. 14; Wong, de Lacy, & Jiang, 2012, p. 137).

¹⁸ Other estimates range from 20% to 25% of GDP (John Connell, 2015, p. 125; Perrottet & Garcia, 2016, p. 3; S. R. Singh, 2019, p. 338).

Tourism in Samoa is nature-based, highly dependent on coastal ecosystems, and vulnerable to natural hazards and climate change.

In Samoa, tourism is centered around beach and marine activities including surfing, cruising, diving and snorkeling, as well as cultural activities and spa and wellness resorts (Perrottet & Garcia, 2016, pp. 12–13). The tourism industry is “highly dependent on pristine marine resources and coastal infrastructure” (Wong et al., 2012, p. 136) and is vulnerable to natural hazards and climate change (ILO, 2019a, p. 23; Parsons et al., 2018, p. 644).

Natural hazards have caused significant economic harm to the tourism sector in Samoa, mostly through damage to accommodation properties.

The 2009 tsunami, for example, damaged or destroyed 20% of accommodation rooms in the affected regions, with the heaviest impact falling on small-scale, typically family-run, beach *fale* accommodations where 77% of rooms were damaged (Government of Samoa, 2009, p. 34). Total damage across the tourism sector was estimated at WST 24.1 million (USD 9.6 million; 1.5% of GDP) (Government of

Samoa, 2009, p. 34). Projections of economic losses varied from WST 76.8 million (USD 30.7 million) to as high as WST 153.7 million (USD 61.5 million), depending on how quickly tourists were expected to return to Samoa or whether they might choose alternative destinations (Government of Samoa, 2009, p. 35). TC Evan, in 2012, caused damage to accommodation properties and cultural heritage sites valued at WST 30.2 million (USD 13.2 million; 1.7% of GDP), only 8.3% of which was insured (Government of Samoa, 2013, p. 33). It was expected that tourist visits would take three years to return to pre-cyclone levels, leading to estimates of economic losses values at WST 21.7 million (USD 9.5 million; 1.3% of GDP) with additional losses due to lost sales of arts and crafts and other products to tourists and sales of agriculture and fishery products to hotels (Government of Samoa, 2013, pp. 33–34). The Government's post-disaster needs assessment estimated that 974 jobs would be lost in the tourism sector (with a nearly equal distribution among men and women), which is about 54% of the sector's employment (Government of Samoa, 2013, pp. 31–32, 34).

Solomon Islands

Solomon Islands has a very small tourism industry which is nature-based and highly dependent on coastal and marine ecosystems and infrastructure which are vulnerable to climate change and natural hazards.

Estimates of the economic importance of travel and tourism to Solomon Islands range from 3% to 10.5% of GDP and from 3% and 10.8% of total employment (ILO, 2017a, p. 30; Perrottet & Garcia, 2016, p. 5; World Travel & Tourism Council, 2020). As of 2013, 80% of visitors were business travelers (TRIP Consultants, 2015, p. 2); in 2015 there were only 6,100 leisure visitors to Solomon Islands, a number that is “tiny

by regional standards” (World Bank, 2017d, p. 64). *The National Tourism Development Strategy* describes the tourism industry as small and “still at an embryonic stage” with limited tourism infrastructure, but having potential for growth, particularly in the adventure tourism market (TRIP Consultants, 2015, pp. 2–3); other international observers concur that the potential of the industry is currently largely untapped (ADB, 2019a, p. 1; Perrottet & Garcia, 2016, pp. 11–12; Roubin, Billy, Hilly, Nardi, Nuia, Fernando, Gesiau, Maneka, & Gereia, 2018, p. 65). Significant attractions and activities include diving, swimming, snorkeling, surfing,

eco-tourism, cultural interest, and historic sites (Perrottet & Garcia, 2016, pp. 11–12). Tourism offers opportunities for inclusive and sustainable economic growth and for creating significant number of good quality jobs for both men and women, and for creating opportunities for youths as well; there is particular interest in developing the industry in the Western Province (Roubin et al., 2018, p. 65; World Bank, 2017d, pp. xviii, 64–65). As noted above for the entire

Tonga

Tonga's tourism industry contributes a relatively small proportion of domestic economic activity but is the largest single source of export earnings. The Government estimates that the tourism industry contributes 3.2% of GDP but also notes that this may be an underestimate (Government of Tonga, 2018b, p. 61); the value could be as high as 12.1% of GDP (World Travel & Tourism Council, 2020). Estimates of the amount of employment created by the tourism industry range from 12.8% (World Travel & Tourism Council, 2020) to 15% (South Pacific Tourism Organization, cited in Perrottet & Garcia, 2016, p. 4). Tourism is the country's largest single source of export earnings, worth 63% of total exports in 2017 (Perrottet & Garcia, 2016, p. 4; WTO, 2019b, p. 19). The industry has grown by 17% over the past five years (Government of Tonga, 2018b, p. 61) and tourist arrivals are expected to increase by 85%, from 47,000 to 87,000 per year, between 2018 and 2028 (World Travel & Tourism Council, cited in WTO, 2019b, p. 19). Tourism in Tonga is nature-based and highly dependent on the health of the coastal environment (Kingdom of Tonga, 2019, p. 99; Van Der Veeken et al., 2016, pp. 55, 59), and tourists are already concerned about natural hazards including tropical cyclones, extreme weather, and tsunamis (Van Der Veeken et al., 2016, p. 59).

Pacific region, climate change is expected to have a range of negative impacts that may adversely affect tourism potential in Solomon Islands. The country's *National Tourism Development Strategy* notes the importance of incorporating disaster risk management, climate change adaptation, and public relations management (in relation to natural hazards) in tourism development plans (TRIP Consultants, 2015, pp. 27, 36, 49).

Tropical Cyclone Gita caused significant economic harm to the tourism sector, mostly through damage to accommodation properties, but the impacts were expected to last only one season. Damage and economic loss to the tourism sector is estimated at TOP 40.6 million (4.1% of GDP), which was 13% of the total damage caused by the cyclone (Kingdom of Tonga, 2018a, p. 17). Most of the damage (90%) was related to accommodation buildings, furnishings, equipment, and other assets (Kingdom of Tonga, 2018a, p. 31). Almost all (72 out of 76) of the accommodation businesses on Tongatapu and 'Eua sustained damage; resort properties suffered the greatest damage in monetary terms but only 14% of the value was insured (Kingdom of Tonga, 2018a, p. 31). Approximately 44% of accommodation properties (but only 20% of resorts) and 40% of restaurants were insured for cyclone damage (Government of Tonga, 2018b, p. 63). Economic losses due to cancellations, lost bookings, closures, and increased operational costs were expected to be felt more by beach and island resorts, backpacker accommodations, and tourist lodges outside Nuku'alofa, which experienced disproportional declines in business compared to urban hotels (Kingdom of Tonga, 2018a, p. 31). Approximately 29% of damaged accommodation properties completed repairs and reopened within two weeks of the cyclone,

and 58% reopened within one month; other properties estimated that repairs could take up to eight months (Government of Tonga, 2018b, p. 63). Both TC Ian and Gita contributed to business down-turns and short-term reductions in employment opportunities (WTO, 2019b, p. 14) but the impacts of TC Gita on tourism were expected to be short-term, with tourist arrivals and revenues slightly reduced in 2017-18 but expected to return to normal the following year (Ministry of Finance and National Planning, 2018, p. 17).

Vanuatu

Vanuatu has a large and growing tourism industry which is extremely important to the country's economy, but is vulnerable to natural hazards. Estimates of the economic importance of travel and tourism to Vanuatu range between 35% and 45% of GDP, between 14% and 38% of total employment, and up to 67% of total export earnings (Jacqueline Connell, 2019, p. 327; ILO, 2017a, p. 30; World Travel & Tourism Council, 2020; WTO, 2019b, p. 31). The World Travel and Tourism Council predicts industry growth of 4.1% per year over the next decade with tourism's contribution to Vanuatu's GDP expected to reach 50% of GDP by 2027 (WTO, 2019b, p. 31). The major attractions for tourists include adventure tourism, volcanoes, beaches, cruising, cultural activities, diving and snorkeling, eco-tourism, and fishing (Perrottet & Garcia, 2016, pp. 12–13), which are vulnerable to the impacts of climate change and natural hazards as is the case for all countries in the region.

Tropical Cyclone Pam caused significant economic harm to the tourism sector, mostly through damage to accommodation properties, but the impacts lasted only one season. Damage and economic loss to the tourism sector was estimated at VUV 9.5 billion (approximately USD 87 million; 12.5%

Tonga's tourism sector largely consists of MSMEs, and the impact of damage and losses to small businesses with limited cash reserves, especially accommodation properties, was severe (Government of Tonga, 2018b, p. 64).

There are no internationally branded hotels in Tonga (Perrottet & Garcia, 2016, p. 14). The scale of the tourism sector is small enough that if several tourist accommodation businesses fail to recover, the country's destination supply and its brand image could be affected (Government of Tonga, 2018b, p. 64).

of GDP) (Government of Vanuatu, 2015b, p. 29). Most of the damage was suffered by accommodation properties (88%), with the greatest damage associated with two major hotels, but widespread lower-value damage was suffered by other accommodation properties and by 88% of all tour operators (Government of Vanuatu, 2015b, p. 31). Women were expected to suffer greater job losses than men, because in post-disaster situations the tourism industry commonly retains managerial and groundskeeping staff, who are mostly male, and lays off housekeeping staff, who are mostly female (Government of Vanuatu, 2015b, p. 34). Tourist arrivals dropped by between 11% and 17% following the cyclone (Perrottet & Garcia, 2016, p. 2; WTO, 2019b, p. 31) but the decline was brief and the tourism sector had recovered to pre-cyclone levels by 2017 (Eriksson et al., 2017, p. 52; WTO, 2019b, p. 31). Some larger properties were slow to reopen (the Holiday Inn took more than 15 months) but smaller owner-operator guesthouses were able to reopen more quickly; however, "many business owners who had not procured cyclone insurance folded in the aftermath of the storm, unable to reinvest sufficient savings in their businesses or to tap sources of credit" (WTO, 2019b, p. 31).

2.5. Housing and Settlements

Fiji

The topography of Fiji leads 90% of the population to live in coastal regions that are exposed to flooding, cyclones and sea-level rise, and there is generally a lack of climate-resilient housing across the country (Government of Fiji, 2018b; UNDRR, 2019b). More than half of the population (54% in 2017) is urban, concentrated in three rapidly growing urban corridors. Urban growth is driven by natural population growth and by migration from rural areas and the outer islands, which is primarily due to urban-rural household income differentials (Government of Fiji, 2017b, p. 41). There is a large backlog in providing low-income housing in Fiji, and urban populations are overcrowding into existing housing stock, building illegally on vacant land, or entering into informal and insecure housing arrangements. About 20% of the urban population (10% of the total population of the country) lives in unplanned and rapidly growing urban and peri-urban informal settlements where land tenure is unregistered and insecure, housing stock is low quality, 13% of households have shared or no access to potable water, 28% had no access to

electricity, and vulnerability to natural hazards is high (Government of Fiji, 2017b, p. 56).

The two major tropical cyclones that hit Fiji in the past decade caused extensive damage to housing stock across the country. TC Evan destroyed about 1% of the country's total housing stock and damaged another 4%, for a total value of FJD 50 million (Government of Fiji, 2013). TC Winston destroyed 7.5% of the total housing stock and damaged a further 6.3% of houses, for a total of FJD 751 million (Government of Fiji, 2016, p. 72). Most households had to bear the rebuilding cost themselves, which was a major challenge (WTO, 2019b, p. 45); the government offered assistance through the Help for Homes program (see section 3.2), but the program's budget was only one-sixth of the estimated amount of damage (Government of Fiji, 2016, p. 72). Households headed by women, the elderly, and people with disabilities may find it particularly challenging to repair or rebuild their houses independently (Government of Fiji, 2016, p. 76).

Papua New Guinea

Most people in Papua New Guinea live in rural areas exposed to a wide range of natural hazards. The majority of the population (87% to 88%) lives in rural areas, highly dispersed geographically with limited access by road or sea, high transportation costs, limited infrastructure, and high levels of poverty (CFE-DM, 2019, p. 25; FAO, 2020; ILO, 2018, p. 2; UNDP, 2019, cited in UNDRR, 2019a, p. 12). More than 80% of the population is susceptible to drought (and frost, in the highlands) caused by El Niño, half a million people live in coastal villages exposed to sea-level rise, coastal degradation and storm surges, the country

is among the top six countries worldwide for the percentage of its population exposed to earthquake hazards, and it has "the highest percentage of population exposed to severe volcanic risk" in the world (GFDRR, 2016a, p. 11; UNDP, 2019, cited in UNDRR, 2019a, p. 12).

Weak construction standards lead to excessive damage to buildings affected by earthquakes. News media reports indicate that building codes in Papua New Guinea are outdated and based on seismic assessments that underestimate the risk posed by earthquakes, and that buildings often fail to conform to

the building code due to poor construction standards, lack of inspections and enforcement, and corrupt tendering practices (Allen, 2018, p. 2; Graue, 2018). Details of damage sustained in the 2018 earthquake suggest that sub-standard construction practices were responsible for some buildings failing to withstand the earthquake (Wari, 2018). Traditional homes built of flexible natural materials perform well in earthquakes, and are light structures that cause few casualties if they collapse; modern structures with heavier construction (for example, with corrugated iron roofs) require higher standards of construction to be robust under earthquake conditions, and cause more casualties if they do collapse (Graue, 2018). Work on updating the national earthquake hazard map, a prerequisites to updating the building code, was underway as of 2018 (Allen, 2018, p. 2).

Samoa

Most people in Samoa live in rural areas and near coastlines, and housing is often poorly constructed and vulnerable to cyclone and tsunami damage. The majority of the population (81% in 2013-14) lives in rural areas (Samoa Bureau of Statistics, 2020b, p. 30) and 70% of the population lives along the coastline, exposed to cyclones, tsunamis and flooding (IFRC, 2016c, p. 42). Most houses in Samoa (82%) are of “European type” construction, as opposed to houses of traditional Samoan design and construction (Samoa Bureau of Statistics, 2020b). A national building code is used in designing structures but is not legally enforceable, construction often deviates from plans, construction standards are often not followed, and building inspection procedures are lax (Government of Samoa, 2013, p. 61;

Rural-urban migration is limited, but contributes to the growth of informal urban settlements that are exposed to risk. In the capital city, Port Moresby, unplanned informal settlements are growing, and are vulnerable to flooding, tsunamis, earthquakes (due to lack of seismic planning), urban fires and diseases which follow the absence of sanitation (Costella & Ivaschenko, 2015, p. 28; UNDRR, 2019a, p. 14). The urban population in Papua New Guinea is growing slightly more quickly than the total population, at 2.6% and 2.0% per year, respectively (World Bank, 2020e). There is some rural-urban migration, and one small study suggests that 61% of rural-urban migrants are seeking economic opportunities (Steven, 2016). However, the rural-urban population flow is not large, as the urban population has remained between 13.0% and 13.3% of the total population for the past twenty years (World Bank, 2020e).

PCRAFI, 2015b, p. 35). Damage caused by TC Evan suggested that many European-style houses lacked sufficient reinforcement in roof, walls, and/or foundations, while traditional Samoan houses were less badly affected and were inexpensive and more easily repairable using locally-available building materials (Government of Samoa, 2013, pp. 58, 62). The 2009 tsunami damaged housing of all types roughly equally, and 70% of the houses that were affected were completely destroyed, suggesting that structures of any type were unlikely to be able to resist the force of a tsunami (Government of Samoa, 2009, p. 40).

Tropical cyclone Evan caused extensive damage to housing through a combination of high winds and flooding. In the affected areas, 2,088 houses were damaged, and 29% of these were considered unsafe for occupation (Government of Samoa, 2013, p. 56). The total value of damage and losses including household goods was estimated at WST 43.4 million (USD 19.0 million; 2.5% of GDP) (Government of Samoa, 2013, p. 54). About 7,500 people were temporarily displaced to stay with friends or family or in public emergency shelters, but most returned quickly to their

places of residence where they carried out makeshift repairs or built temporary structures; shelter assistance consisting of tents and tarpaulins, tool kits, hygiene kits, kitchenettes, and household items was distributed to families whose houses were no longer fit for occupation (Government of Samoa, 2013, pp. 54, 58). Access to financial resources for purchasing building materials including timber was a significant constraint mentioned by homeowners (Government of Samoa, 2013, p. 59).

Solomon Islands

Housing in Solomon Islands is often low-quality and vulnerable to natural hazards, with informal settlements in urban areas being a particular concern. According to the 2009 Population and Housing Census, the majority of houses in Solomon Islands are constructed with walls or roofs (54% and 61%, respectively) of traditional materials, rather than more robust wood, metal, or concrete block construction (Solomon Islands National Statistical Office, 2012, p. 35). The Government notes that “buildings constructed of traditional materials are not built to any regulated standards and tend to be far less resilient to natural hazards such as flooding and cyclones” (Government of Solomon Islands, 2014, p. 26), although an academic study considering the effect of cyclones on housing in Vanuatu, Samoa and Solomon Islands concluded that “traditional buildings, if carefully built, are actually designed to let a cyclone flow around or through them without serious damage” (Yates and Anderson-Berry, 2004, cited in Weir, Dovey, & Orcherton, 2017, p. 1021). The country has a draft building code, developed in 1990, but it is not legally enforceable and is considered out of date (PCRAFI, 2015c, p. 37; Saefoa,

2020). About 75% of the population lives in rural areas, but urbanisation is proceeding rapidly and the urban population is expected to increase to 40% of the total population by 2050, placing strain on urban planning and public services (Fleming, Anthonj, Thakkar, Tikoisuva, Manga, Howard, Shields, Kelly, Overmars, & Bartram, 2019, p. 332). Much of the urban growth consists of inexpensive, temporary, and poorly-constructed structures in informal settlements located in low-lying areas at risk of flooding, tidal surges, and tsunamis (Costella & Ivaschenko, 2015, p. 28; GFDRR, 2016b, p. 1; Government of Solomon Islands, 2014, p. 27). Flooding in Honiara in 2014, for example, which destroyed 675 houses (about 2.7% of the city’s total housing stock and 2.5% of the total housing stock of Guadalcanal province), was largely attributed to exposure and vulnerability related to unregulated urbanization, and particularly to “highly exposed houses located on dangerously low ground and to the presence of low-resilience (traditional leaf) housing styles, which were disproportionately damaged”, although the floods also damaged and destroyed houses of concrete block construction (Government of Solomon Islands, 2014, pp. 2, 26–27, 37–38).

Tonga

Tonga is predominantly rural and most settlements are on low-lying coastal areas which are vulnerable to cyclones and tsunamis.

The majority of the population lives on the coasts of the larger islands at or near sea level (Kingdom of Tonga, 2019, pp. 98, 176). Seventy-four percent of the population of the country lives on the largest island, Tongatapu, but only 23% of the population live in the relatively urban area of Nuku'alofa (Tonga Statistics Department, 2017a, p. 10). There is a trend of migration from the outer islands to Tongatapu, where 74% of the population live: net internal migration between 2011 and 2016 amounted to 1.2% of the population of Tongatapu in 2016 (Tonga Statistics Department, 2017a, pp. 13, 64–65). However, the population of Tongatapu decreased by 1.1% and the total population of Tonga decreased by 2.5% over the same period due to emigration (Tonga Statistics Department, 2017a, p. 10; United Nations Population Division, 2019). Some land use and settlement challenges in the more densely populated areas of Tongatapu have been attributed to migration from the outer islands, including increased settlement on marginal, low-lying and flood-prone lands, reclamation of environmentally sensitive areas, increased fishing pressure adjacent to urban areas, removal of coastal vegetation and mangroves causing soil loss and coastal erosion, and loss of terrestrial and marine habitats and species (Government of Tonga, 2018a, p. 5; Kingdom of Tonga, 2019, p. 98).

Housing in Tonga is often low-quality and vulnerable to cyclone damage. Houses in Tonga are mostly built with wood (58%) or brick (38%) outer walls, only 4% using other materials (Tonga Statistics Department, 2017a, p. 162). There is limited compliance with the national building code “due to weak regulatory supervision, lack of budget and a shortage of expertise for enforcement, and high construction and maintenance costs”, which contributed to widespread damage to housing as a result of TC Gita (IMF, 2020b, p.

38). Following Cyclone Ian in 2014, it was found that houses constructed to cyclone standards in the early 1980s suffered significantly less damage than newer houses that were not built in compliance with the standard (IFRC, 2016d, p. 85). A study of housing quality on Tongatapu found that approximately three-quarters of houses surveyed showed evidence of structural damage or water penetration indicative of past storm damage, which was largely attributed to the use of imported building practices and materials poorly adapted to local conditions (Robinson, Hulme-Moir, Puloka, Smith, Stanley, & Signal, 2017).

Recent cyclones have caused extensive damage to housing, and repair and reconstruction has been slow.

TC Gita in 2018 caused widespread damage to housing stock across the affected islands, with 33% of housing in Tongatapu and 57% in 'Eua damaged or destroyed (Kingdom of Tonga, 2018a, p. 35). Damage to housing was estimated at TOP 111.6 million (11.3% of GDP), which was 61% of the total damage caused by the cyclone (Kingdom of Tonga, 2018a, p. 17). Timber and masonry houses experienced similar rates of damage, while 2% of masonry houses and 11% of timber houses were destroyed (Kingdom of Tonga, 2018a, p. 35). The Government of Tonga provided support for housing repair and reconstruction following both TC Ian and TC Gita, but “the lack of an overarching policy and the intensity of relief efforts contributed to long delays in decision-making, exacerbating uncertainties for communities” (IMF, 2020b, p. 38). Immediately following TC Gita, the government was described as “encouraging self-recovery approaches” (CARE, 2018, p. 5) and the transition from immediate response activities to longer-term recovery work was slow and hampered by lack of clarity about roles, responsibilities, and capacity in the relevant government ministries, with options for providing assistance still being discussed at least eight months after the storm (Kingdom of Tonga, 2018a, p. 37, 2018b, p. 2).

Vanuatu

Housing in Vanuatu is often low-quality and vulnerable to cyclone damage. Seventy-five percent of the population of Vanuatu lives in rural areas, with 19% living in the capital, Port Vila, and 6% in the country's second city, Luganville (Vanuatu National Statistics Office, 2017, pp. 95–96). Most construction in rural areas is informal, unregulated, and not built according to any standards or codes, which makes communities vulnerable to building damage and injury resulting from natural hazards (Handmer & Iveson, 2017, p. 64). Vanuatu has a large stock (43%) of houses built using traditional locally-available materials and techniques such as thatch, woven palm fronds, and woven cane; 30% of houses are built of locally-available materials supplemented with features such as timber framing and corrugated galvanized iron roofs; and 27% are of more durable timber or concrete block construction (Government of Vanuatu, 2015b, p. 36). Studies looking at housing damage after TC Pam arrived at different conclusions: the Shelter Cluster found that buildings constructed in the traditional style survived better than houses using modern materials or methods, while a report by Save the Children concluded that roofs constructed from traditional materials suffered greater damage than roofs constructed from modern materials (Handmer & Iveson, 2017, p. 64) and the Government's post-disaster needs assessment concluded that buildings constructed to modern standards survived better and called for more inspections to improve compliance with standards (Government of Vanuatu, 2015b, p. 27). Port Vila also has large informal settlements which house 35% of the city's population (as of 2013), where housing and infrastructure are not disaster-resilient and access to services is poor (NDMO [National Disaster Management Office], 2018, p. 11). These informal settlements do not have official sanction and are generally based on agreements with local land owners (Handmer & Iveson, 2017, p. 61).

Tropical cyclone Pam caused extensive damage to housing stock and temporarily displaced 65% of households in affected areas. In affected areas, 81% of households reported some level of damage, with the most vulnerable houses being those with thatched roofs (55% to 77% of such houses reported total destruction of the roof, depending on the materials used) and walls and floors of bamboo (56% of bamboo walls and 63% of bamboo floors were completely destroyed) (REACH, 2015, pp. 20–21). Damage to homes also results in loss of income from home-based livelihood activities, which particularly affects women (Government of Vanuatu, 2015b, p. 38). Sixty-five percent of households in the affected areas left their houses to stay in safer locations, suggesting widespread fears that houses were not sufficiently robust to withstand the cyclone (REACH, 2015, p. 2). Most stayed with friends or family in their own community (53%) or in a community-managed shelter such as a school or church (30%) (REACH, 2015, p. 12). By five to six months after the cyclone, 86% of displaced households had returned home and half of the remainder expected to return home at some point (Shelter Cluster, 2015, p. 14). Rebuilding after TC Pam often tended to be done quickly and cheaply, and buildings were typically restored to their previous conditions in the same locations and using the same materials rather than raising standards (Handmer & Iveson, 2017, pp. 63–64). Within one to one and a half months after the cyclone, 72% of households had completed enough repairs that they “perceived that their immediate shelter needs had been met”, and by five to six months after the cyclone, this had risen to 85% (REACH, 2015, p. 24; Shelter Cluster, 2015, p. 20). Five to six months after the cyclone, 68% of households reported that they had received shelter assistance, consisting mostly of tarpaulins (82%), building materials (35%), blankets (27%), and tool kits (26%) (Shelter Cluster, 2015, p. 16). However, most households (81%) reported that they had relied on using recovered materials (sifting through debris) and locally-available natural materials (Shelter Cluster, 2015, pp. 21–22).

2.6. Low-Income and Informal Workers

Worldwide and across the Pacific, poor and marginalized people are disproportionately exposed to natural hazards. Poor people often live on low-value land in locations where they are more exposed to hazards (including frequent, low-intensity hazards) than wealthier people are. They lack resources to invest in disaster-resilient housing and other infrastructure, their employment and incomes are less secure, they have less access to social protection schemes, they have limited savings, and they have limited access to insurance or affordable credit. When disaster strikes they are often forced to adopt coping strategies that have long-term negative impacts, such as taking children out of school, selling productive assets, or reducing food intake, and they often receive less post-disaster support, and less quickly (Hallegatte et al., 2017, p. 4; ILO, 2019a, p. 4; SPC, 2018, p. 108; Utz, 2017, p. 90; Wehrhahn et al., 2019, p. 60).

The impacts of natural hazards are also disproportionately higher for poorer people (Wehrhahn et al., 2019, p. 60). The same

loss affects poor people more severely than wealthy people because “their livelihoods depend on fewer assets, their consumption is closer to subsistence levels, they cannot rely on savings to smooth the impacts, their health and education are at greater risk, and they may need more time to recover and rebuild” (Hallegatte, Rentschler, & Walsh, 2018, p. 4). The monetary value of damage to assets and losses to economic production does not fully reflect the impacts on people’s well-being (Hallegatte et al., 2018, p. 4). Women, youth, children, the elderly, people living with disabilities, and people belonging to ethnic or religious minorities are also more severely affected by natural hazards than people who have more wealth, power, and influence. Vulnerable people in all these groups tend to be overrepresented in the informal economy, more likely to be unemployed or in insecure work, and have less access to resources with which to restore their livelihoods or adapt to climate change (ILO, 2019a, p. 12).

Fiji

More than one-third of Fijians are below the national poverty line, and informal and subsistence livelihoods are common, but extreme poverty is rare. The World Bank reports that 2.3% of the population lives on less than USD 1.40 per day, and 15.1% live on less than USD 3.10 per day (World Bank, 2017c, p. 8). However, 35% of Fijians (26% in urban areas and 44% in rural areas) live below the national basic needs poverty line (Government of Fiji, 2016, p. 19). Many Fijians live in “affluent subsistence”: they have sufficient resources to meet most basic needs, but have limited economic opportunities to move beyond that level (Wehrhahn et al., 2019, p. 41). About 18% of adults identify their primary economic activity as solely subsistence based (Singh-Peterson & Iranacolaivalu, 2018, p. 12), but 60% of the employed population (78% in rural areas and 37% in urban areas) engage in some form of informal or subsistence activities (ILO, 2017a, pp. 4–5).

Tropical cyclone Winston is expected to have a significant long-term effect on employment and livelihoods for people on lower incomes. The Government’s post-disaster needs assessment noted that “most civil servants and salaried people will not suffer income loss as a result of TC Winston” but that less well-off people may be forced into the informal sector and to increase subsistence activities (Government of Fiji, 2016, p. 34). This will likely depress incomes and livelihoods for a long time: while some sectors of the economy were expected to recover within a few months, agricultural production in some areas may not return to pre-cyclone levels for five to ten years, and fisheries in some areas for as long as 12 years (Government of Fiji, 2016, pp. 12, 50).

Papua New Guinea

Poverty is a major challenge in Papua New Guinea. The most recent available data on extreme poverty is from 2009, when 38% of the population fell below the USD 1.90/day income poverty line (World Bank, 2020e). Papua New Guinea also has a nationally-defined poverty line, and in 2017, 37.5% of the population was below that level (ADB, 2020, p. 1). An IFPRI (International Food Policy Research Institute) study carried out in 2018 in three provinces and in the Autonomous Region of Bougainville found that on average, the poorest 40% of households “do not consume sufficient calories to meet the minimum daily calorie recommendation for a healthy life”, poor and non-poor households in three of the four locations were not meeting their recommended daily protein intake, 29% of children surveyed had stunted growth, and 9% showed wasting¹⁹ (Schmidt, Gilbert, Holtemeyer, Rosenbach, & Benson, 2019, p. vi).

Papua New Guinea has high levels of subsistence economic activity and informal and vulnerable employment. The majority of the population (82% to 85%) is engaged in subsistence agriculture (CFE-DM, 2019, pp. 15, 22); the 2011 census provides a breakdown of those engaged in subsistence agriculture, hunting, and forestry as consisting of 71% of males and 81% of females (ILO, 2017a,

p. 6). Unpaid work, unemployment and underemployment are widespread, and formal employment has not kept pace with labor force growth; although extractive industries (mining, oil, and gas) have contributed significantly to the economy in GDP terms in recent years, this has not created large-scale employment or other economic opportunities (ILO, 2018, p. 3). Estimates of the proportion of the workforce in informal employment range between 84% and 90% (CFE-DM, 2019, p. 22; Jones & McGavin, 2015, cited in ILO, 2017a, p. 4), and the ILO considers 75% of employment in Papua New Guinea to be vulnerable (including people working on their own account and contributing family workers) in the sense of suffering from low job and income security and less protection under employment regulation than work in the formal economy (ILO, 2019a, p. 4). The majority of skilled, formal work is done by foreign workers (CFE-DM, 2019, p. 22). In many countries, the informal economy is seen as negative, and policies aim to formalise economic activity, but in Papua New Guinea, Government policy aims to protect, promote, and grow the informal economy and “to see the informal economy acknowledged as the full and legitimate partner of the formal economy” (Department for Community Development, 2011, p. ix; Kopel, 2017, pp. 3–4).

¹⁹Stunting, or low height for age, is the result of chronic or recurrent undernutrition, and impairs the full development of physical and cognitive potential; wasting, or low weight for height, usually indicates recent and severe weight loss because of insufficient food or an infectious disease, and is a contributor to child mortality (World Health Organization, 2020).

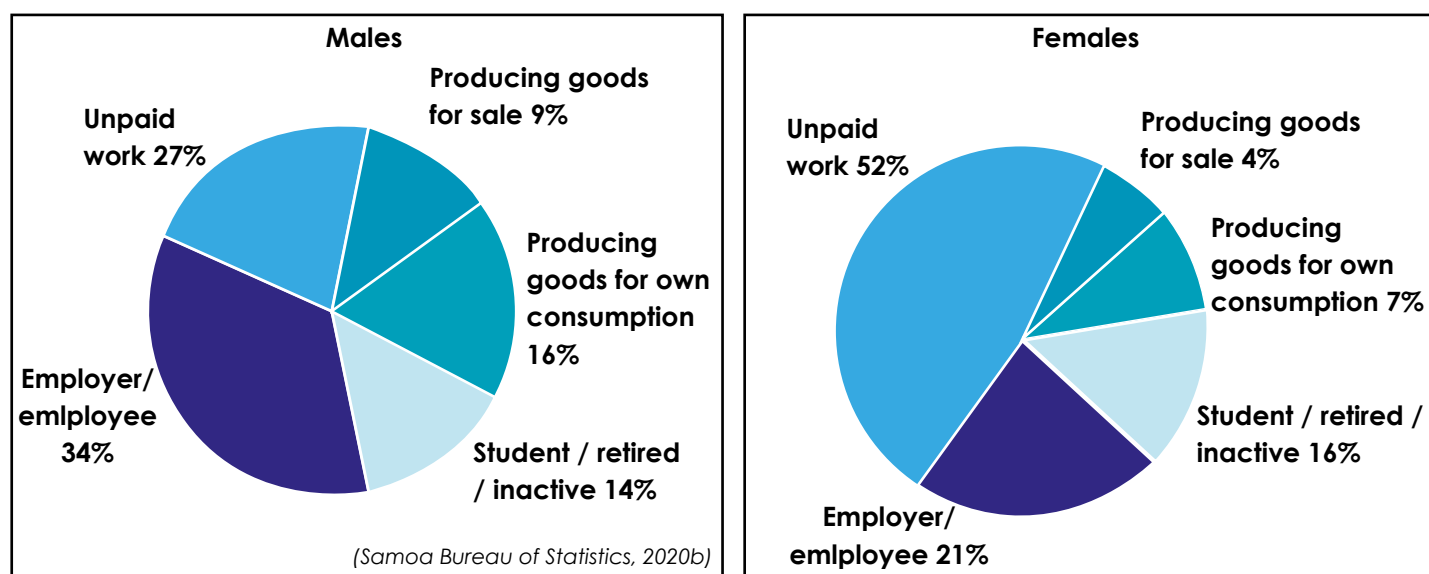
Samoa

Extreme poverty as defined by the Sustainable Development Goals is rare in Samoa, but poverty and hardship by national standards is a significant issue. Only 1.1% of the population falls below the USD 1.90/day extreme poverty line (ADB, 2020, p. 1). Samoa has defined food poverty and basic needs poverty lines tailored to national conditions, which identify income levels required to purchase a minimum food basket and essential non-food basic needs, and on these measures 4.3% of the population was below the food poverty line and 18.8% below the basic needs poverty line in 2013²⁰ (Moustafa, 2016, pp. 13–15). Poverty rates are highest in the capital city Apia, which is the only significant urban area in the country, followed closely by northwest Upolu island; poverty is lower in the rest of Upolu and on Savai'i island (Moustafa, 2016, p. 16).

Samoa has high levels of informal employment and subsistence economic activity. Of the adult (aged 15+) population, 27% are involved in formal paid employment as an employer or an employee, 57% produce goods for their own consumption, sale, or work unpaid in a family business, agricultural plantation, or household duties, and 15% are students, retired, or otherwise not working (Samoa Bureau of Statistics, 2020b).

The labor force participation rate is 43% (55% for men and 32% for women) (Samoa Bureau of Statistics, 2017, p. 54), which is low compared to neighboring countries in the region. The informal economy is estimated to make up 68% of the total labor force (ILO, 2017a, pp. 4–5; Pita & Schoop, 2015, p. 6). Almost all (97%) households in the country engage in some form of subsistence agriculture, usually alongside other income-generating activities (Samoa Bureau of Statistics, 2016, pp. 1, 35). Informal, home-based workers (weavers, house keepers, babysitters and caregivers) and food vendors, mostly women, are two of the largest groups of the informal workforce and income from these activities makes important contributions to household welfare, including being used for school fees, home renovations, and family and church obligations (Taua'a, 2015, pp. 55, 63). Women are often reluctant to admit to being engaged in the informal economy, perhaps because activities such as street vending and subsistence work are held in low regard, and may be recorded in statistics as being economically inactive rather than as working in the informal economy (ADB, 2018b, p. 179).

■ Adult (ages 15+) population by main economic activity in Samoa



²⁰The most recent complete data on poverty currently available are from the 2013/14 Household income and Expenditure Survey report; some data from the 2018 survey have been published but are incomplete and the full analytical report for the 2018 survey is not yet available.

People living on low incomes and subsistence agriculture have been severely affected by events such as tsunamis and cyclones. The 2009 tsunami affected a region that was already one of the poorest parts of the country, where reliance on home-produced food was higher than any other part of the country and where many people worked in the tourism sector. The post-disaster needs assessment reported that loss of livelihoods in the affected area was substantial, with damage to subsistence agricultural production putting households at risk of food poverty, and some 500 workers in the tourism industry losing their jobs (Government of Samoa, 2009, pp. 79–80). Similarly, following TC Evan in 2012, subsistence livelihoods and low-income households were heavily impacted and that lost economic opportunities, mostly in agriculture, was likely to push many families temporarily below the poverty line (Government of Samoa, 2013, pp. 105–107). Several weeks

after the cyclone, households reported eating less, eating fewer types of foods, eating less-preferred foods, and slaughtering productive animals to meet food needs, which undermines future productivity (Government of Samoa, 2013, p. 114). Rural families that depended on their plantations for food and income estimated that it would take 6–12 months before production could be harvested again, and a year and a half to two years before returning to pre-cyclone levels of production; however, no rural households sought to change their livelihoods in the meantime, and most sought to re-establish their existing livelihoods (Government of Samoa, 2013, p. 114). It is often the case that people dependent on subsistence farming, especially in remote locations with limited market economies, have limited options available to them and “cannot simply change their livelihoods” (Handmer & Nalau, 2019, p. 371).

Solomon Islands

Poverty is widespread in Solomon Islands (ADB, 2019a, p. 1). In 2013, 25.1% of the population was below the USD 1.90 per day international poverty line, and 58.8% fell below the USD 3.20 per day poverty line (World Bank, 2020e). Solomon Islands also has a nationally-defined poverty line, and in 2013, 12.7% of the population fell below this line (ADB, 2020, p. 1). Electricity, water, transport, and telecommunication services are not available to a large proportion of the population (ADB, 2019a, p. 1).

Solomon Islands has high levels of subsistence economic activity and informal and vulnerable employment. The labor force participation rate is 67% (74% for men and 61% for women), but 85% of those who are employed are considered to be in informal employment (ILO, 2017a, pp. 4–5), and the ILO considers 63% of employment in Solomon Islands to be vulnerable (including people working on their own account and contributing family workers) in the sense of

suffering from low job and income security and less protection under employment regulation than work in the formal economy (ILO, 2019a, p. 4). Informal employment is significant in Honiara, including activities such as: selling betel nut, tobacco, handicrafts, and fruit and vegetables; construction, transport, and repair work for men; house cleaning and child care for women; and also including illicit work (World Bank, 2017d, p. 78). Such work is short-term and sporadic: “the bulk of informal enterprises appear to operate more as survival mechanisms than as means of accumulation. Stalls and canteens, for instance, often operate intermittently to raise income for small household expenses or one-off items. Betel nut, tobacco, and mixed goods sellers tend to remain small, unable to accumulate sufficient capital for expansion. Instead, profits are used for reinvestments in stock, immediate needs, lending, or kinship obligations that it is difficult for business owners to resist” (World Bank, 2017d, p. 78).

Tonga

Extreme poverty is rare in Tonga, but there are significant levels of deprivation and hardship, especially in rural areas (World Bank, 2017b, p. 2; WTO, 2019b, pp. 9–10). In 2016, 3.1% of the population was living below the World Bank's USD 1.90 per day international poverty line (up from 1.1% in 2009) (Ministry of Finance, 2019, p. 64) and about 10% of the population was below the USD 3.10 poverty line (World Bank, 2017b, p. 2). The government also uses a national poverty line of TOP 970 per month for adults, equivalent to USD 13.92 per day, against which 27% of the population is considered to be in poverty (Ministry of Finance, 2019, p. 64).

Tonga has high levels of informal and vulnerable employment and subsistence economic activity. Only 57% of the economically active

population works in paid employment, with 26% undertaking subsistence work, unpaid family work, or volunteer work, and 16% classified as unemployed (Tonga Statistics Department, 2017a, pp. 10–14). The ILO considers 56% of employment in Tonga to be vulnerable, including own-account and contributing family workers who typically experience low job and income security and less protection under employment regulations (ILO, 2019a, p. 4). The government's post-disaster assessment of TC Gita warns of a risk that formal-sector workers affected by Gita may be forced to transition to informal employment (Government of Tonga, 2018b, p. 28). Tonga's existing social protection programs are limited by regional standards (see section 3.2 below).

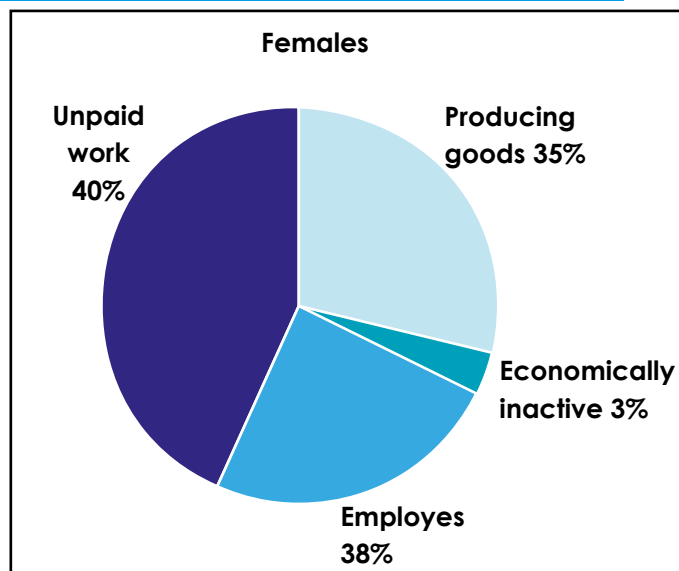
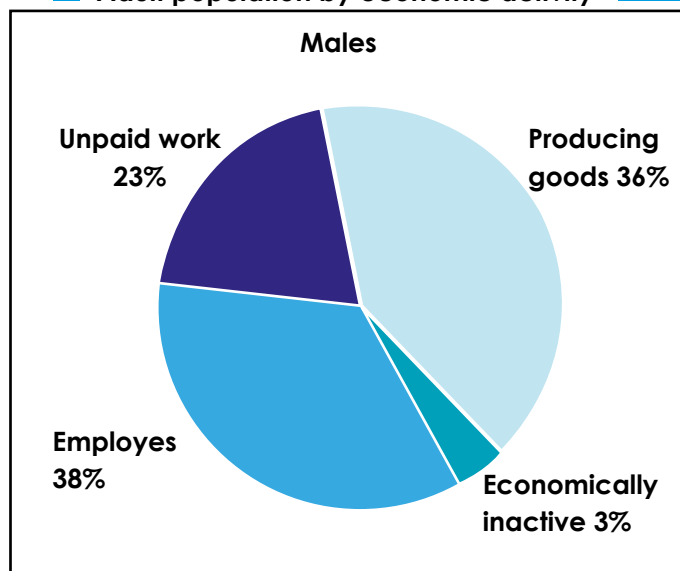
Vanuatu

Poverty is a significant issue in Vanuatu, although there is a lack of recent data to confirm the current situation. The most recent data available come from the 2010 Household Income and Expenditure Survey, which showed that 13.2% of the population fell below the USD 1.90 per day international poverty line, and 39.5% fell below the USD 3.20 per day lower middle income poverty line (World Bank, 2018b, p. 1). Vanuatu also has a nationally-defined basic needs poverty line and food poverty line; in 2010, 12.7% of individuals were in basic needs poverty and only 3.2% were in food poverty (Anderson, Barnes, Raoof, & Hamilton, 2017b, p. 108). Poverty rates are higher in urban areas than in rural areas (Anderson et al., 2017b, p. 23).

Vanuatu has high levels of subsistence economic activity, and employment is largely informal and vulnerable. Only 30% of the adult population (excluding full-time students) is in paid employment, with 35% producing goods for their own consumption or for sale, 32% doing unpaid work in a family business or agricultural

plantation, or undertaking household duties, and 3% considered economically inactive (Vanuatu National Statistics Office, 2017, pp. 75, 232). The formal economy is relatively small, but the size of the informal economy is difficult to measure: the Government's post-disaster needs assessment following TC Pam estimated that 20% of the labor force (26% of working-age males and 14% of working-age females) were in formal employment (Government of Vanuatu, 2015b, pp. 88–89), while the ILO estimates that 40% of total employment is informal (ILO, 2017b, p. 31). The ILO also considers 74% of employment in Vanuatu to be vulnerable in the sense of having low job and income security and less protection under employment regulation than work in the formal economy (ILO, 2019a, p. 4). Approximately 80% of Vanuatu's population relies on agriculture (mainly crops, livestock, and fisheries) for livelihood and for food and nutrition security, and at least 71% of the rural population derives some income from agricultural activities (VNSO 2013, cited in Government of Vanuatu, 2015b, p. 16).

■ Adult population by economic activity



(Vanuatu National Statistics Office, 2017, pp. 75–80)

Tropical cyclone Pam had severe impacts on people living on low incomes and subsistence livelihoods. In affected areas, half of all agricultural households lost part or all of their crops and required support in the short term to meet minimum needs, and 75% to 95% of income-generating activities were disrupted (Government of Vanuatu, 2015b, pp. xii, 94). On Tanna Island, food crops took at least a year to recover, partly due to the impacts of drought

conditions caused by El Niño; some remote communities which lacked access to monetary income experienced significant food insecurity with increased health problems (Handmer & Nalau, 2019, p. 375). People dependent on subsistence farming, especially in remote locations with limited market economies, have limited options available to them; they “cannot simply change their livelihoods” (Handmer & Nalau, 2019, p. 371).

2.7. Gender

Worldwide and across the Pacific, women and girls are disproportionately vulnerable to the effects of natural hazards and climate change (Bogdan, McPherrlain, & Yoon, 2019; Utz, 2017, p. 90). Women and girls have less ability than men to influence, participate in, and benefit from disaster risk reduction and recovery efforts, and from climate change mitigation and adaptation efforts (Utz, 2017, p. 90). They have less access than men to the resources necessary to cope with and respond to hazardous events, including information, employment opportunities, education, health, land, income, property, other financial and economic assets, and basic rights (Morioka, 2016, p. 22; Utz,

2017, p. 90; Vincent, Tschakert, Barnett, Rivera-Ferre, & Woodward, 2014, p. 105). Women often have less access than men to early warning systems such as weather forecasts and warnings of floods and water levels, and are often less prepared to understand and act on the information, due to gender differences in literacy, mobility, access to public venues, work schedules, and preferences for different communication media (Bogdan et al., 2019, pp. 26–33; IFRC, 2010, p. 32). Women's livelihoods often depend on natural resources that are affected by natural hazards, and on assets that are vulnerable to disasters or to being sold as a negative coping strategy (Bogdan et

al., 2019, pp. iv–v; ILO, 2019a, p. 12). Women also usually have more limited opportunities than men to diversify their livelihoods by taking up new occupations because of social norms, home-based responsibilities, or limited education (A. S. Thomas et al., 2019, p. 706). “Socially constructed roles and responsibilities, occupational segregation, and cultural norms” lead to women bearing burdens that include “increased time and labour workloads, health issues like malnutrition, increased rates of sexual and gender-based violence and even early child marriage” (Bogdan et al., 2019, p. 33). Worldwide, even fatality rates in disasters tend to be higher for women than for men, “primarily due to gendered differences in support to cope with such events and insufficient access to information and early warnings” (Bogdan et al., 2019, p. 33; ILO, 2019a, p. 12).

Gender also interacts with other social characteristics to affect how individuals are impacted by natural hazards (Bogdan et al., 2019, p. 4). Across Asia, the Pacific and Africa, women in rural areas tend to be more vulnerable than those in urban areas; older women and women with disabilities are more severely affected because of a lack

of accessible infrastructure and information; pregnant and lactating women are at higher risk because of inadequate health services following disasters; and widowed and divorced women tend to be more vulnerable (Bogdan et al., 2019, p. 23).

Gendered social norms mean that men suffer different risks compared to women, particularly physical and mental health risks and pressures for migration. Most research on the gendered impacts of climate-related hazards considers effects on women, with “scarce evidence” available about impacts on men (Bogdan et al., 2019, p. iv). Social norms generally call for men to be “brave and heroic, and engage in risky life-saving behaviors that increase their likelihood of mortality” (Bogdan et al., 2019, p. 25; Vincent et al., 2014, p. 106). Under crisis conditions, they also tend to suffer mental health issues from isolation and worry, including depression, and to use alcohol as a coping mechanism (Bogdan et al., 2019, p. 25). Men often migrate (from rural to urban areas, or overseas) in search of new livelihoods, which can strain households and break up families (Bogdan et al., 2019, p. 25).

Gendered impacts of climate change in Asia, the Pacific and Africa

	Women	Men
Physical	<ul style="list-style-type: none"> • Higher mortality and morbidity rates in disasters • Extra workloads (time and labour) • Malnutrition • Sexual and gender-based violence during and after disasters 	<ul style="list-style-type: none"> • Mortality risks among men with heroic behaviour and rescue workers • Migration for livelihood diversification • other health issues, like rheumatism
Material	<ul style="list-style-type: none"> • Loss of small household livestock • Loss of livelihoods connected with natural resources, less time to re-establish them • Loss of land because of inheritance issues • Disparities in access to disasters relief and aid 	<ul style="list-style-type: none"> • Loss of livestock and assets
Psychological	<ul style="list-style-type: none"> • Psychological issues associated mostly with fear of gender-based violence and feelings of shame during disasters and stress for providing food for the family 	<ul style="list-style-type: none"> • Psychological impacts including social isolation, trauma, depression, stress that can lead to alcohol abuse and even suicide
Most affected groups	<ul style="list-style-type: none"> • Girls (early marriage) and adolescent girls (risks of sexual harassment) • Rural women and women without access to resources • Women living in low-living areas • Disabled and older women • Widowed, divorced and single women • Pregnant and lactating women • Female-headed households 	<ul style="list-style-type: none"> • Rural and poor men • Widowers
Gender relations	<ul style="list-style-type: none"> • Negative: weaker family structures, domestic violence 	<ul style="list-style-type: none"> • Positive: change in household and community roles, women taking leadership

(Bogdan et al., 2019, p. 22)

Gender-based violence is widespread across all six countries reviewed in this report, and anecdotal evidence that gender-based violence increases in post-disaster conditions.

Data on gender-based violence in the six countries reviewed here tend to be weak, outdated, and often anecdotal even under normal conditions. Worldwide, evidence shows

that gender-based violence often increases following disasters, in all countries at all stages of development (Masson, Lim, Budimir, & Podboj, 2016, p. 11), and although anecdotal evidence suggests that this is the case across the Pacific region, domestic violence is rarely reported to authorities and there is a general lack of official records and robust data.

Fiji

In Fiji, gender inequality is a significant challenge, with social roles heavily influenced by traditional values (Charan, Kaur, & Singh, 2016, pp. 110–112). Traditional cultural norms among both of the principal ethnic groups in Fiji emphasise male authority and limit women's participation in decision-making and rights to own property, although education is valued and women are able to participate in many types of employment (Chattier, 2015, pp. 180–181; Schoeffel, 2006, pp. 3–4). Women have limited participation in decision-making at the household, community, and national levels (Charan et al., 2016, p. 112; Taylor & Michael, 2013, p. 11). The labor force participation rate for women is 38.6%, which is half that of men (76.2%) (ILO, 2020). Women and girls are expected to take on heavy domestic responsibilities and are responsible for 74% of household work, compared to 26% for men (Government of Fiji, 2016, p. 51). They are often limited to working in the informal sector and in subsistence agriculture, which offer low income and little security (Government of Fiji, 2016, p. 99). The Government of Fiji has made significant efforts to integrate gender in disaster and climate change policies, including undertaking gender-disaggregated vulnerability and capacity assessments or including gender considerations in post-disaster needs assessments, particularly in the needs assessments that followed TC Evan and TC Winston (Bogdan et al., 2019, p. 13).

Tropical cyclone Winston may result in reduced economic opportunities for women, increasing dependence on subsistence activity, increasing time poverty, deepening poverty and widening gender inequality (Government of Fiji, 2016, p. 99). Immediately after the cyclone, electricity and water supply outages led women and girls to take up increased burdens of household chores such as fetching water and doing laundry, and curtailed their ability to engage in other productive and income-generating activities (Government of Fiji, 2016, p. 103). Women are often home-based workers, and many women engaged in home-based production lost income, materials, and equipment when their homes were damaged or destroyed (Government of Fiji, 2016, p. 76). Women's livelihoods are also often connected to natural resources which are vulnerable to natural hazards. Many women work at basket and mat weaving, which rely on *voivoi* (pandanus leaves) which were heavily affected by the cyclone (Bogdan et al., 2019, p. 15), while in coastal areas of Bua province, storm damage prevented female mud-crab fishers from accessing mangrove areas or damaged their fishing equipment, leaving them with few alternative income opportunities (A. S. Thomas et al., 2019). Women's ability to contribute to household subsistence was also more deeply affected than men's: 71% of the livestock killed as a result of the storm were small animals like

poultry, pigs and beehives, which are usually under the control of women (Bogdan et al., 2019, p. 15), and vegetables were the most badly affected type of crop, which again are largely cultivated by women (Government of Fiji, 2016, p. 51). Women “are poorer, earn less income, are more dependent on subsistence economies, and, therefore, have fewer options to cope with the disaster impact than their male counterparts” (Government of Fiji, 2016, p. 102). Conversely, however, disruptions caused by climate change may also force women and men to take on new activities and roles in the family and the community, and may create opportunities for women to take on new leadership roles as they engage in alternative livelihoods and income-generating activities (Bogdan et al., 2019, p. 33).

Gender-based violence rates in Fiji are among the highest in the world, with 72% of women who have ever been in intimate relationships

Papua New Guinea

Gender equality is a major challenge in Papua New Guinea and women and girls suffer political and economic exclusion, and systemic violations of their rights throughout the country

(Gwatirisa et al., 2017, p. 395; V. Thomas, Kauli, & Rawstorne, 2017, p. 3; UNFPA, n.d.). In 2018, Papua New Guinea ranked 161st out of 189 countries on the UN Human Development Report's Gender Inequality Index (UNDP, 2019, p. 318). Women are under-represented in decision-making at all levels, have limited access to resources, and experience heavy work burdens; “gender inequality in Papua New Guinea is pervasive, persistent and deep-seated” (V. Thomas et al., 2017, p. 3). In both rural and urban areas, traditional cultural norms give men authority over their clan and family members and the right to make most of the decisions and control most of the resources in the family; women are expected to conform to

reporting physical, sexual, or emotional violence from an intimate partner (Fiji Women's Crisis Centre, 2013, p. 2). During disasters, gender-based violence often increases, particularly when living in short-term emergency or shared accommodation which may have inadequate lighting and mixed sleeping arrangements and WASH facilities (Bogdan et al., 2019, p. 15; Government of Fiji, 2016, p. 76; UNDRR, 2019b, p. 10; Vincent et al., 2014, p. 106). Increased stress, property damage, lack of electricity and lighting, the use of alcohol by men as a coping mechanism, and the breakdown of normal community protection mechanisms are contributing factors (Bogdan et al., 2019, p. 15; Government of Fiji, 2016, p. 103). Following floods in 2012 and TC Winston in 2016, there were increased reports of domestic violence, and reports of men requesting sexual favors in exchange for food and supplies (Government of Fiji, 2016, pp. 102–103).

subservient societal rules and norms, are “often viewed as commodities used in exchange for money, gifts and to resolve tribal disputes” and are vulnerable to sexual and gender-based violence (UNFPA, n.d.). “There is a strong social pressure on men to play a masculine, assertive role in the home which has resulted in toxic exhibitions of masculinity resulting in controlling, dominating, and abusive relationships with domestic partnerships” (CFE-DM, 2019, p.16). Papua New Guinea is one of only three countries in the world that has no women in its national parliament (the other two are the Federated States of Micronesia and Vanuatu) (International Parliamentary Union, 2020). The labor force participation rate is almost identical for women and men (46% and 48%, respectively) (World Bank, 2020e) but women's participation is mainly limited to informal subsistence agriculture work in rural areas

(ILO, 2018, p. 7). Girls lag slightly behind boys in primary school enrolment rates (73% and 77%, respectively) and completion rates (59% and 74%) (ILO, 2018, p. 7), but among adults aged 25 or older, only 9.9% of women and 15.2% of men have attained some secondary education (UNDP, 2019, p. 318). Child marriage is common (21% of girls are married before the age of 18), which puts girls at high risk of abuse (Girls not Brides, 2020), and customs such as forced marriage, bride price, and beliefs in sorcery are found in many communities (Brun, 2018, p. 9).

Natural hazards disproportionately affect women's activities and livelihoods by damaging the natural resources that women rely on.

Most of the discussion in the literature about the gendered impacts of natural hazards in Papua New Guinea (other than gender-based violence, which is discussed below) relates to the roles of men and women in subsistence agriculture, which is the basis of livelihoods for the vast majority of the population. Assessments during the 2015-16 drought and following the 2018 earthquake in the highlands found that lost production due to drought, and destruction of gardens due to the earthquake and associated landslides, not only deprived families of their main food source but also removed the main source of income for women, who customarily worked the gardens and were entitled to sell surpluses (Brun, 2018, pp. 1, 6; CARE, 2015a, p. 9). Studies report that under crisis conditions, women's workloads tend to increase because of the increased difficulty of obtaining food, water, fuel, and other household necessities, and that when food is scarce, men and boys are given priority access to high-quality food over women and girls (Brun, 2018, pp. 1, 5-6; CARE, 2015a, pp. 2-3; Morioka, 2012, cited

in Morioka, 2016, p. 26). During the 2015-16 drought, women spent less time working in food gardens, which were unproductive, while men spent more time searching for bush foods (CARE, 2015a, p. 3). The assessment following the 2018 earthquake highlighted that women would take on additional burdens of caring for children and other family members, and that female-headed households including widows and single mothers, would be particularly disadvantaged as they have fewer resources and are more vulnerable to exploitation (Brun, 2018, pp. 1, 5-6).

Gender-based violence in Papua New Guinea is widespread and is widely accepted based on traditional social norms.

There are no recent, comprehensive, national data on the prevalence of gender-based violence in Papua New Guinea (Brun, 2018, p. 8; UNDP, 2016a, p. 32), but "several studies indicate that the rates of family and sexual violence are among the highest in the world" (Brun, 2018, p. 8). The following small-scale studies are illustrative:

- A survey in 2009-10 found that 65% of women in rural and urban areas in coastal, highland and island provinces had suffered gender-based violence (Ganster-Breidler, 2010, cited in UNDP, 2016a, p. 32);
- Human Rights Watch estimated in 2016 that 70% of women in Papua New Guinea experienced rape or assault at some point in their lives (Human Rights Watch, 2016, p. 447);
- A survey of 197 individuals employed in three companies found that 68% of respondents had experienced gender-based violence during the previous year and reported an average of 7.8 incidents (9.4 incidents per

year for women and 6.1 for men), including an average of 2.4 “severe” incidents, defined as rape by a partner or other, or sexual assault or physical assault by a partner²¹ (Darko, Smith, & Walker, 2015, pp. i, 13–14); and

- A study of 846 men in Bougainville suggests that 59% have committed rape of an intimate partner, and 41% have raped a non-partner²² (Jewkes, Fulu, Roselli, & Garcia-Moreno, 2013, p. e210).

Domestic violence is illegal, but is rarely prosecuted, women do not report assaults out of fear of retribution and because they do not expect authorities to assist, and there is a shortage of support services such as safe houses, counselling, and legal aid (CFE-DM, 2019, pp. 19–20). A national strategy on gender-based violence has been adopted, aiming to reduce gender-based violence and improve the handling of cases reported to authorities, improve data collection to support evidence-based planning, improve support for survivors of gender-based violence, and undertake preventive measures and messaging (Government of Papua New Guinea, 2017, p. 13).

There is evidence that gender-based violence increased in Papua New Guinea during crisis brought on by natural hazards. An assessment conducted during the 2015 drought found that women and children faced increased safety risks when alone collecting water or when male family members were away gathering food or seeking work (CARE, 2015a, p. 1). Respondents mentioned increases in gender-based violence

and in violence between communities arising from increased tensions caused by shortages of food and water, and there were reports of women engaging in transactional sex and being pressured into becoming a second wife (CARE, 2015a, pp. 6, 10–11). A similar assessment conducted a few weeks after the 2018 earthquake noted that there was at that time “limited information” about how the earthquake had affected gender-based violence, but the report anticipated that violence was likely to increase due to the likelihood of tribal conflict as displaced people moved; beliefs in sorcery which were strong in the region; difficulties accessing drinking water and lack of sanitation facilities which exposed women and girls to greater risks; and emotional trauma and stress caused by loss, uncertainty, and food shortages. The report also noted that economic hardship was expected to lead to an increase in transactional sex to obtain necessities, sex trafficking, or arranged or early marriages, with widows and single mothers being most vulnerable due to limited resources and support networks (Brun, 2018, pp. 1, 9). One contrasting report examined four communities following the 2018 earthquake and found that the communities reported that gender and protection issues were no worse three months after the earthquake than they were before it, and that tasks such as water collection and land cultivation were shared equally among men, women, and children, although the authors of the report note that gender-based violence is often under-reported (Roche et al., 2018, p. 26).

²¹There are some indications in the study that some of the people surveyed, especially males, are likely to have included incidents of non-gender-related violence in their responses, and that males and females may have interpreted questions differently, so these figures may overstate the number of strictly gender-related incidents.

²²Rates of gender-based violence in Bougainville may have been influenced by the 1988–1998 civil war.

Samoa

In Samoa, gender inequality is a significant challenge, and women's political and economic participation is significantly limited by social norms. A national inquiry found that "Samoa is built on patriarchy" with social norms that reinforce men's dominance in society and control over women (Office of the Ombudsman, 2018, p. 22). Samoa's traditional village government system presents significant barriers, sometimes justified in terms of traditional customs or on religious²³ grounds, to women's participation in decision-making forums in local government councils, church leadership, school management and community-based organisations (Meleisea, Meredith, Mow, Schoeffel, Lauano, Sasa, Boodoosingh, & Sahib, 2015, p. 7; Office of the Ombudsman, 2018, pp. 23–24, 37). Women are rarely selected to hold the title of matai, a traditional chiefly title indicating leadership of an extended family which not only grants a role in village decision-making but is also a prerequisite to being elected to the national parliament (ADB, 2018b, p. 171; Meleisea et al., 2015, pp. 7–8). In employment, large gender disparities are evident: the labor force participation rate is 55% for men and 32% for women; the employed population is 67% male and 33% female; and the unemployment rate is 10.6% for males and 21.3% for females (Samoa Bureau of Statistics, 2017, pp. 23, 33, 54). Women find it more difficult to start a business than men do, particularly because of cultural attitudes and customs which typically restrict women to low-level and domestic work and limit their familiarity with business processes, because women are often time-poor due to domestic responsibilities, and because women have less access to customary

land (ADB, 2018b, p. 182). Discrimination on the basis of sex is prohibited by the Samoan constitution, and a national policy for gender equality was adopted in 2016 (Meleisea et al., 2015, p. 8; Ministry for Women Community & Social Development, 2016). A constitutional amendment passed in 2013 established a quota of 10% women in the national Legislative Assembly²⁴ (Pacific Women in Politics, 2020a).

There is some evidence that natural hazards have affected women's livelihoods, good quality gender-disaggregated data on the impacts of natural hazards in Samoa appear to be scarce. For example, Samoa's National Disaster Management Office has been described as documenting "anecdotal evidence (rather than hard data) on gender impacts of disasters as part of its standard procedure" (Morioka, 2016, p. 81), although recent post-disaster needs assessments do demonstrate efforts to collect sex-disaggregated information (Morioka, 2016, p. 55). Following TC Evan in 2012, the Government's post-disaster needs assessment estimated that employment and self-employment losses due to the cyclone would affect men more than women "at a nearly 9:1 ratio" (Government of Samoa, 2013, pp. xvi, 104–105; Samoa Bureau of Statistics, 2016, p. 47), although this impact is influenced by the fact that men are more likely than women to be in income-earning roles. Some of the factors that affected women's livelihoods following the cyclone included: women had to spend more time on domestic chores, particularly fetching water; fragile vegetable crops cultivated by women in household gardens were lost during the cyclone; and closure of schools affected

²³Most village churches are Congregational, Catholic, Latter-Day Saints (Mormon) or Methodist (Meleisea et al., 2015, p. 9).

²⁴In the 2016 elections, 24 women stood as candidates and four were elected to the 49-seat Legislative Assembly; in accordance with the provisions of the quota system, a new seat was created for the highest-polling unelected female candidate, bringing the total number of women in the Legislative Assembly to five out of 50 members (Pacific Women in Politics, 2020a).

women's incomes more than men's because most teachers are female (Government of Samoa, 2013, pp. 22, 51, 113). Mat weaving, a significant source of income for women, may have been affected, but at the time of the post-disaster needs assessment, the extent of damage to pandanus trees, whose leaves are used in weaving, had not yet been assessed (Government of Samoa, 2013, p. 113). Women involved in fishing did not report any negative impacts, but there were concerns that the livelihoods of women who sell commercial fishing bycatches might suffer if commercial fishing did not resume quickly (Government of Samoa, 2013, p. 113).

Gender-based violence in Samoa is widespread and generally accepted as normal. The most comprehensive and robust data available on the prevalence of gender-based violence in Samoa are from the Samoa Family Health and Safety study published in 2006, which was part of a multi-country study following World Health Organization methodology (IFRC, 2016c, p. 49; SPC, 2006, p. 1). That study found that 46% of Samoan women had experienced physical, emotional, and/or sexual abuse from a partner, with abuse being more prevalent in poorer and rural households than in wealthier and urban ones, and 62% reported being physically abused by someone other than a partner (SPC, 2006, pp. 86–87). Gender-based violence is widely accepted as normal: 73% of women in the study said that abuse in relationships is normal and not serious, and between 20% and 46% of women and men agreed that physical abuse was justified in various circumstances, including disobedience or showing disrespect (SPC, 2006, pp. 43, 86–90). More recent data from a national inquiry published in 2018 suggest that either the problem has not improved since 2006, or that it has become more acceptable to speak openly about domestic violence so that incidents are more freely reported (Office

of the Ombudsman, 2018, p. 10). The 2018 inquiry found that 86% of respondents had been subjected to physical violence within the family, and 9.5% reported that they had been raped by a family member at some point in their lives (Office of the Ombudsman, 2018, pp. 10, 15). Child marriage, which puts girls at risk of abuse, occurs in Samoa: 11% of girls are married before the age of 18 (Girls not Brides, 2020).

Legal frameworks for responding to domestic violence exist, but incidents are rarely reported to authorities. The Family Safety Act of 2013 introduced a broad definition of domestic violence and provides for courts to issue protection orders, sexual violence within a marriage relationship can be prosecuted, and there is a dedicated Domestic Violence Unit within the national police force and dedicated Family Violence Courts to deal with domestic violence cases (ADB, 2018b, p. 173; IFRC, 2016c, pp. 49–51). However, 54% of women in the Family Health and Safety Study who had been physically abused had never told anyone about it, and it is estimated that only 2% of all family violence is reported to the police (Office of the Ombudsman, 2018, p. 27; SPC, 2006, pp. 41–42). Domestic violence is considered by the majority of Samoans to be a private matter to be resolved within families and as is the case in most Pacific Island countries, Samoa has customary arbitration/reconciliation practices that are used to settle cases within or between families rather than through external authorities (IFRC, 2016c, p. 52; SPC, 2006, pp. 49–50, 64, 67–68; Taylor & Michael, 2013, p. 20). The collection of statistical data on domestic violence and sexual abuse is “sporadic at best”, error-prone (Office of the Ombudsman, 2018, p. 26), and “not taken seriously by the police” (Office of the Ombudsman, 2015, cited in ADB, 2018b, p. 173).

Evidence about gender-based violence under emergency conditions in Samoa is limited and largely anecdotal.

In studies following the 2009 tsunami and TC Evan in 2012, IFRC noted that the relatively high background level of gender-based violence already present in Samoa made it difficult to determine whether incidences of violence changed following disasters (IFRC, 2016c, p. 42). IFRC also reported that incidents of sexual violence, abuse and intimate partner violence occurred, but were not officially recorded by caseworkers or service providers, and that it was difficult to establish clear causal links to the disaster (IFRC, 2016c, pp. 51, 57). Similarly, the Samoan government's post-disaster needs assessment following TC Evan in 2013 reported that although communities and service providers

raised concerns about gender-based violence, "no specific incidents of sexual and gender-based violence attributable to the disaster were recorded" (Government of Samoa, 2013, p. 117). Unequal distribution of relief supplies was one factor identified as contributing to disillusionment, agitation and tensions that indirectly increased the risk of physical violence amongst intimate partners (IFRC, 2016c, pp. 42–43). Several sources also note that living under temporary emergency shelter conditions is a significant risk factor, as emergency shelters often entail living in crowded conditions among strangers with reduced supervision, insufficient privacy and security arrangements, and inadequate lighting, shower/bathing and toilet facilities (Government of Samoa, 2013, pp. 52, 109; IFRC, 2016c, pp. 42–43, 55–56).

Solomon Islands

In Solomon Islands, gender inequality is a significant challenge, with traditional social norms significantly restricting women's roles.

Most cultures in Solomon Islands follow gender norms that "maintain strict social hierarchies dominated by men", leading to women experiencing "vast and persistent gender inequality" (Homan, Honda, Leung, Fulu, & Fisher, 2019, p. 4). Women suffer from poor access to social services and infrastructure (notably education and health), have limited control over economic resources, and are restricted in participating in public decision-making (ADB, 2019a, p. 1; Roubin et al., 2018, p. 4). Traditional extended family structures and matrilineal land ownership systems have gradually been replaced by nuclear family structures which have promoted men's control of the family unit, and by patriarchal religious, legal, economic and political systems including control of land (Roubin et al., 2018, p. 4; UNICEF and Government of Solomon Islands, 2002, cited in SPC, 2009, p. 28; Secretariat of the Pacific Community, 2012, cited in Taylor & Michael, 2013, p. 11). Traditional restrictive social norms are stronger in rural areas than in urban areas,

which can be slightly more cosmopolitan (Soaki, 2017, p. 100). Most studies indicate that women have "very little say in everyday decisions" and "must 'stand behind' men when it comes to speaking about and dealing with resources in the public arena" (Taylor & Michael, 2013, p. 11). However, some studies suggest that within the household, decision-making can be more of a shared responsibility: a study looking at financial decision-making found that women tend to make decisions about household items, clothing, and savings, men tended to make decisions about shelter, transportation, and non-food items, and men and women made joint decisions about items such as food and education (Huber & Fischer, 2020, p. 35). The *National Gender Equality and Women's Development Policy* adopted in 2016 commits the government to ensuring that "policies and services benefit women and girls, as well as men and boys" (Government of Solomon Islands, 2016, p. 1), and gender considerations are being increasingly acknowledged in government policy, including policies on climate change and disaster risk management (Morioka, 2016, p. 41; Vaike & Salili, 2020, p. 18).

Women's participation in political life outside the household is sharply limited.

Women's participation in politics "has only recently been seriously considered", mainly under pressure from international actors; public decision-making is generally considered "men's business" and although women vote, most women do not have an understanding of political structures and processes or of government policy (Soaki, 2017, pp. 95–105). As of October 2020, Solomon Islands is ranked 177th out of 188 countries on the basis of the number of women elected to parliament, with 3 women out of 50 members of parliament (International Parliamentary Union, 2020; National Parliament of Solomon Islands, 2019; Pacific Women in Politics, 2020b).

- **Women's economic opportunities are limited by cultural practices that disadvantage women and increase men's economic power** (Roubin et al., 2018, p. 6). Within the family, women are dependent on men to give permission to pursue economic opportunities, to share care and domestic work to free up women's time, and to provide financial input into business activities (Roubin et al., 2018, p. 6). In one study, women identified the burden of unpaid care work²⁵ as their biggest barrier to economic activity: social norms dictate that women are responsible for care work and should prioritise it over economic activity, while men should not be involved in such work (Roubin et al., 2018, p. 4). Data collected in three provinces indicated that adult women contribute 12.5 hours of unpaid care work per day, young women 23.5 hours per day, and men between 2.5 and 3.5 hours per day (the high totals for women are due to the study counting simultaneous activities separately, for example child care and cooking and

cleaning the house being done at the same time, and noting that young women provide care for infants throughout day and night) (Roubin et al., 2018, pp. 4, 32). Women also feel that they are unable to access business support services such as transportation, markets, financial services, and training, and that existing support services are oriented towards activities that are seen as male domains, such as palm oil, copra, cacao and tourism, rather than value chains that women have control over, such as vegetable production, weaving, and sewing (Roubin et al., 2018, pp. 4, 6). Another study, by the World Bank, notes that literature on women's participation in agricultural value chains identifies five main constraints (World Bank, 2018a, pp. 20–23):

- **Access to resources:** lacking decision-making power over the use of land, access to technology and means of production, and access to finance.
- **Decision-making power:** exclusion from training and skills development, limited opportunities to develop knowledge through social networks, and low levels of education and literacy.
- **Control over income:** lack of participation in and control over processing and selling cash crops, suffering harassment and discrimination when selling products in markets, limited access to transportation, lacking access to market information and value-adding opportunities, lack of entrepreneurship and financial skills, limited control over household income, and limited power to control demands for money and goods from male relatives.
- **Leadership roles:** social constraints on taking

²⁵"Unpaid face to face services provided for family and community members outside of the market that strengthen the wellbeing, health and safety of the recipient, for example child care, meal preparation, laundry, cleaning, etc." (Roubin et al., 2018, p. 4).

leadership and management roles, and on participation in decision-making at every level from the household to the political level, as well as dependence on the support and approval of men for all types of initiatives.

- **Time and health burdens:** Women are responsible for the bulk of domestic chores, caring work, and fulfilling cultural obligations, leaving little time or energy for other productive activities; women also suffer disproportionate health burdens related to high fertility, low immunization rates, and heavy household workloads.

The impacts of natural hazards and climate change disproportionately affect women.

The majority of economically active women are engaged in agriculture, and although their cash incomes are small, any disruption to agricultural activities is likely to have a disproportionate effect on women's earning capacities (Government of Solomon Islands, 2014, p. 24). Disasters also often make access to clean water, firewood, and other necessities more difficult for women and girls, who are typically responsible for obtaining these items, require women and girls to spend more time farming to meet household needs (Morioka, 2016, p. 26), and increase domestic burdens such as cleaning, replanting gardens, and caring for children who are not in school (Huber & Fischer, 2020, p. 18). A Red Cross study in 2010-2011 reported, for example, that the drying up of water sources in and around the community of Namokaviri required women and girls to dig more water holes and walk farther to access water (Bill, 2012, p. 14).

Gender-based violence in Solomon Islands is widespread and considered to be within social norms. The best available data on gender-based violence come from the Solomon Islands Family Health and Safety Study, which was

carried out in 2009, but more recent, smaller scale reports indicate that gender-based violence remains widespread (Ming, Stewart, Tiller, Rice, Crowley, & Williams, 2016; Roubin et al., 2018). The Family Health and Safety Study found that 64% of women and girls aged 15 to 49 who had ever been in a relationship had experienced either physical or sexual violence, or both, by an intimate partner, 18% reported physical violence from someone other than a partner, and 18% reported sexual violence from non-partners (SPC, 2009, pp. 3-4). Violence was more common in Honiara than in rural areas, which is unusual compared with other countries (SPC, 2009, pp. 3, 77). Sexual abuse before age 15 was reported by 27% of women (SPC, 2009, p. 4), 21% of girls are married before the age of 18 (Girls not Brides, 2020), and the custom of bride price, which is a risk factor for violence, is practiced in at least two provinces (Roubin et al., 2018, p. 23; SPC, 2009, p. 29). Gender-based violence is widely accepted as normal: the majority of women surveyed (73%) believe that a man is justified in beating his wife under some circumstances (in particular, for infidelity and disobedience) (SPC, 2009, p. 3). Violence is rarely reported: 70% of women who reported physical and/or sexual partner violence in the Family Health and Safety Study had never told anyone else about it (SPC, 2009, p. 8). The Family Protection Act criminalized domestic violence in 2014; previously, there has been no legislation specifically relating to domestic violence and although a prosecution could be brought under general assault laws, such cases were rare (Homan et al., 2019, p. 10; SPC, 2009, p. 31). However, majority of domestic violence cases, if reported at all, are still resolved using traditional methods and support services for women are rare outside of Honiara (Homan et al., 2019, p. 10).

Incidences of gender-based violence in crisis have not been well documented in Solomon Islands. Following the 2007 tsunami, for example, “there were reports of men loitering around bath facilities used by women and girls in evacuation camps”, one case of child sexual abuse was reported, but other incidents of violence were believed to remain unreported “due to women’s fears for their safety should they speak out against the perpetrator” (Tara, 2007, cited in Morioka, 2016, p. 26). Following the 2013 earthquake and tsunami, an assessment acknowledged that gender-

based violence had been a concern before the earthquake, but stated that no increase in violence had been observed although admitting that “there is a general lack of detailed information about the protection situation in the temporary settlements and about possible gender-based violence” (Government of Solomon Islands, 2013, p. 21). A 2019 study noted that data collection about protection of vulnerable groups is routinely lacking, citing assessments carried out following the 2016 Makira earthquake, flooding in Honiara in 2018, and TC Liua in 2018 (Sutton, Flint, Lees, & Kenni, 2019, pp. 18–19).

Tonga

In Tonga, gender inequality is a significant challenge, with social roles heavily influenced by traditional values and gender stereotypes. Cultural norms allocate men decision-making roles in the public arena, and usually in the household as well, with women being “generally excluded from planning and decision-making processes” at all levels from national politics to the village level (CARE, 2018, p. 12). In general, men’s roles tend to lie outside the home and include commercial agriculture, offshore fishing, and tasks requiring physical labor in areas like agriculture and construction; women and girls undertake agricultural work and fishing, mostly for subsistence purposes, and are primarily responsible for caring for family members, for community, family, and church activities, and for making handicrafts (CARE, 2018, p. 12). Significant numbers of men migrate overseas as seasonal laborers, and mostly for this reason about 20% of households on Tongatapu and 25% on 'Eua are headed by women (CARE, 2018, p. 6). Both men and women undertake paid work, although the labor force participation rate for women is lower than for men (66% and 81%, respectively) and the unemployment rate for women is much higher than for men (27% and 8%, respectively) (Tonga Statistics Department, 2017a, p. 10). Women do not have the right to own land in

Tonga, except by inheriting land from a male ancestor or a husband where no male heirs exist, which makes women dependent on male relatives’ good will and social convention for accommodation and livelihoods (Allens, 2017), and “some women with no land or income remain in households with violent fathers, uncles, family members or husbands with no viable means of support to leave” (Kingdom of Tonga Ministry of Internal Affairs, 2019, p. 4). Women are active in the informal economy, leading small and micro-enterprises and small retail shops, and making handicrafts (CARE, 2018, p. 4; Government of Tonga, 2018a). Handicraft work, which relies on locally-available natural resources such as pandanus leaves, is vulnerable to natural hazards and climate change (Government of Tonga, 2018a, p. 7). Tonga’s national Gender and Development policy commits to gender equality, but notes that cultural attitudes continue to assign women a lower status than men (CARE, 2018, p. 12).

Some natural hazards affect natural resource-based activities that are primarily undertaken by women. For example, mulberry and pandanus trees, which are strongly affected by cyclones, are used by women for agriculture and handicrafts so damage to them will have significant impacts on women’s livelihoods, while damage to root crops, which are less

severely affected by high winds, affects incomes of men (CARE, 2018, p. 9). In particular, home-based production of handicrafts, such as weaving mats, baskets and traditional clothing, is primarily done by women and is a significant source of income, especially in the outer islands where handicrafts contribute more than half of household income (CARE, 2018, p. 13; Government of Tonga, 2018a). TC Gita caused extensive damage to several of the species of plants on 'Eua Island that women use to make handicrafts which they sell locally, regionally, and internationally, which may force women to explore other options for producing handicraft, or to seek other business ventures, informal employment, or unpaid work (Government of Tonga, 2018b, pp. 28–29). Similarly, the tsunami of 2009 damaged houses and sheds on the island of Niuatoputapu used by women for weaving pandanus leaf mats for sale, which is one of the main sources of cash income on the island (along with government employment and remittances from relatives overseas) (Kingdom of Tonga, 2009, p. 6). The tsunami also covered the coral reef with silt, which affected the collection of shellfish and sea cucumbers from the reef, which is an activity normally done by women (Kingdom of Tonga, 2009, pp. 6–7).

Gender-based violence in Tonga is widespread and is likely to be exacerbated by natural hazards. In a 2009 survey, 45% of women reported experiencing physical, sexual, or emotional violence from an intimate partner

at any point in their lives, and 19% reported physical and/or sexual violence in the 12 months preceding the survey (Jansen, Johansson-Fua, Hafoka-Blake, & 'Ilolahia, 2012, p. 40). Violence against women and children is prosecuted and a 'no drop' policy²⁶ is in place (CARE, 2018, p. 13), but the 2009 survey found that 75% of abused women never sought help from any official authorities (Jansen et al., 2012, pp. 97, 227). Worldwide, evidence shows that gender-based violence often increases following disasters, in all countries at all stages of development (Masson et al., 2016, p. 11). Following TC Gita, women and girls reported feeling unsafe due to lack of power for lighting²⁷ and phones (Government of Tonga, 2018b, p. 30). Concerns about shortages of food and water, lack of electricity, lost income, cost of repairs to damaged houses, and household duties and caring responsibilities were cited as factors that contributed to tension and conflict within the household (CARE, 2018, pp. 6, 10). Some emergency shelters lacked adequate supplies to support the number of evacuees housed, or did not have the means to provide safe and private spaces for women, children, and lactating mothers (Government of Tonga, 2018b, p. 30). Some women and girls who were relocated to emergency accommodations reported feeling unsafe due to a lack of segregated, well-lit, and lockable toilet and sleeping facilities, separation of children from family members, and a lack of support services (CARE, 2018, p. 5; IFRC, 2018b).

²⁶ Once a case of domestic violence has been filed, these cases cannot be dropped and must move on to be dealt with in the magistrates' courts (Nam, 2017).

²⁷ Solar-powered street lighting installed in some areas proved to be robust, with most installations surviving undamaged, while those that were damaged were quickly repaired (CARE, 2018, p. 2).

Vanuatu

In Vanuatu, gender inequality is a significant challenge, and women's political and economic participation is significantly limited by social norms. Women are largely excluded from decision-making processes at the national and local levels, including the traditional local governance systems present in all communities, and face challenges accessing paid employment outside of agriculture (CARE, 2015b, p. 3; Government of Vanuatu, 2015b, p. 103, 2015a, p. 26). Vanuatu is one of only three countries in the world that has no women in its national parliament (the other two are the Federated States of Micronesia and Vanuatu) (International Parliamentary Union, 2020). Men and women tend to undertake different types of livelihood activities: men typically undertake more profitable activities including fishing, growing cash crops, and operating shops, while women are typically involved in activities such as weaving mats and baskets, selling prepared food at markets, sewing clothes for sale, and growing vegetables for subsistence or sale (Government of Vanuatu, 2015b, p. 95). Gender-based inequality is deeper in urban areas than in rural areas, and there is significant disparity in wages and economic opportunities (Rust, 2019, p. 10). The labor force participation rate in 2016 was 61.7% for women and 80.5% for men (ILO, 2017b, p. 29). The government has made significant efforts to acknowledge the impacts of natural hazards on women's social and economic well-being and to collect sex and age disaggregated data in disaster risk reduction work, and is seeking to increase women's participation in decision-making forums (Government of Vanuatu, 2015a, pp. 16, 26), and recent post-disaster needs assessments such as the one that followed TC Pam in 2015 demonstrate significant attention to gender issues.

Natural hazards can disproportionately affect women's livelihoods by damaging natural resources that women rely on and because women's social roles can inhibit them from pursuing alternative income-earning activities.

In Vanuatu, for example, making handicrafts is a major economic activity for women which was badly affected because of extensive damage to pandanus trees (Government of Vanuatu, 2015b, p. 97; Morioka, 2016, p. 24). The government lifted a seasonal ban on sandalwood harvesting, a role taken by men, to stimulate the economy, but the damage to pandanus trees that affected women's livelihoods did not attract much attention because they were not officially regarded as an agricultural commodity (Morioka, 2016, p. 24). The loss of food crops was a double blow to women, not only affecting households' own food supplies but also affecting women who prepared and sold food in markets, which is another major economic activity for women (Morioka, 2016, p. 24). The Government's post-disaster needs assessment of TC Pam noted that women were more likely than men to be affected by the cyclone because of women's higher poverty levels, disproportionate share of family care work, and because women are often employed in low-skilled work (Government of Vanuatu, 2015b, pp. 94, 105). A study carried out in 2000 found that women spend four times as many hours as men on unpaid household work (27.2 hours per week compared with 6.6 hours for men) during normal times²⁸, and women's domestic and caring workloads increased dramatically following the cyclone (Government of Vanuatu, 2015b, p. 105). Following TC Pam, women tended to have high workloads, experience post-disaster emotional distress, have their voices filtered through male managers, have their finances controlled by

²⁸These figures are cited by multiple sources, but come originally from a study carried out by Foundation of the People of South Pacific International: Whyte, J., S. Siwatibau, et al. (2000). Vanuatu Rural Time Use Survey.

husbands, and undertake stereotypical income-generating activities (Clissold, Westoby, & McNamara, 2020, p. 108). Some authors also note that women played an important role in post-disaster recovery by sharing resources, helping each other across formal and informal social networks, and through diversification, adaptation, and entrepreneurialism (Clissold et al., 2020, p. 108).

Gender-based violence in Vanuatu is widespread and widely accepted based on traditional social norms. A study on violence against women and girls conducted in 2009 found that 60% who have ever been in a relationship have experienced either physical or sexual violence or both by a husband or intimate partner (Vanuatu Women's Centre, 2011, p. 55). A 2013 survey showed that 56% of men and 60% of women agree that a husband is justified in beating his wife²⁹ (Vanuatu Ministry of Health; Vanuatu National Statistics Office; and the Secretariat of the Pacific Community, 2013, pp. 228–232). Marriage at a young age is common (21% of girls are married before the age of 18), which put girls at high risk of abuse (Girls not Brides, 2020; Taylor & Michael, 2013, pp. 12–13), and the practice of bride-price is cited as a factor in perpetuating violence against women (Taylor & Michael, 2013, p. 12). National policy and law criminalizes gender-based violence, provides access to protection orders, and seeks to counter some traditional discriminatory practices and address gender inequalities (Taylor & Michael, 2013, p. 17), but nevertheless gender-based violence is high,

widely accepted, and often considered to be a private matter to be resolved within families following traditional customs (Anderson et al., 2017b, p. 119; Government of Vanuatu, 2015b, p. 103).

There is limited evidence available about gender-based violence under emergency conditions in Vanuatu. Assessment reports for disasters in Vanuatu have raised concerns and highlighted risks, but provide little robust evidence on the incidence of gender-based violence following disasters. Following two tropical cyclones in 2011, a counseling center on Tanna island reported more than a tripling in domestic violence cases (CARE, 2015b, p. 8). Surveys of evacuees from Ambae island in 2017 found that between 10% and 35% of respondents had observed increases in domestic violence and child abuse (Gender & Protection Cluster, 2017b, p. 5, 2017c, p. 5, 2017a, p. 3). Following TC Pam in 2015, emergency shelter facilities on Emae and Tanna islands were noted to be often overcrowded and lacking privacy and lighting, particularly around toilet facilities, which are identified as risk factors for sexual violence (CARE, 2015b, p. 8; Government of Vanuatu, 2015b, p. 106), but no data on outcomes regarding gender-based violence following TC Pam could be located. A review of the Australian government's response to Cyclone Pam stated that "Vanuatu Women's Crisis Centre and communities reported that domestic violence had increased in the weeks and months following the cyclone," but no figures are given (Office of Development Effectiveness, 2017, p. 61).

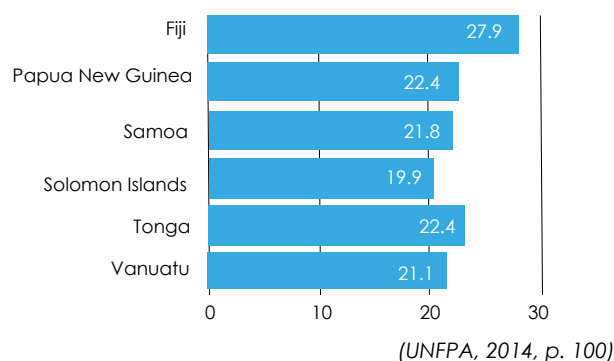
²⁹Specifically, respondents agreed that a husband is justified in hitting or beating his wife for one or more of the following reasons: she burns the food, argues with him, goes out without telling him, neglects the children, or refuses to have sexual intercourse with him.

2.8. Youth

Countries across the Pacific region have young populations that are growing, marginalized, and experiencing challenges accessing quality education and employment. Across the region,

youths aged 15-24 make up 19.7% of the population, compared with the global average of 15.5% (Clarke & Azzopardi, 2019, p. 6; United Nations Population Division, 2019). In Solomon Islands, 19% of the population is between the ages of 15 and 24 years (United Nations Population Division, 2019). Youth development is a major concern across the region, particularly in relation to educational quality and relevance, employment and entrepreneurship, health (particularly non-communicable diseases, sexual and reproductive health, and mental health), civic and political representation and participation, protection from abuse and exploitation, gender equality, and equality for young people with disabilities (Clarke & Azzopardi, 2019, pp. vi–viii; SPC [Secretariat of

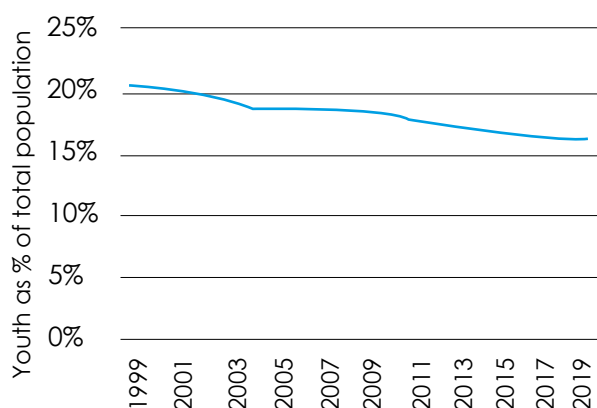
■ Median ages for Pacific region countries ■



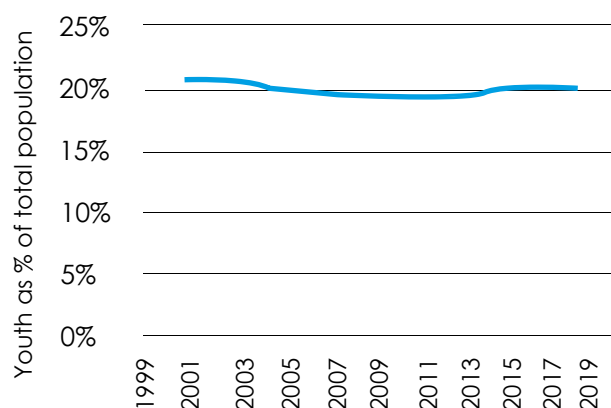
the Pacific Community], 2015, pp. 5–6, 18–19). Region-wide, however, there is a general lack of statistical data disaggregated by age in areas such as education, health, and employment, which makes it difficult to identify priorities and evaluate progress (Clarke & Azzopardi, 2019, p. vi; SPC, 2015, pp. 6, 11).

Youth population (ages 15-24) as a percentage of total population

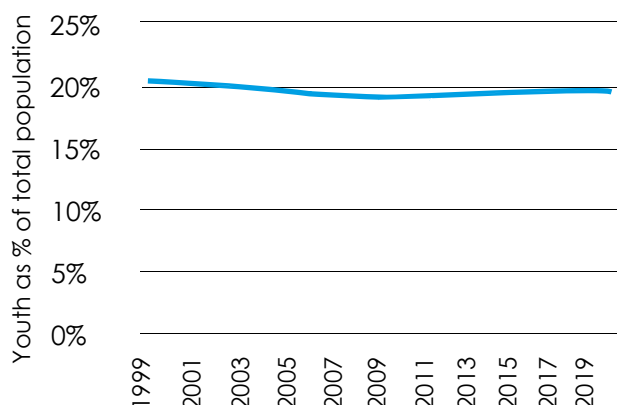
■ Fiji



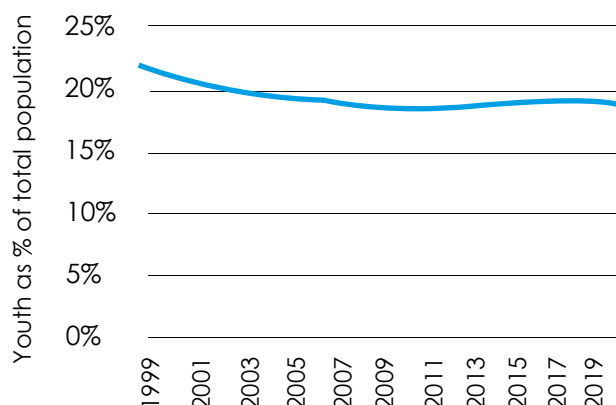
■ Papua New Guinea



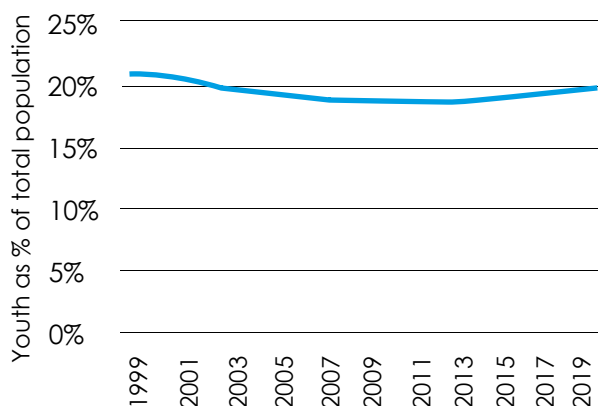
Samoa



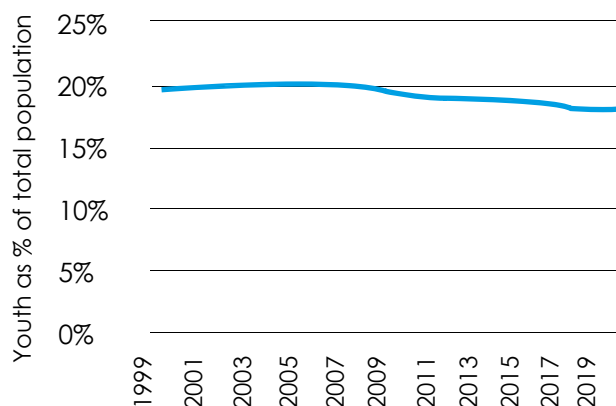
Solomon Islands



Tonga



Vanuatu



(United Nations Population Division, 2019)

Across the Pacific, evidence shows that natural hazards can disrupt education with long-term consequences for young people. In the Philippines, for example, one year after Typhoon Washi (2011), 23% of families in one of the most severely-affected cities said their children had permanently dropped out of school (Barber, 2014, p. 11), and in Australia research five years after the 'Black Saturday' bushfires in Victoria state (2009) found that children in some affected areas were suffering developmental delays of between one and five years (Hubbard, B., 2014, cited in Barber, 2014, p. 10). Disasters often exacerbate existing inequalities, notably gender inequality, and in many countries girls are more likely than boys to be pulled out of school during crisis, and many do not return (Barber, 2014, p. 11).

Across the Pacific region, youth employment and employability are significant concerns and there is evidence that youths are particularly vulnerable to the impacts of economic crises and natural hazards. Many youths experience difficulty making the school-to-work transition, job opportunities in the formal economy are limited and economic growth is low, the number of youth reaching working age is large, and there is a mismatch between the skills taught by education and training institutions and employers' needs (Clarke & Azzopardi, 2019, pp. 95–108; ILO, 2017a, p. 7). Across the region, youths are over-represented in the informal economy and more likely to be unemployed or in vulnerable work (ILO, 2019a, p. 12). They are disproportionately employed as temporary workers and in low-quality and low-skilled jobs; they are perceived to lack education, skills, and experience; and they lack the social networks,

job market information, and experience to find new work (Marcus & Gavrilovic, 2010, pp. 9–10). Official unemployment figures may understate youth unemployment as many youths drop out of the labor force and give up actively seeking work (ILO, 2017a, p. 7). In economic crisis and as a result of severe weather events, young people are pushed into the informal sector, underemployment, deteriorating employment conditions, and lower earnings (Marcus & Gavrilovic, 2010, pp. 9–19). The effects of a crisis can be long term, including depreciation of skills, failure to develop human capital, delayed transition to adulthood, permanently reduced employment prospects and incomes, and increased vulnerability of social exclusion (Marcus & Gavrilovic, 2010, pp. 9–19). Many young people are employed in an informal capacity in agriculture, tourism, and fisheries, which are particularly vulnerable to climate change and natural hazards (ILO, 2017b, p. 138).

Fiji

In Fiji, floods and cyclones have disrupted education, but there is limited evidence about events prior to 2016. Widespread flooding in the Western Division of Fiji in 2012 forced more than 15,000 people from their homes and affected about 150,000 people, and although there are no systematic data on school closures or attendance³⁰, there were reports of some rural residents being displaced to informal settlements where children lacked access to education (Ravesloot & Sobir, 2017, p. 12). Following TC Evan, also in 2012, assessments reported damage to 118 primary and 32 secondary schools, but similarly no data were available on disruption to education (Ravesloot & Sobir, 2017, p. 12). A study in Cakaudrove Province, a rural area where traditional, non-

It is often presumed that there is a link between youth unemployment and participation in crime and political violence, but there is little hard evidence of this. There are suggestions in the literature that widespread youth unemployment leads to participation in insurgencies, extremism, and violent gangs, but this appears to be “based more on intuition and assumption than on evidence” (Cramer, 2015, p. 1). Research does not directly disprove such a link, but there is insufficient data to show clearly that a link exists, and studies suggest that more important drivers of instability include weak governance, corruption, injustice, discrimination, humiliation, leadership offered by armed groups, availability of weapons, drug use, dysfunctional family relationships, and experience of violence in a culture of acceptance of violence (Idris, 2016, pp. 2–4).

mechanized farming practices are used, showed that boys from households affected by Cyclone Ami (2003) had a greater tendency than girls to drop out of school and take up farm work if housing aid was not provided, where housing aid was delivered within two years of the cyclone, dropout rates were reduced and the gender gap in schooling was eliminated (Takasaki, 2017, pp. 75–76).

Tropical cyclone Winston caused considerable damage to school infrastructure and led to reduced academic performance in the year following the storm. Most schools officially reopened within two weeks of the cyclone, although the first week or two was typically occupied with cleaning up debris and providing

³⁰Ravesloot & Sobir (2017, p. 11) note that: “Other than damage assessment information, quantitative and qualitative information were not readily available on the impact of floods and Cyclone Evan. As FEMIS [Fiji Education Management Information System] was not yet fully functional at that time, there was not sufficient data collected and/or consolidated on all relevant EIE/CSS indicators (e.g. for how many days schools were closed).”

psycho-social support, with regular teaching only resuming in the third or fourth week (Ravesloot & Sobir, 2017, pp. 13, 18). Very few schools closed entirely, and where necessary students were reassigned and transported to other schools (Ravesloot & Sobir, 2017, p. 17). Repairs have been slow, however, and even seven months after the cyclone many schools were still using tents as temporary teaching facilities because “the bulk of the reconstruction and rehabilitation of affected school infrastructure had not begun” (Ravesloot & Sobir, 2017, pp. 17–19). School attendance dropped by more than half immediately after the cyclone, as teachers, students and families prioritised repairing property damage and cleaning up debris, waited for transport links to be restored, or coped with injury, illness, or death in the family; attendance returned to normal after about three months (Ravesloot & Sobir, 2017, pp. 16–17). Teachers reported that students, especially younger students, showed decreased participation and concentration, and increased behavioural and emotional problems, in the months following the cyclone (Ravesloot & Sobir, 2017, p. 18). Students’ academic performance dropped significantly in the two terms following the cyclone in both primary and secondary schools, with slower

learners and those in the final year of high school being particularly disadvantaged, “the latter because their performance will account for future eligibility for scholarships for higher education” (Ravesloot & Sobir, 2017, p. 31).

In Fiji, the unemployment rate for youth is high, but there does not appear to be direct evidence about how natural hazards affect youth employment.

The unemployment rate for youths is 3.6 times the overall unemployment rate, and the rate for young women is 5.4 times the overall rate (World Bank, 2020e). Most school leavers are forced to seek work in the informal sector because of the lack of job opportunities in the formal economy (Prasad, Chen, & Singh, 2013, p. 31). The unemployment rate for young women is double the rate for young men: 22.0% compared with 11.4% (World Bank, 2020e). For young people with post-secondary education, this disparity holds but is slightly narrower: 23% of young women with post-secondary education are unemployed, compared with 15% of young men with post-secondary education (Prasad et al., 2013, p. 43). Official unemployment figures may understate youth unemployment in the region, as many youths drop out of the labor force and give up actively seeking work (ILO, 2017a, p. 7).

Papua New Guinea

In Papua New Guinea, natural hazards have disrupted education provision, but there are very little quantitative data about disruptions, and no evidence about the resulting outcomes for students.

A survey of internally displaced people across ten provinces (72% of whom had been displaced by the effects of natural hazards, with the remainder displaced as a result of tribal and ethnic violence) found that 29% of households reported having children of school-going age who were not attending school, primarily because of unaffordable school fees, the need for children to work to support the family, or the school being too far away (IOM, 2017, p. 12). A study following the 2018 earthquake found that poor families were

likely to prioritise the education of boys over girls if families were unable to afford school fees for all children (Brun, 2018, p. 1). A study conducted during the 2015 drought described “a high incidence of children and teachers not attending schools as a direct result of the drought” (CARE, 2015a, p. 1). The study team visited ten regions affected by drought and found that schools were either completely closed or only operating half-days due to the lack of food and water at the schools and due to teachers being unable to work as they were coping with the effects of the drought themselves. There was also “a high level” of absenteeism, as parents held back children if they had no food to send with them to school,

many children took on additional responsibilities for water collection at home, and some families became unable to afford school fees (CARE, 2015a, pp. 6–7, 10). Following the 2018 volcano on Manam Island, classes on the island were suspended and although school buildings were not damaged at the time of the assessments, teachers had evacuated from the island, and students' books, uniforms and other equipment in the worst-affected villages were likely to have been lost along with their houses (ACAPS, 2018, p. 4). In 2016, primary net school enrollment rates were 96% for males and 90% for females, lower secondary net enrollment rates were 90% and 81%, and upper secondary rates were 60% and 49%, which are only slightly below average for the region (UNESCO, 2020).

Papua New Guinea's labor market fails to provide sufficient employment opportunities for youth, and there is considerable interest in increasing youth employment, but no evidence available specifically about the impacts of natural hazards on youth employment. The ILO estimates that only 10,000 of the approximately 80,000 school leavers each year find work in

the formal labor market, with the majority of the rest pursuing subsistence livelihoods in their village communities or otherwise remaining unemployed or underemployed in the informal economy which is linked with lower wages, poor working conditions and limited career prospects (ILO, 2017a, p. 7, 2018, p. 3). The youth unemployment rate (4.5% overall, 5.6% for young men and 3.4% for young women) is 1.8 times the overall unemployment rate (2.5%) (World Bank, 2020e). However, the ILO cautions that official unemployment figures may understate youth unemployment, as many youths drop out of the labor force and give up actively seeking work (ILO, 2017a, p. 7). Skill shortages are a problem for young people; there are mismatches between employers' needs and the training offered by educational institutions, on-the-job training and apprenticeship programs are small and inefficient, and there is a lack of entrepreneurial skills (ILO, 2017a, pp. 7–8). In the time available for this study, it was not possible to locate any evidence that specifically addressed the impacts of natural hazards on youth employment.

Samoa

In Samoa, cyclones and tsunamis have damaged schools and disrupted education provision, but no good quality evidence is available about the resulting outcomes for students. Natural hazards "are significant barriers to education, not only because they damage the physical infrastructure of schools, preventing attendance, but also because they reportedly affect the physical and psychological well-being of children, who prefer to remain at home rather than attending school during these events" (Anderson, Barnes, Raoof, & Hamilton, 2017a, p. 65). TC Evan in 2012 caused damage and losses to school buildings, furniture, equipment, and educational materials valued at WST 7.8 million (USD 3.4 million), ranging from

minor repairs and cleaning required in schools that were used as emergency shelters up to complete destruction of some school buildings (Government of Samoa, 2013, pp. 50–51). Some 5,300 students were affected (AusAID, 2013) but there appears to be no good evidence available on the extent of the disruption suffered. Emergency shelter workers reported that child labor (typically selling products on the street or begging to provide income for the family) increased as a result of the effects of TC Evan, but there is no robust evidence about the extent of the increase (Anderson et al., 2017a, p. 75; IFRC, 2016c, p. 57). The 2009 tsunami affected seven schools with 1,087 students and caused damage estimated at WST 9.0 million

(USD 3.6 million) (Government of Samoa, 2009, p. 18). Temporary facilities were established where feasible and students were reallocated to nearby schools as a temporary measure until repairs could be completed; teaching resumed within about three weeks of the tsunami, with priority given to students who were due to take key national exams shortly thereafter (OCHA, 2009, p. 2). Following both of these disasters, there were concerns that the loss of income-earning opportunities and subsistence food production would lead to families having difficulty paying for costs such as school fees, uniforms, and transportation (Government of Samoa, 2009, p. 20, 2013, p. 51). These pressures were expected to be most severe in the case of the 2009 tsunami, as the area affected was one of the poorest areas in the country (Government of Samoa, 2009, p. 20). Education completion rates in Samoa are high by regional standards, with 76% of Samoans completing primary school, 82% of females and 71% of males continuing on to secondary school, and 68% of the adult (ages 15 to 65) population completing secondary school (Pita & Schoop, 2015, p. 7).

In Samoa, job opportunities in the formal economy are limited and most youths transition from school into the informal economy or subsistence agriculture. The youth unemployment rate is 18.1% (15.3% for young men and 22.8% for young women), which is more than twice the overall unemployment rate of 8.4% (World Bank, 2020e), and the ILO cautions that official unemployment figures may understate youth unemployment, as many youths drop out of the labor force and

give up actively seeking work (ILO, 2017a, p. 7). Young women, early school leavers and those with low levels of education, youth with special needs, and youth living in rural areas are more likely to be unemployed than other groups (Pita & Schoop, 2015, p. 10). Many youths in Samoa are disengaged from the formal economy: the proportion of youth not in employment, education, or training is high, at 41% (ILO, 2017b, p. 27), and approximately 13% of youths say they are not interested in formal work (Pita & Schoop, 2015, p. 7). The informal economy involves 68% of the total labor force and absorbs the majority of youths entering the labor force, with many of the rest moving into subsistence agriculture (Pita & Schoop, 2015, p. 6). There is a mismatch between the skills that young Samoans receive at school and in technical and vocational training, and the needs of employers; youth often enter the labor market with poor core employability skills, and weak systems for labor market information and career guidance for youth do not adequately support their transition to work (Pita & Schoop, 2015, pp. 7–9). The private sector struggles to accommodate the numbers of young people coming out of school (approximately 4,000 per year); constraints that limit job creation by MSMEs and hinder young entrepreneurs include limited access to start-up capital and credit, insufficient forms of other financial and non-financial business support, and high training costs (Pita & Schoop, 2015, p. 10). There appears to be little or no information specifically addressing the impacts of natural hazards on youth employment in Samoa, apart from a general impediment to economic growth.

Solomon Islands

In Solomon Islands, there are numerous reports of infrastructure damage and disruption to education caused by natural hazards, but little or no evidence about the resulting outcomes for students. For example, an earthquake and tsunami in February 2013 damaged 21 schools and displaced an estimated 2,714 children, with most classes resuming in April; flooding in Makira in July 2013 disrupted schooling for 144 students for over a month; floods caused by TC Ita in 2014 damaged or destroyed 33 schools in Honiara and Guadalcanal; and in 2015 many schools closed or operated short days due to water shortages caused by the El Niño drought (Solomon Islands Government, 2015, pp. 10–11). The Solomon Islands Government has noted that “the impact of recurrent flooding events on schooling is undocumented but contributes to a significant number of school days lost in any given year” (Solomon Islands Government, 2015, p. 10). The Government also notes that there are no documented contingency plans or guidance to assure educational continuity in disasters either at the provincial level or individual school level, that quality of school construction is often low, and that there is a lack of temporary learning facilities apart from tents available from UNICEF and Save the Children (Solomon Islands Government, 2015, pp. 18, 20–23). Gross enrollment rates for females and males in 2013 in primary school were 112% and 113% respectively, and in secondary school

49% and 51%; overall completion rates are not available but in 2013 the number of students enrolled in the first stage of primary school in 2013 was 23,266 and the number enrolled in the final year of secondary school was only 596, suggesting that no more than 2.6% of children complete the full course of primary and secondary schooling (Solomon Islands Government, 2015, pp. 4–5). The cost of school fees is a significant barrier for much of the population (Solomon Islands Government, 2015, p. 2).

The Solomon Islands labor market fails to provide sufficient employment opportunities for the majority of the population. Each year, the formal economy produces about 400 new jobs while about 10,000 young people join the labor force (ILO, 2017a, p. 7). Officially, unemployment rates appear very low, with the youth unemployment rate at 1.1% overall (0.8% for young men and 1.3% for young women) being twice the overall unemployment rate (0.6%) (World Bank, 2020e), but the ILO cautions that official unemployment figures may understate youth unemployment, as many youths drop out of the labor force and give up actively seeking work (ILO, 2017a, p. 7). Evidence specifically addressing the impacts of natural hazards on youth employment in Solomon Islands, beyond generally inhibiting economic growth, does not appear to be available.

Tonga

In Tonga, cyclones have damaged schools and disrupted education provision, but there appears to be no evidence available about the resulting outcomes for students. UNICEF, for example, notes that the education system in Tonga is vulnerable to natural hazards, but that “quantitative data on the impact of disasters on school infrastructure and children attending school is unavailable” (Anderson, Barnes, Raoof, & Hamilton, 2019, p. 54) although some information about the extent and nature of damage caused by some past hazards is available. For example, TC Gita caused

widespread damage to 109 out of 150 (73%) educational facilities on the affected islands, affecting 23,000 to 25,000 students (IFRC, 2018b, p. 4; Kingdom of Tonga, 2018a, p. 40). All schools in the affected areas were closed for between four days and three weeks, with students returning to most schools quickly (IFRC, 2018b, p. 4; Kingdom of Tonga, 2018a, p. 77). Students were transported to alternative schools if their regular schools could not be reopened quickly (Kingdom of Tonga, 2018a, p. 40). Temporary relief to damaged schools (provided by UNICEF) included school supplies, tents

and tarpaulins, recreation kits, early childhood development kits, and backpacks for students (Kingdom of Tonga, 2018a, p. 77). Media reports indicate, however, that at least 17 months after the cyclone some schools on Tongatapu were still using tents which had been intended to serve as temporary classrooms (Radio New Zealand, 2019b).

Tonga's youth face poor labor market outcomes and a large proportion of youth fail to transition into employment, remaining unemployed or inactive in the labor market (Government of Tonga, 2018b, p. 35; World Bank, 2017a, p. 4). Economic disadvantages due to the country's small size, remoteness, exposure to economic shocks and natural hazards have led to slow economic growth and job creation (World Bank, 2017a, p. 3). The unemployment rate for youths is 3.2 times the overall unemployment rate, and the rate for young women is 6.2 times the overall rate (World Bank, 2020e). A relatively high proportion of youths aged 15-34 are not in employment, education or training: 45% of young women and 35% of men (Tonga Statistics Department, 2019, p. 6). A study of youth on 'Eua Island found that although there are increasing expectations that young people

should find paid work after completing school, families also still rely on younger family members to help with farming, fishing and other self-provisioning activities, and when formal waged employment is unavailable, many youth work at home instead (Good, 2019, p. 42). A mismatch between the technical and vocational training available and the skills in demand in industry, and a secondary school dropout rate of 25% may also be contributing factors to low youth employability (World Bank, 2017a, p. 4).

Very little information appears to be available specifically addressing the impacts of natural hazards on youth employment in Tonga. UNICEF and World Bank reports cite exposure to natural hazards as a contributing factor for the shortage of employment opportunities for youth in Tonga (Anderson et al., 2019, p. 83; World Bank, 2017a, p. 3), but specific details of how natural hazards have affected employment, beyond generally inhibiting economic growth, do not appear to be available. The Government of Tonga's post-disaster assessment of TC Gita notes that the high youth unemployment rate "is concerning, especially since it could be further exacerbated by the cyclone" (Government of Tonga, 2018b, p. 28).

Vanuatu

In Vanuatu, cyclones have damaged schools and disrupted education provision, but very little evidence is available about the resulting outcomes for students. A UNICEF report notes a lack of data on the impacts of disasters on school infrastructure and school attendance in Vanuatu, although reporting that disasters have an impact in the form of reduced access to schools and school closures, and that "anecdotal evidence suggests that children in Vanuatu are often kept out of school in the aftermath of a natural disaster to help their families with clean-up activities" (Anderson et al., 2017b, p. 64). The physical damage inflicted on schools for recent events has been increasingly well documented in recent years, but there is a lack of information about the impact on educational outcomes. TC Pam, for

example, is reported to have damaged 64% of primary and secondary schools in affected areas, as well as damaging kindergartens and staff housing, affecting 34,614 students (Government of Vanuatu, 2015b, pp. 47–48). Many school facilities had been built to poor standards or not well maintained, including some built by local communities on limited budgets and not following building standards (Government of Vanuatu, 2015b, p. 46). Schools were typically closed for 10 to 30 days following the cyclone (Ireland, 2016, p. 28); those with minor damage resumed lessons within about two weeks, and all schools were operating within about two months (SPC, 2016, p. 41). However, some schools were still using tents as temporary facilities in late 2016, a year and a half after the cyclone (IMF, 2016, p. 69).

Following disasters, children are more likely to drop out of school to support their family through agricultural or domestic work and because of reduced household income to pay for school fees, which is more likely to affect girls than boys because girls tend to take on more domestic responsibilities (Government of Vanuatu, 2015b, pp. 49–50). School enrolment rates in Vanuatu are high at the primary school level, but most children do not go onto secondary school due to the limited number of places available, distances, and costs (Ireland, 2016, p. 26) and because many subsistence households rely on the labor of younger family members (Government of Vanuatu, 2015b, p. 88). Gross enrolment rates for primary school are 130% for males and 125% for females, and for secondary school are 44% for males and 50% for females (Ministry of Education and Training, 2020, p. 20). Only about 5% of the population goes on to tertiary education (SPC, 2015, p. 25). Damage caused by TC Pam in 2015 may have contributed to a reduction in primary school enrolment in 2015 (Anderson et al., 2017b, p. 77) (the primary gross enrollment rate fell by nine percentage points, from 118% to 109%, between 2013 and 2015) (UNESCO, 2020).

Vanuatu's labor market fails to provide sufficient employment opportunities for the majority of the population (Government of Vanuatu, 2015b, p. 89). The formal economy produces fewer than 700 new jobs each year, and 3,500 to 5,000 young people join the labor force each year (Government of Vanuatu, 2015b, p. 89;

ILO, 2017a, p. 7). The youth unemployment rate (8.8% overall, 8.5% for young men and 9.1% for young women) is twice the overall unemployment rate (4.4%) (ILO, 2017a, p. 6; World Bank, 2020e). However, the ILO cautions that official unemployment figures may understate youth unemployment, as many youths drop out of the labor force and give up actively seeking work (ILO, 2017a, p. 7). Youth employment tends to be informal and insecure (Anderson et al., 2017b, p. 112). A lack of opportunities for adolescents and young people perpetuates cycles of poverty and has led to unhealthy behavior, such as drug and alcohol abuse, and mental health issues (Anderson et al., 2017b, p. 5).

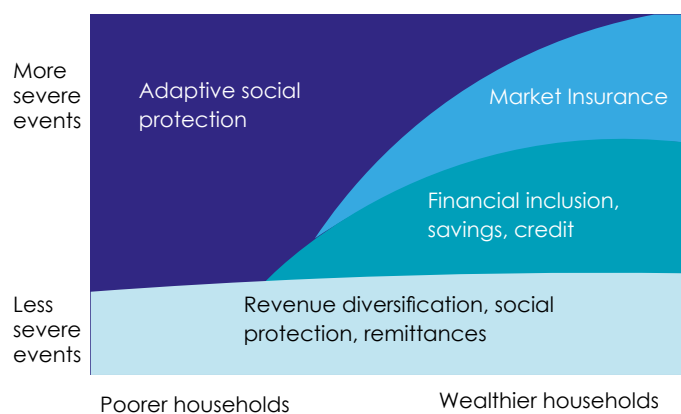
Very little information appears to be available specifically addressing the impacts of natural hazards on youth employment in Vanuatu. The Government of Vanuatu's post-disaster needs assessment of TC Pam notes that youth are particularly vulnerable: "youth are generally the first to lose their jobs in times of economic contraction and the last to gain employment when the economy rebounds" (Government of Vanuatu, 2015b, p. 92). Exposure to natural hazards contributes to weak economic growth and a shortage of employment opportunities for youth in Vanuatu (Anderson et al., 2017b, p. 112), but specific details of how natural hazards have affected employment, beyond generally inhibiting economic growth, do not appear to be available.

3. Coping Mechanisms

3.1. Types of Coping Mechanisms

The Global Facility for Disaster Reduction and Recovery outlines four broad types of financial mechanisms for helping households cope with disaster risk (Hallegatte et al., 2017, pp. 11–13):

- **Revenue diversification** including cash transfers from social programs and remittances from family members abroad can help households at all wealth levels cope with relatively small shocks;
- **Adaptive social protection**, or scaling up social safety nets, can protect poor households against larger shocks if targeting and delivery are flexible and can respond quickly to need;
- **Financial inclusion** enables people save in ways that are less vulnerable to hazards than property like livestock and housing, and enables them to access credit which can accelerate recovery and reconstruction, although poor people's own resources are likely to be insufficient for larger shocks; and
- **Market insurance** can protect against larger losses, but efforts to provide universal access to insurance face challenges of weak institutional and legal capacity, affordability, and high transaction costs, especially for the poor.



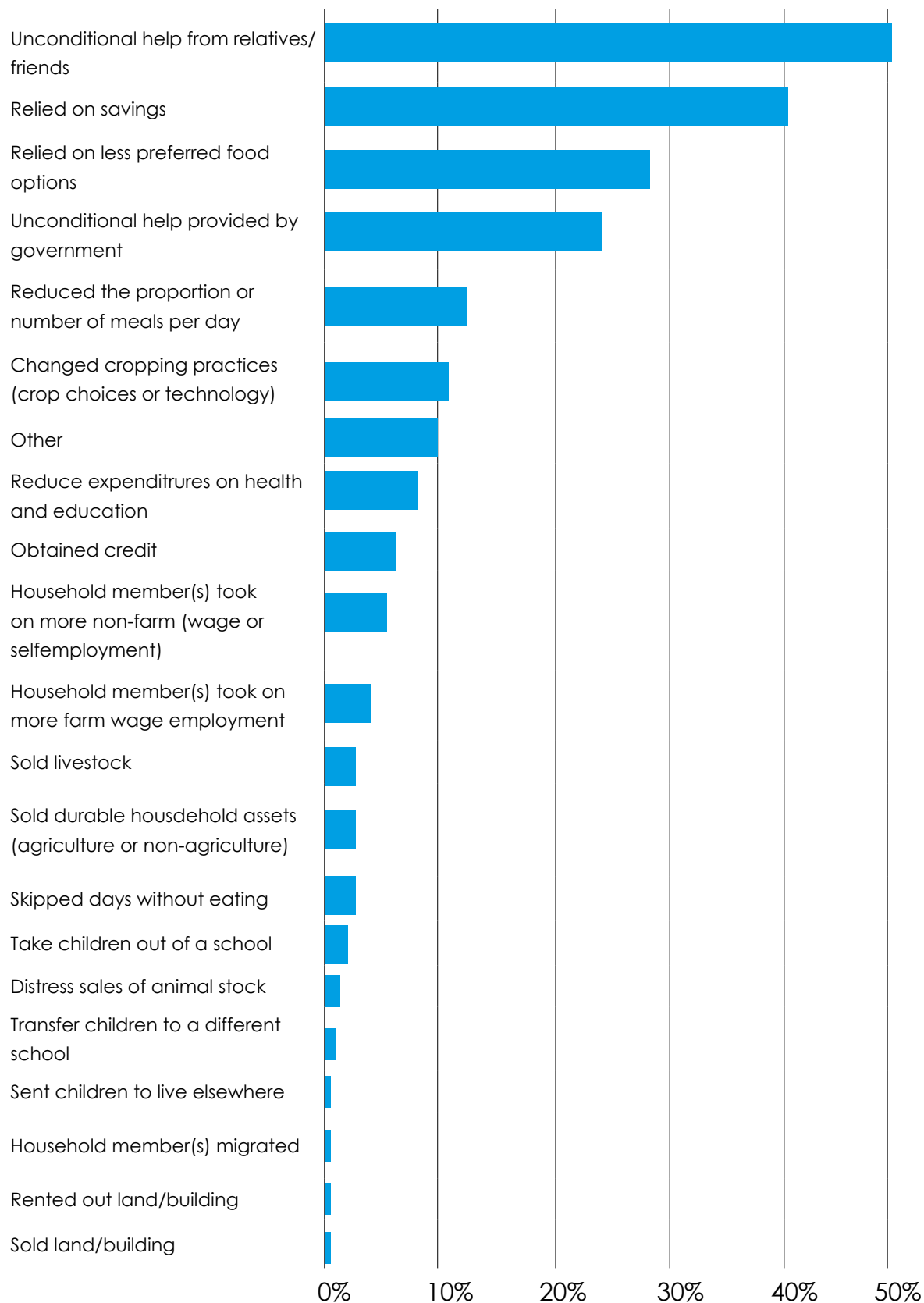
(Hallegatte et al., 2016, p. 21; 2017, pp. 11–13)

Other disaster resilience mechanisms that are particularly relevant are:

- **Migration and the resettlement of populations at risk** are widely used adaptation strategies in response to natural hazards and environmental change (Melde & Laczko, 2017, p. 85); and
- **Community-based support** systems and strong traditions of informal social protection and resource-sharing, which are common across the Pacific (Hobbs & Jackson, 2016, p. 23).

In Fiji, for example, following TC Evan in 2012, households reported that reliance on friends, relatives, and their own resources were the most common coping mechanisms, with formal external sources of assistance from government or elsewhere used by less than 30% of households.

Coping mechanisms used by households in Fiji following TC Evan



(Government of Fiji, 2017b, p. 67)

3.2. Adaptive Social Protection

Scaling up social protection schemes quickly by providing cash payments or vouchers to people affected by humanitarian crisis is increasingly common worldwide (Huber & Fischer, 2020, p. 8; Idris, 2017a, pp. 1–2; Save the Children and ACAPS, 2018, p. 12). International experience has shown that a cash-based response is efficient and effective, enables recipients to identify and prioritise their own needs, supports the dignity of recipients, can be more timely and flexible than other types of assistance, and supports the recovery of local markets (Fabre, 2017, p. 3; Holt & Hart, 2019, p. 2; Save the Children and ACAPS, 2018, p. 12). Concerns about cash-based programming leading to risks of theft, diversion, corruption, security, targeting, misuse by beneficiaries, inflation, and disempowerment of women have not been shown to be significant in practice, and there is consensus that the risks of cash-based programming are no greater than those associated with in-kind assistance (Fabre, 2017, p. 9; Idris, 2017b).

Fiji

In the aftermath of Tropical cyclone Winston, the government of Fiji leveraged the existing social protection system to provide support to the affected population, rapidly adapting three major programs to support existing beneficiaries. The Poverty Benefit Scheme, targeting poor families, the Social Pension Scheme, providing income support to the elderly, and the Care and Protection Scheme / Child Protection Allowance, for children, were used to distributed top-up payments equivalent to three months' worth of their regular benefits (Government of Fiji, 2017b, p. 68; Wehrhahn et al., 2019, p. 19). Supplements were paid to all beneficiaries, irrespective of whether they resided in the affected areas (Government of Fiji, 2017b, p. 68), and were followed up by two additional months of food voucher top-up payments in partnership with the World

In the Pacific, cash-based programming has not been widely used until quite recently, but it is now becoming more accepted (Hobbs & Jackson, 2016, p. 11; Huber & Fischer, 2020, p. 8; Save the Children and ACAPS, 2018, p. 12). Large-scale, in-kind distributions of aid have been preferred to cash transfers, because of limited availability of cash transfer mechanisms and a cultural aversion to cash transfers in many Pacific Island countries (Costella & Ivaschenko, 2015, pp. 7–8; Holt & Hart, 2019, p. 2). However, as Pacific Islands' economies become increasingly monetized, the role of cash in the wake of disasters has become stronger (Costella & Ivaschenko, 2015, p. 8). Examples of successful activities in the region include responses to TC Pam in Vanuatu in 2015, TC Winston in Fiji in 2016, and the volcanic eruption on Ambae island in Vanuatu in 2018 (Huber & Fischer, 2020, p. 8). Cash transfers in crisis situations are more feasible in countries with prior experience of cash transfers through social protection programs and remittances, and with well-developed financial services and a high degree of financial inclusion, although country-specific social, cultural and gender-related issues also affect feasibility (Hobbs & Jackson, 2016, pp. 8–9).

Food Programme for people living in the most badly affected areas (Government of Fiji, 2016, p. 34, 2017b, p. 69). Recipients spent their top-up payments on general consumption, transportation, and buying seedlings, livestock, tools, and equipment (Mansur, Doyle, & Ivaschenko, 2018, p. 28). An evaluation of the Poverty Benefit Scheme top-ups found that three months after the cyclone, households that had received support were 8% to 10% more likely to report having repaired housing damage than those that had not received the additional payments (Mansur et al., 2018, p. 28). One challenge of cash-based programming in other humanitarian contexts has been the challenge of coordination among multiple relief agencies (Idris, 2017a), but in Fiji relief has been coordinated by the government through its own programs.

A new Help for Homes program was also launched to assist with housing repair and reconstruction. Households earning less than FJD 50,000 received electronic cards pre-loaded with funds that could be spent on hardware and construction materials in approved hardware stores; the amount of funds each household received depended on the amount of damage suffered (Wehrhahn et al., 2019, p. 13). A total of FJD 120 million was distributed to almost 50,000 households under this scheme (Wehrhahn et al., 2019, p. 59), but this is only 16% of the estimated FJD 751 million damage caused by the cyclone (Government of Fiji, 2016, p. 72). The program also partnered with humanitarian agencies to provide training and advice in resilient building techniques to support building back stronger (Government of Fiji, 2017b, p. 69; Hallegatte et al., 2018, p. 19).

In addition, the Fiji National Provident Fund, the principal national contributory pension scheme, allowed members to withdraw a portion of their pension funds if they had been affected by TC Winston. Withdrawals of up to FJD 1,000, plus an additional FJD 5,000 for property owners in affected areas, were permitted and at least 170,000 people took advantage of this opportunity (Mansur et al., 2018, pp. 12–13). This released FJD 275.5 million into the economy (equivalent to 2.7% of GDP) quickly, although at the cost of reduced future pensions for individuals taking advantage of the facility (Government of Fiji, 2016, p. 34, 2017b, p. 69; Prochaska, Levula, & Levula, 2018, p. 10; Wehrhahn et al., 2019, pp. 59–60).

Papua New Guinea

Papua New Guinea has no national social protection programs with universal coverage, although there are some limited employment-linked social protection schemes (CFE-DM, 2019, p. 15; ILO, 2018, p. 5). The country's social protection programs are very limited by regional standards: the Asian Development Bank's Social Protection Indicator³¹ calculates an expenditure of 0.1% of GDP per capita, which is the lowest among the 38 countries in Asia and the Pacific included in the indicator (ADB, 2016, pp. 11–12). The Government operates programs related to child protection and disaster relief, and there are employment-linked social protection programs covering people in formal employment; these include compulsory contributory pension schemes in the public and private sectors, a workplace injury compensation scheme, employer-funded

sick pay, paid maternity leave for public sector employees, and labor market training programs (ILO, 2018, p. 5; Wrondimi, 2012, pp. 7–10). The province of New Ireland has operated a non-contributory old age pension and disability benefit since 2009, providing an annual payment of PGK 360 (USD 103) which is distributed in cash to all residents who are at least 60 years old or have a significant disability³²; in 2013, there were 8,362 beneficiaries (4.3% of the province's population) (Sibley, Ivaschenko, Pagau, & Tanhchareun, 2014, pp. 20–23). Recipients of this benefit reported in focus group discussions that the funds were typically used for food, medicine, clothing, to pay grandchildren's school fees, or to buy other goods; some reported saving the money at home or in a bank account, but most participants stated that the funds only lasted two to four weeks (Sibley et al., 2014, p. 29).

³¹ADB's Social Protection Indicator calculates countries' total expenditures on social protection divided by the number of intended beneficiaries, expressed as a percentage of GDP per capita (ADB, 2016, p. 4).

³²Eligibility is assessed by local ward councillors and the chairs of village planning committees, as many elderly residents have no birth certificates, and disability is not clearly defined, leaving scope for interpretation.

Cash transfer programming for disaster relief appears unlikely to be feasible in Papua New Guinea in the immediate future.

Limited financial inclusion and a lack of markets and transportation systems to supply goods would likely limit the feasibility of cash transfer programs in rural areas. An IFRC report on the response to the 2018 Kadovar Island volcanic eruption warned that “due to security risks handling money represents, no cash programming can be considered for this operation. The authorities are not allowing this option and PNGRC [Papua New Guinea Red

Cross] cannot put its staff and volunteers at risk” (IFRC, 2018a, p. 3). A report for the Papua New Guinea government and UNICEF in 2008 proposed a “conceptual framework” for a cash transfer system targeted at supporting children affected by HIV/AIDS, but did not go as far as evaluating the feasibility of such a system, and did not address the issue of disaster resilience (Samson, 2008). In the time available for this report, no studies were found examining the feasibility of cash transfers or the use of social protection systems for disaster relief and recovery in Papua New Guinea.

Samoa

Samoa's social protection programs are limited in scale by regional standards, but include a universal pension scheme.

The Asian Development Bank's Social Protection Indicator³³ calculates an expenditure for Samoa of 1.2% of GDP per capita, which is well below the average for the Pacific region (1.9%) or for Asia (3.7%) (ADB, 2016, pp. 11–12). Two principal social protection programs exist:

- **Samoa National Provident Fund**, a contributory, employer-matched pension scheme offering members who reach the retirement age of 55 a lump sum payment or annual pension based on accumulated contributions, as well as life insurance and some loan products (Samoa National Provident Fund, 2020a); and
- **Senior Citizens Benefit Fund**, a universal pension payable to all Samoan citizens and permanent residents aged 65 or older, providing a monthly payment of WST 135 (approximately USD 51), free travel on government ferries between the main islands, and some free medical services (Samoa National Provident Fund, 2020b). Approximately 12,000 people (6.1% of the population) receive this benefit (Hobbs & Jackson, 2016, p. 27).

In Samoa, the use of cash transfers to provide disaster assistance has been limited.

In one example, following the 2009 tsunami, the Samoa Red Cross disbursed cash grants to 171 households assessed to be particularly in need. Most of these grants (82%) were worth WST 500 (USD 200), with a few businesses grants ranging up to WST 12,000 (USD 4,800); funds were paid into bank accounts or transferred via Western Union, and were typically used for expenses related to agriculture, fishing, or house repair (IFRC, 2011, pp. 3, 11–13). Samoa's National Provident Fund allows partial early withdrawals in the case of certain medical conditions (Samoa National Provident Fund, 2020a) but Samoa is not known to have allowed pension fund members to access funds for disaster recovery (Guo & Narita, 2018, p. 9). A regional study of the feasibility of cash transfer programming noted that markets in Samoa may not have capacity to accommodate demand during emergencies (an important consideration for the feasibility of cash transfer programming), based on observed delays in the delivery of construction materials and the cost of fresh fruit and vegetables to markets following TC Evan (Hobbs & Jackson, 2016, p. 37).

³³ADB's Social Protection Indicator calculates countries' total expenditures on social protection divided by the number of intended beneficiaries, expressed as a percentage of GDP per capita (ADB, 2016, p. 4).

Solomon Islands

Solomon Islands' social protection system is essentially limited to employment-linked entitlements for people in formal employment, with no large, rapidly-scalable social cash transfer programs appropriate for disaster resilience (ADB, 2019b, p. 16; Huber & Fischer, 2020, p. 20). Solomon Islands' social programs are limited by regional standards: the Asian Development Bank's Social Protection Indicator³⁴ calculates an expenditure of 1.3% of GDP per capita, which is well below the average of 1.9% for the Pacific region (ADB, 2016, pp. 11–12). Social assistance programs are limited to primary education, primary health care, disaster relief, and (in 2009) a few very small programs providing training, workers' compensation, and benefits to people with disabilities (ADB, 2019b, p. 16; ILO, 2015, p. 3; Tafoa, 2012, p. 7). Social insurance coverage is provided by the national pension scheme, the Solomon Islands National Provident Fund, which is a compulsory, defined-contribution pension for people in formal employment; it also offers a parallel voluntary pension saving scheme for the self-employed, called youSave, which was launched in 2017 and can be operated by mobile phone (Huber & Fischer, 2020, p. 20; Solomon Islands National Provident Fund, 2018). Other social programs include cash-for-work

for unemployed youth, and skills development and training programs (ADB, 2019b, pp. 19–20). A cash-for-work scheme to rehabilitate community infrastructure formed part of the response to flooding in 2014; the scheme was funded and managed by the ILO, and provided short-term employment to 121 people (Costella & Ivaschenko, 2015, p. 39; ILO, 2014, pp. 2–5).

Cash transfer programs in response to disasters may be feasible in some areas of Solomon Islands, depending on local infrastructure. A comprehensive study found that feasibility is highest in and near the major economic centers (Honiara, Gizo, Munda, Noro, Auki and Malu'u), and lower in more remote areas due to the low penetration of financial services and telecommunication services, limited capacity of local shops and markets to meet surges in demand, limited and expensive transportation services, local shops lacking lines of credit with suppliers, and low financial literacy (Huber & Fischer, 2020, pp. 5, 29–30, 83). Mobile money systems might offer opportunities for distributing money in emergencies in remote areas, but improvements to logistics chains would be necessary to enable shops and markets to respond to demand (Huber & Fischer, 2020, pp. 5, 20)

Tonga

Tonga's social protection programs are limited by regional standards. ADB's Social Protection Indicator³⁵ calculates an expenditure of 0.8% of GDP per capita, which is well below the average for the Pacific region (1.9%) or for Asia (3.7%) (ADB, 2016, pp. 11–12) (ADB, 2016, pp. 11–12). The government operates two social assistance programs³⁶: the Social Welfare Program for the Elderly, introduced in 2012,

providing cash payments of TOP 70 to 80 per month (approximately USD 30 to 40) to people aged 70 or older; and the Disability Welfare Scheme, introduced in 2015, which supports people with severe physical, intellectual, psychological, or sensory disabilities by providing regular ca Tonga, 2018b, p. 33). There are also two contribution-based pension schemes, the Retirement Fund Board (RFB) scheme for central

³⁴ADB's Social Protection Indicator calculates countries' total expenditures on social protection divided by the number of intended beneficiaries, expressed as a percentage of GDP per capita (ADB, 2016, p. 4).

³⁵ADB's Social Protection Indicator calculates countries' total expenditures on social protection divided by the number of intended beneficiaries, expressed as a percentage of GDP per capita (ADB, 2016, p. 4).

³⁶A third social assistance program, Skills and Employment for Tongans (funded by the World Bank), began providing conditional cash payments to households based on secondary school enrolment and attendance in 2020 (World Bank, 2020c, p. 1).

government employees, and the National Retirement Benefits Fund (NRBF) for private and public sector employees (ADB, 2016, p. 26), and pilot programs for supporting children with disabilities and vulnerable older people needing care (ADB, 2016, p. 31).

As part of the response to TC Gita, the Government of Tonga used its existing social protection system to provide cash payments for disaster assistance (Government of Tonga, 2018b, p. 26). Leveraging the Social Welfare Program for the Elderly and the Disability Welfare Scheme, with funding from the Government of Australia, the government distributed one-time top-up payments to existing beneficiaries in the affected areas (approximately 3,558 people in all) within one month of the cyclone worth TOP 225 (approximately USD 101) in addition to regular monthly payments (Department of Foreign Affairs and Trade, 2018; Government of Tonga, 2018b, p. 26). The total value of this assistance was approximately TOP 800,000 (USD 358,000)

(Government of Tonga, 2018b, p. 34). Two other forms of cash assistance were provided by the government following TC Gita: cash grants worth TOP 500,000 were made to 27 registered fishers to support repairs to damaged boats and fences (Ministry of Finance, 2019, p. 84); and cash grants worth a total of TOP 6.5 million were distributed to 8,217 households based on the amount of property damage suffered (TOP 3,000 for homes that were destroyed, TOP 1,500 for partial damage, and TOP 500 for minor damage) (Ministry of Finance, 2019, pp. 83–84). The national civil service pension scheme also allowed pensioners to borrow money from their pension assets (Retirement Fund Board, 2018). The government of Tonga and UNDP operated cash-for-work programs following the Niuatoputapu tsunami in 2009 (reportedly the first emergency cash-for-work program in the Pacific) and following TC Ian in 2014, in which payments were made through the mobile money service provided by Digicel, the largest mobile phone company in the country (Hobbs & Jackson, 2016, pp. 29, 46, 51).

Vanuatu

Vanuatu has limited activity in the area of social protection, and no existing large and scalable cash transfer programs. Vanuatu's social protection programs are small and limited by regional standards, ranking second-last in the Pacific on the Asian Development Bank's Social Protection Indicator³⁷ (above only Papua New Guinea) (ADB, 2016, pp. 11–12). Social protection is a relatively new area of activity for Vanuatu (Costella & Ivaschenko, 2015, p. 37); there are no regular social transfer schemes, "the comprehensiveness and impact of Vanuatu's 'formal' social protection system appears quite weak" (Anderson et

al., 2017b, pp. 112–116), and there are no broad-based social protection programs apart from employment-linked pension schemes such as the Vanuatu National Provident Fund (Holt & Hart, 2019, p. 26). Four targeted social assistance programs existed as of 2012: a Home Island Passage Allowance scheme, details of which appear to be unavailable; scholarships for students; a Family Assistance Support Program providing short-term financial assistance to destitute families; and disaster assistance which consists of emergency supplies such as food, water, clothing, blankets, temporary shelter, and transportation services

³⁷ADB's Social Protection Indicator calculates countries' total expenditures on social protection divided by the number of intended beneficiaries, expressed as a percentage of GDP per capita (ADB, 2016, p. 4).

(Alatoa, 2012, pp. 6–9). Some small-scale cash transfer programs have been undertaken in the country, including:

- Following the evacuation of Ambae island in 2017 and 2018 due to volcanic activity, Oxfam led a cash transfer program to help displaced people buy goods from local markets (Nalau, McNaught, & Dalesa, 2020, p. 31).
- Following TC Pam, members of the national contributory pension scheme, the Vanuatu National Provident Fund, were permitted to withdraw up to 20% of their pension savings; 21,634 of the approximately 31,000 members of the pension scheme did so, releasing funds amounting to VUV 1.7 billion (approximately USD 15.6 million), equivalent to about 2.1% of GDP (Government of Vanuatu, 2015b, p. 24; IMF, 2016, p. 27; Vanuatu National Provident Fund, 2017, p. 13). The average amount withdrawn was VUV 78,600 (approximately USD 720) per person.
- Cash-for-work projects were also undertaken following TC Pam: Oxfam provided vouchers for agricultural inputs and managed a cash-for-work program in Port Villa for around 500 people to support debris removal and recovery activities (Hobbs & Jackson, 2016, p. 29), and UNDP provided a small-scale cash-for-work project for around 100 people in Port Villa and on Tanna island (Hobbs & Jackson, 2016, p. 29).

Cash transfer programs may be feasible in some parts of Vanuatu, depending on local conditions on each island. A 2016 survey by the Cash Learning Partnership showed that government and humanitarian respondents agreed that there was potential for increasing

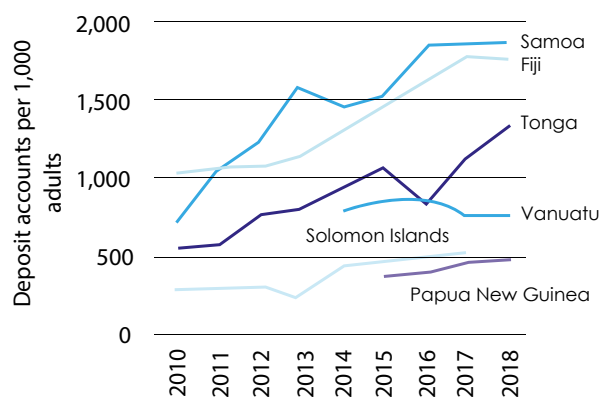
the use of cash transfers in emergency response in the most central islands, but that the majority of outer islands could not support cash transfers due to a lack of markets with sufficient capacity, a lack of knowledge and practical experience across the country, poor access to financial services, risk of fraud, poor coordination among implementing agencies, and the potential to undermine longer-term development programming (Hobbs & Jackson, 2016, p. 29). A follow-up study by Oxfam in 2019 agreed that cash transfer programs were feasible in some locations, but that the level of feasibility varies greatly across different islands with challenges including limited access to markets with necessary goods and capacity to meet surges in demand, limited availability and capacity of financial services providers, questions about fairly distributing cash payments between male and female heads of households, targeting of assistance, requirements for formal identification of recipients, and robustness of communications networks to support electronic payment solutions (Holt & Hart, 2019, pp. 3–4). Oxfam and the financial technology firms Sempo and ConsenSys carried out a small-scale trial of a digital cash transfer system using electronic cards and cryptocurrency (blockchain) technology in a project called “UnBlocked Cash” in 2019, distributing VUV 966,443 (approximately USD 8,600) and involving 187 heads of households and 29 vendors in Port Vila over four weeks. The pilot project showed “modest cost savings and significant time savings” compared with other methods of distributing cash and vouchers, particularly in registering beneficiaries and simplifying identification requirements (Rust, 2019, pp. 4–5).

3.3. Financial Inclusion

Worldwide, financial inclusion is an important contributor to development, poverty reduction, and disaster resilience. Access to financial services enables and incentivizes people to accumulate savings and smooth consumption over time, obtain loans, start businesses, receive remittances and other payments, obtain insurance, and improve resilience to financial shocks while reducing reliance on negative coping strategies and predatory lending (ESCAP [Economic and Social Commission for Asia and the Pacific], 2019, pp. 6–9). Evidence from multiple countries shows that financial inclusion contributes to poverty reduction and improving food security (Klapper, El-Zoghbi, & Hess, 2016, p. 2). Financial inclusion also helps poor people save in forms that are less vulnerable to natural hazards than physical property, and to preserve resources to help with recovery and reconstruction (Hallegatte et al., 2017, pp. 135–137). Evidence about the

impacts of microcredit, however, shows little or no improvement to household welfare through lending to individuals, although better results are observed when lending to small businesses (Dimble & Mobarak, 2019; Klapper et al., 2016, p. 8).

Number of deposit accounts with commercial banks per 1,000 adults



(IMF, 2020a)

Fiji

Financial inclusion in Fiji is high compared with other Pacific island countries, and is comparable with other upper-middle-income countries. In Fiji, 77% of adults have a formal bank account (Reserve Bank of Fiji, 2019a, p. 32). Some reports suggest that many people only use bank accounts to receive payments, and routinely withdraw all funds in cash as soon as possible (Hobbs & Jackson, 2016, p. 104), but the Reserve Bank of Fiji indicates that the proportion of Fijians who save money, either in bank accounts or through informal means like savings clubs, is higher than average for upper-middle income countries: 71% in Fiji

compared with an average of group average of 63% (Reserve Bank of Fiji, 2015, pp. 21–31). Several financial inclusion indicators have increased significantly from 2015 to 2019: the proportion of adults using formal credit products has increased from 6.9% to 15.3%, the proportion holding any type of insurance product has increased from 12.0% to 41.0%, and the proportion actively using a mobile money account has increased from 2.2% to 24.2% (Reserve Bank of Fiji, 2019a, p. 33). Mainstream commercial banks offer microfinance products, and only one specialist microfinance institution³⁸ is operating in Fiji as of 2018 (Wehrhahn et al.,

³⁸South Pacific Business Development Microfinance Ltd., with around 6,900 active loan clients, mostly women, and a loan portfolio of FJD 46 million (Wehrhahn et al., 2019, p. 42).

2019, p. 42). Savings and loan cooperatives, sugarcane cooperatives and other farming cooperatives, and communal cooperatives operate in the country, but many cooperatives that were originally set up as development initiatives have lost ground as infrastructure development has improved access to commercial markets (Wehrhahn et al., 2019, p. 42).

The relatively high level of financial inclusion in Fiji contributes to disaster resilience and is an important component of recovery efforts.

The national climate vulnerability assessment notes, for example, that the fact that a large

proportion of households had access to formal banking played an important role in coping and recovery following TC Evan in 2012 (Government of Fiji, 2017b, p. 66). Following TC Winston, 98% of recipients of emergency top-up funds distributed by the government through the Poverty Benefit Scheme received their funds electronically (Mansur et al., 2018, p. 24). The government also used Vodafone's M-PAiSA mobile money platform to pay emergency relief into recipients' mobile phone wallets and bank accounts through the Help for Homes program following TC Winston in 2016, and the Care for Fiji Initiative following TC Josie and TC Keni in 2018 (Prochaska et al., 2018, pp. 9–10).

Papua New Guinea

The overall level of financial inclusion in Papua New Guinea is similar to that of other Pacific island countries and other lower-middle-income countries, but rural and remote areas are largely excluded.

In Papua New Guinea, 37% of adults hold a commercial bank account; this is in the middle of the range for Pacific island countries and close to the average of 42% (in 2014) for lower-middle-income countries worldwide (Bank of Papua New Guinea, 2016, p. 17; World Bank, 2020a). Use of other types of financial services is low, with just 2% of adults borrowing from a bank³⁹ and 6% having a mobile financial services account (Bank of Papua New Guinea, 2016, pp. 17, 19). The 2009–2010 Household Income and Expenditure Survey reported that 16.9% of people had some form of outstanding loan obligation (including cash or in-kind loans from any sources, including informal borrowing), with the average loan size being PGK 193 (approximately USD 71) (National Statistical Office, 2009, p. 121). Papua New Guineans also often use informal financial mechanisms including Rotating Savings and Credit

Associations, informal money lenders, wantok members (see section 3.8), and community finance schemes (Bank of Papua New Guinea, 2016, p. 16). Informal money lenders are anecdotally said to charge interest rates “as high as 50–100% fortnightly” (Ganesh, Kohli, Sinha, Arora, Patnaik, Kaushal, & Borthakur, 2016, p. 75). Barriers to financial inclusion include a lack of access points such as bank branches or agents, especially in rural areas; limited tailoring of products to low-income people and informal businesses and lack of data necessary for designing products; high costs of banking services; lack of financial literacy; high crime rates; and gender inequality, as women have significantly lower levels of financial inclusion than men (Bank of Papua New Guinea, 2016, pp. 21–25; Ganesh et al., 2016, p. 82; Sibley, Kauzi, Barker, Zhang, & Gibson, 2015, pp. 46–49). The vast majority of retail transactions, especially lower-value transactions, are made in cash (Bank of Papua New Guinea, 2016, p. 22). Financial education programs have been piloted in one technical-vocational school, with more planned, and a program aimed at

³⁹Another study, covering just two provinces, found that 34% of urban households and 3% of rural households reported formal borrowing, while 24% of urban households and 18% of rural households reported informal borrowing (store credit or borrowing from family, friends, or moneylenders) (Sibley et al., 2015, pp. 45–46).

developing a savings habit operates in about 150 primary and secondary schools (PFIP, 2018, paras. 5–6).

Papua New Guinea's financial services sector includes four commercial banks (Australia & New Zealand Banking Group, Bank of South Pacific, Kina Bank, and Westpac Bank), 14 licensed financial institutions (micro-banks), and 16 savings and loan societies licensed by the country's central bank as of 2019 (Bank of Papua New Guinea, 2019). One mobile phone network, Digicel, offers mobile money services as of 2019, including sending money internationally via KlickEx Pacific (Hahm, Subhanij, & Almeida, 2019, p. 16), and five commercial banks or micro-banks also provided

banking services via mobile phones as of 2016 (Ganesh et al., 2016, p. 81). Bank South Pacific, Westpac Bank, and ANZ Bank are developing networks of agents using smart cards and point-of-sale terminals in rural areas to extend the reach of their services (Ganesh et al., 2016, p. 77).

There is little evidence available about the extent to which financial inclusion supports disaster resilience and recovery in Papua New Guinea. Although financial inclusion issues are discussed in the literature in relation to development in general, there appears to be little information available about the extent to which households have drawn upon financial resources such as savings, credit, or other sources of finance following disasters.

Samoa

The level of financial inclusion in Samoa is similar to other Pacific island countries and other lower-middle-income countries on most indicators. A survey led by the Central Bank of Samoa in 2015 found that 39% of adults (40% of women and 38% of men⁴⁰) hold a commercial bank account; this is in the middle of the range for Pacific island countries and similar to the average of 42% (in 2014) for lower-middle-income countries worldwide (Central Bank of Samoa, 2015, p. 3). The number of deposit accounts with commercial banks per capita is high compared with other Pacific island countries (IMF, 2020a), but this may be skewed somewhat by Samoa's relatively small population. The proportion of people who reported saving money is 61%, which is above the average for lower-middle-income countries worldwide, but most people use informal savings instruments, such as saving at home or through savings clubs, and only 11% report saving in a formal financial institution (Central Bank of Samoa, 2015, pp. 27, 42). Excluding pensions, adults with bank accounts had

average balances of WST 1,213 (USD 534) while unbanked individuals using informal savings instruments had average balances of only WST 60 (USD 26) (Central Bank of Samoa, 2015, p. 30). Use of other types of financial services is low, with 13% of adults borrowing from a bank and 3% having a mobile money account (Central Bank of Samoa, 2015, pp. 37–38). Discussions about how financial education could be included in primary and secondary school curricula are underway, following a scoping study in 2016 (PFIP, 2018, para. 7), and an adult financial literacy program called MoneyMinded, led by the bank ANZ, is reported to have led 44% of participants to increase saving regularly (Hahm et al., 2019, p. 19).

Financial inclusion is higher in urban Apia, among people with higher incomes, and among people in formal employment (Central Bank of Samoa, 2015, pp. 7–8). Eighty percent of unbanked Samoans say that the reason they do not have a bank account is that they do not have enough money; other barriers to financial inclusion include limited financial literacy and

⁴⁰It is unusual for women to have higher rates of bank account ownership than men; this may be a consequence of women needing to receive remittances from male family members working overseas (Central Bank of Samoa, 2015, p. 1).

competence, high transaction costs and minimum balance requirements, distance and travel cost to banks, a cultural preference for using cash, the sharing of accounts among household members, and lack of necessary documentation (Central Bank of Samoa, 2015, p. 13; National Financial Inclusion Taskforce, 2017, p. 7).

Samoa's financial services sector includes:

- Four commercial banks: ANZ, Bank South Pacific, Samoa Commercial Bank, and National Bank of Samoa (Central Bank of Samoa, 2019), all of which offer internet and mobile phone banking services, and report that the majority of their small and medium enterprise customers increasingly use internet banking (Hardin, 2020, para. 12).
- Two mobile phone operators that offer mobile money services: Digicel, which also provides international transfers via KlickEx Pacific (Hahm et al., 2019, p. 16), and Vodafone's⁴¹ M-Tala service which provides international transfers from Australia via a linked service called Rocket Remit (Vodafone Samoa, 2020b, 2020a).
- Twelve money transfer operators and one money changer, with numerous associated branches and agents (Central Bank of Samoa, 2019).
- Four microfinance providers: South Pacific Business Development (the largest provider), making small loans to approximately 19,000 MSMEs owned by women; Development Bank of Samoa, offering micro-loans to farmers and female entrepreneurs; Samoa Business Hub (formerly the Small Business Enterprise Centre), offering training, business advice, loans and loan guarantees; and Women in Business Development Inc., assisting MSMEs to access

international supply chains through training, advice, mentoring, and loans (ADB, 2018b, p. 194; Hardin, 2020, pp. 1–3; Samoa Business Hub, 2019).

There is little evidence about the extent to which financial inclusion supports disaster resilience and recovery in Samoa, apart from facilitating overseas remittances. There appears to be little information available about the extent to which households have drawn upon financial resources such as savings, credit, or other sources of finance following disasters in Samoa. Funds available from savings are limited, however: as noted above, adults with bank accounts had average balances of WST 1,213 (USD 534) while unbanked individuals using informal savings instruments had average balances of only WST 60 (USD 26) (Central Bank of Samoa, 2015, p. 30); for context, the average household weekly expenditure in 2013 was WST 950 (Moustafa, 2016, p. 31). Following TC Evan in 2012, few households considered taking recovery loans from formal financial institutions, most citing insufficient collateral and a few citing high interest rates as reasons for not borrowing money; microfinance providers have made loans for business purposes to women in the affected areas but details of these are not readily available; and no information appears to be available about informal loans from moneylenders or from family (Government of Samoa, 2013, p. 115). Insurance appears to play only a small role in recovery, as only 6% of Samoans have any form of house insurance and not all insurance policies cover all natural hazards (Central Bank of Samoa, 2015, p. 35). Remittances, however, do play a major role in disaster recovery (see section 3.3), and money transfer networks enable Samoans to access funds remitted by overseas family members within hours of a crisis (Le Dé, Gaillard, Friesen, & Smith, 2015, p. 657).

⁴¹Formerly BlueSky Samoa (De Rosbo, 2020).

Solomon Islands

The level of financial inclusion in Solomon Islands is low compared with other Pacific island countries and other lower-middle-income countries.

A survey of people's use of financial services led by the Central Bank of Solomon Islands in 2015 showed that 26% of adults (20% of women and 32% of men) hold a commercial bank account; this is low for Pacific island countries and well below the average of 42% (in 2014) for lower-middle-income countries worldwide (Central Bank of Solomon Islands, 2015b, pp. 2–3). Another 8% of adults have an account with another type of formal financial institution such as a credit union or pension fund, 35% use informal financial services such as shop credit, moneylenders, or savings clubs, and 31% do not use any type of financial services (ADB, 2019a, p. 3). The proportion of people who reported saving money is 87%, which is above the average for lower-middle-income countries worldwide, but only 15% report saving through a bank; most people use informal methods such as saving at home or using savings clubs (Central Bank of Solomon Islands, 2015b, pp. 14–15). Formal borrowing is limited, with only 15% of adults borrowing from a bank (Central Bank of Solomon Islands, 2015b, pp. 10, 15). Financial inclusion is higher among people with higher incomes and in formal employment, and is higher among men than women (Central Bank of Solomon Islands, 2015b, pp. 3–4). The most common reasons that people cite for not having a bank account are that they don't have enough money (56%), they don't know how to use a bank account (46%), that distances to banks or bank agents is a barrier (43%), that they lack the necessary documents (31%), or that

the cost is too high (18%) (Central Bank of Solomon Islands, 2015b, p. 8). The geographic reach of financial services is also a major challenge: bank branches, ATMs, and point-of-sale terminals are limited to just five towns in the country, while the population is dispersed over about 300 inhabited islands (Central Bank of Solomon Islands, 2015b, p. 2; Huber & Fischer, 2020, p. 27). For businesses, access to finance is also constrained by risk aversion at commercial banks, unclear land rights, systemic difficulties in using most types of collateral for loans, lack of an inter-bank financial clearing system outside Honiara, large infrastructure gaps, and lack of business planning skills (Huber & Fischer, 2020, p. 10; Ministry of Commerce Industry Labour and Immigration, 2016, p. 2; World Bank, 2017d, p. 63). Data from 2011 indicate that 68% of MSME borrowers default on loans, leading to a high cost of credit (Ministry of Commerce Industry Labour and Immigration, 2016, p. 2); commercial banks “are effectively not interested in these firms” due to the high transaction costs and credit risk (World Bank, 2017d, p. 63).

The financial services sector in Solomon Islands includes

four commercial banks (ANZ Banking Group, Bank South Pacific, Pan Oceanic Bank, and BRED Bank), 12 other credit companies and credit unions, one microfinance institution, and the national defined-contribution pension scheme (ADB, 2019a, p. 2). The microfinance institution, South Pacific Business Development (SPBD), provides savings and microfinance services primarily to women; at the end of 2019, clients of SPBD had 7,994 savings accounts and SBD 20 million (approximately USD 2.5 million) in

loans (Central Bank of Solomon Islands, 2020, p. 25). One mobile money provider, ANZ GoMoney Pacific, has been operating in the country with a large network of local shops acting as agents, although it did not support international money transfers (Hahm et al., 2019, p. 16; Huber & Fischer, 2020, p. 27); however, ANZ will withdraw the GoMoney product in November 2020, replacing it with a bank-account-linked mobile app that will support international transfers (ANZ, n.d.; Kekea, 2020). Work is underway to develop and pilot-test a financial education curriculum for primary, secondary, and technical-vocational schools (PFIP, 2018, paras. 9–10).

Tonga

Financial inclusion in Tonga is low compared with other upper-middle-income countries, but similar to other Pacific island countries

(National Reserve Bank of Tonga, 2017, p. 26). In Tonga, 41% of people aged 15 or older hold a commercial bank account, with no difference in bank account ownership between men and women (although data are not available on whether men and women might use their accounts differently); this is in the middle of the range for Pacific island countries, but well below the average of 70% for upper-middle income countries worldwide (National Reserve Bank of Tonga, 2017, pp. 3–9). The proportion of Tongans who save money is 63%, which is the same as the average for upper middle income countries worldwide, but most people in Tonga use informal instruments, such as saving at home or through savings clubs, and only 18% report saving in a formal financial institution (National Reserve Bank of Tonga, 2017, p. 6). Use of other types of financial services is low, with only 9% of adults borrowing from a bank, 10% of adults using a mobile money account, and 13% having any type of insurance (National Reserve Bank of Tonga, 2017, pp. 19–25). Financial inclusion is higher among residents of the two largest islands and among people with higher incomes and in formal employment; people living in outlying islands face long journeys to

There appears to be little or no evidence available about the extent to which financial inclusion supports disaster resilience and recovery in Solomon Islands.

Financial inclusion rates are low and capacities of local markets are limited, especially in rural areas, and the economy is not monetized to the same extent as in some neighboring Pacific island countries. There does not appear to be information available about the extent to which households draw upon financial resources such as savings, credit, or other sources of finance following disasters.

reach bank branches (National Reserve Bank of Tonga, 2017, pp. 6–7). Lack of identification is a barrier for many, as 19% of adults do not have official photo identification, 21% do not have a birth certificate, and 7% have neither (National Reserve Bank of Tonga, 2017, p. 12). Cash is customarily used for most transactions, 96% of agricultural income is received in cash, and even 70% of people in formal employment receive their salaries in cash (Hahm et al., 2019, p. 19; National Reserve Bank of Tonga, 2017, pp. 12–13).

Tonga's financial services sector includes microfinance providers and one mobile money operator.

The largest microfinance organization in Tonga is South Pacific Business Development Tonga, which lends to almost 5,000 people, almost exclusively women, with a total loan portfolio of more than TOP 2.2 million (Hobbs & Jackson, 2016, p. 71). The Tongan Development Bank, under the direction of the Ministry of Finance & National Planning, also operates two smaller microfinance schemes: one of these is valued at USD 280,000 and aimed at supporting women's groups in the outer islands, while details about the other scheme are not available (Hobbs & Jackson, 2016, p. 71). The largest mobile phone network in Tonga, Digicel, launched a mobile money service in 2011 in collaboration with the Pacific Financial Inclusion

Programme, AusAid, and the GSM (Global System for Mobile communications) Association, offering low-cost money transfers from Australia and New Zealand (John Connell, 2015, pp. 147–148) and a “Beep and Go” point-of-sale payment service using mobile phones and electronic tags, but take-up of the latter has been slow as many Tongans prefer to withdraw and use cash instead of making electronic payments (Hobbs & Jackson, 2016, p. 81).

Financial inclusion plays a limited role in disaster resilience and recovery in Tonga, apart from facilitating overseas remittances.

Following TC Gita, for example, the Tonga Statistics Department surveyed all households in the main affected islands and found that only 0.8% of households whose houses were damaged by the cyclone had borrowed money for repairs from a bank, relatives, or friends (these categories were not disaggregated), 0.4% had used insurance, 4% had drawn on savings, 10% had used remittances, 14% had used current wages or business income, 67% had repaired their houses by simply reusing materials that

they already had available (Catalán, 2018, p. 24). Banks offered low-cost (5% interest) loans but information about the number of loans made was not available (Government of Tonga, 2018b, p. 75). The government and humanitarian agencies have limited understanding of and experience using cash transfers in disaster relief, government and civil society are wary of damaging traditional community-recovery approaches and encouraging aid dependency, and there are concerns about weakly functioning markets and financial services, especially on the outer islands (Hobbs & Jackson, 2016, p. 65; IFRC, 2018b, p. 6). However, there is a foundation of financial infrastructure and social protection experience in the country and there have been pilots of cash transfer programs using the government’s existing social protection programs (the Social Welfare Program for the Elderly and the Disability Welfare Scheme) to make payments⁴² after TC Gita, suggesting that there is potential for financial inclusion to play a larger role (Hahm et al., 2019; Hobbs & Jackson, 2016).

Vanuatu

The level of financial inclusion in Vanuatu is similar to that of other Pacific island countries and other lower-middle-income countries

(Reserve Bank of Vanuatu, 2016a, pp. 1, 4). In Vanuatu, 37% of adults (32% of women and 41% of men) hold a commercial bank account, which is in the middle of the range for Pacific island countries and similar to the average of 42% for lower-middle-income countries worldwide (Reserve Bank of Vanuatu, 2016a, pp. 1–4). The proportion of people who reporting saving money is 59% (65% of women and 53% of men), which is above the average for upper-middle-income countries worldwide, but most people use informal savings

instruments, such as saving at home or through savings clubs, and only 21% report saving in a formal financial institution (Reserve Bank of Vanuatu, 2016a, pp. 16–18). Financial inclusion is higher in urban areas and among people with higher incomes; people living outside Port Vila and Luganville face long journeys to reach bank branches (Reserve Bank of Vanuatu, 2016a, pp. 8–12). Lack of identification is a barrier for many, as 27% of adults across the country do not have either formal identification or a birth certificate (Reserve Bank of Vanuatu, 2016a, p. 7). Use of other types of financial services is low, with 16% of adults borrowing from a bank, only 1% reporting using a mobile money account to send money and 0.7% to receive money,

⁴²Payments under this scheme were originally made directly into bank accounts, but at some point the practice switched to making payments personally in cash, apparently at the request of beneficiaries who felt that receiving cash in hand gave them more control (Hobbs & Jackson, 2016, p. 71).

and 5% having any type of insurance (Reserve Bank of Vanuatu, 2016a, pp. 27, 32–39). Cash is customarily used for most transactions: 100% of adults who work in agriculture and 69% of those who work in the private sector receive their income in cash (Hahm et al., 2019, pp. 19–20; Reserve Bank of Vanuatu, 2016a, p. 7; Rust, 2019, p. 10), and only 0.2% of MSMEs use electronic payments (Reserve Bank of Vanuatu, 2016b, p. 39). A survey of MSMEs found that only 8% use internet banking (25% of those in urban areas, but only 3% of those in rural areas) (Reserve Bank of Vanuatu, 2016b, pp. 39–40).

The financial services sector includes two microfinance providers and two mobile money service operators. Two microfinance organizations operate in the country: VANWODS Microfinance (Vanuatu Women Development Scheme), a non-profit charitable organization

offering various small-scale savings and loan products to individuals and small businesses (Reserve Bank of Vanuatu, 2016a, p. 2; VANWODS Microfinance, n.d.); and South Pacific Business Development Microfinance (SPBD), an international microfinance organization that operates in five countries, primarily working with women and supporting micro-enterprise development, savings, life insurance, and loans for education and housing (South Pacific Business Development, n.d.). Two mobile money service providers are operating as of 2019: ANZ GoMoney Pacific, a service of the Australian bank ANZ, and M-Vatu, operated by Telecom Vanuatu Limited in association with Vodafone Fiji; neither service supports international money transfers (Hahm et al., 2019, p. 16; Pacific Financial Inclusion Programme, 2019).

3.4. Insurance

Worldwide, insurance is as an important tool for managing risks associated with natural hazards, but the Pacific region is “one of the least insured regions in the world” (Leith & Subramanian, 2013, p. 9). The insurance penetration rate⁴³ in the region is 3.6% (Leith & Subramanian, 2013, p. 9), which is well below the average of 8.9% in Organisation for Economic Co-operation and Development (OECD) countries (OECD, 2020). Barriers to uptake include affordability, inadequate disaster risk mitigation measures, insufficient baseline information for designing insurance products, limited availability of reinsurance, consumer awareness and cultural issues, lack of trust, inadequate building codes and certification mechanisms, lack of public asset registers, aid dependence, and weak mechanisms for distributing pay-outs (Lucas, 2015, pp. 4–5). There is both limited demand for and limited availability of insurance products in the region, and many communities have limited

access to financial institutions (ADB, 2018a, p. 18). MSMEs, in particular, are often overlooked by insurance companies and regulators, and it is rare for insurance products to be tailored to the specific needs of the smallest businesses (Chatterjee & Wehrhahn, 2017, pp. 3–4).

Insurance may not be cost-effective for the poorest of the poor, and is not an appropriate approach for frequently recurring events or for slow-onset, highly predictable events (Germanwatch, 2020, pp. 18–19; Schaefer & Waters, 2016, pp. 50–51; Warner, Kreft, Zissener, Höpfe, Bals, Loster, Linnerooth-Bayer, Tschudi, Gurenko, Haas, Young, Kovacs, Dlugolecki, & Oxley, 2012, p. 13). Microinsurance has generally been considered unsuitable for covering risks associated with natural hazards, which affect many people simultaneously, because of the large capital reserves required and the high cost of assessing claims (Ramachandran & Masood, 2019, p. 11).

⁴³An indicator of insurance industry development, calculated as the ratio of total insurance premiums to GDP.

Fiji

In Fiji, the majority of middle- and low-income households have no insurance protection of any kind, including against natural hazards (PCRAFI, 2015a, p. 17; Wehrhahn et al., 2019, p. 37). Fiji's insurance penetration rate was 3.4% in 2018 (Reserve Bank of Fiji, 2019b, p. 12), and only about 6% of households and 17% of commercial properties have any type of property insurance (Mahul, Cook, & Bailey, 2015, p. 52) – and these rates are for basic coverage that does not necessarily provide protection against major disasters. Cyclone insurance is only available as an extension to basic property coverage and requires certification by a qualified engineer, which is a barrier that makes many homes uninsurable, and earthquake and tsunami coverage are also optional extras (PCRAFI, 2015a, p. 18; Wehrhahn et al., 2019, p. 26). Property insurance rates for cyclone cover are only 0.3%, and for earthquakes 0.08% (PCRAFI, 2015a, p. 18). Insurance coverage is more common among larger businesses and in the tourism industry, but very low among low- and middle-income households (Wehrhahn et al., 2019, p. 37). Fiji's insurance industry is small, has limited capacity, and tends to be conservative compared with international norms (Wehrhahn et al., 2019, pp. 25–26). Low standards in the construction industry, including weak training and certification systems for tradespeople, are also a barrier to insuring properties (Wehrhahn et al., 2019, p. 27).

Microinsurance products currently available in Fiji do not cover property damage arising from natural hazards. Three microinsurance products were available as of 2019⁴⁴ providing various combinations of life insurance, funeral benefit, personal accident cover, fire cover, and hospitalization cover (Wehrhahn et al., 2019, pp. 52–53), but these products do not include protection against natural hazards such as cyclones, floods, or droughts, and do not include crop insurance (Prochaska et al., 2018, p. 8). Fiji's insurance market does not have the financial capacity or expertise to underwrite risks associated with natural hazards that affect many people simultaneously (Prochaska et al., 2018, p. 8).

Fiji does not have any form of agricultural insurance (FAO, 2014, cited in Martyn & Rogers, 2016, p. 62; Wehrhahn et al., 2019, p. 27). The government has provided some funds to farmers to support rehabilitation of agriculture in response to past disasters, but FAO estimates that this has only covered 3% of the value of the losses suffered (FAO, 2014, cited in Martyn & Rogers, 2016, p. 62). One example of ad hoc support that was offered to sugarcane farmers following TC Winston was that the Sugar Cane Growers' Fund, which lends money for working capital and investment purposes, restructured loans and offered grants of up to FJD 10,000 to almost 4,000 growers (Wehrhahn et al., 2019, p. 31).

⁴⁴Microinsurance from FijiCare (<http://www.fijicare.com.fj/Pages/MicroInsurance>) and Microlife from Life Insurance Corporation of India (<http://www.licifiji.com/pages.cfm/products/microinsurance>) are available, but the third provider, BIMA (<https://www.bima.com.fj>), has closed its operations in Fiji. FijiCare was developed in partnership with the Pacific Financial Inclusion Programme.

Papua New Guinea

In Papua New Guinea, the vast majority of people and businesses have no property insurance (Bank of Papua New Guinea, 2016, p. 29). The insurance penetration rate in Papua New Guinea is 1.4%, less than half the 3% average for the Asia-Pacific region (Oxford Business Group, 2019b). A study that examined two rural provinces (Morobe and Madang) found that less than 2% of households had either house or motor vehicle insurance, and anecdotal evidence indicates that rates of coverage are low all across the country (Sibley et al., 2015, p. 46). Anecdotal evidence suggests that virtually all local insurance is sold in the two largest cities, Port Moresby and Lae, with only “micro-percentages” in smaller towns and in rural areas, and large-scale extractive industry facilities generally being insured outside the country (Oxford Business Group, 2019a). Demand for insurance is low, partly because people rely mostly on strong community support systems (see section 3.8) (Ganesh et al., 2016, p. 75; Oxford Business Group, 2019b) although life and health micro-insurance packages are available in the market⁴⁵.

The insurance market for natural hazards is hampered in part by the high frequency of damaging events, which are making reinsurance increasingly expensive. The risks are “considered too great for the private sector or the government to bear” and “the reinsurance market is hardening amid resistance to extend

coverage to the country's most disaster-prone regions... access to sustainable reinsurance is viewed by some industry stakeholders as the largest constraint to the development of PNG's insurance sector” (Oxford Business Group, 2020).

No agricultural insurance products currently exist in Papua New Guinea, but a 2013 “pre-feasibility” study suggested that there could be potential to develop insurance products for some cash crops. A World Bank study (Mahul, KC, Stutley, Oliver, Kunda, & Siri, 2013) on the feasibility of crop and livestock insurance in Papua New Guinea noted that no agricultural insurance products were available in the country, and that the domestic insurance industry, farmers, and regulators lacked experience in this area. Barriers to developing agricultural insurance products include a lack of agricultural production data and meteorological data, limited financial resources of farmers, limited financial capacity of insurers and potential difficulties obtaining reinsurance capacity, and a lack presence of insurance companies in rural areas. The study concluded that there may be potential to develop indemnity-based or parametric insurance products to cover some cash crops (oil palm, rubber and possibly cocoa) against perils such as cyclones, wind, rain, volcanic eruption, or fire; there may also be potential for the national government to take insurance coverage against drought.

⁴⁵In one unfortunate example, the insurance company BIMA and the Digicel mobile phone network launched a mobile-based micro-insurance product that sold 800,000 policies in the first two and a half years (Oxford Business Group, 2019b), but then experienced problematic levels of fraudulent claims that led to the company withdrawing from the country (Oxford Business Group, 2020). Other life and health micro-insurance packages continue to be sold, typically in partnerships between micro-banks and insurance companies.

Samoa

In Samoa, the majority of people and businesses have no insurance coverage against natural hazards.

The non-life insurance penetration rate in Samoa was 2.5% in 2012 (PCRAFI, 2015b, p. 31), which is slightly below the average for the Pacific region; an IMF report estimates a somewhat lower rate of 1.2% in 2013 (IMF, 2015, para. 8). One study reported that 21% of Samoans have insurance coverage (mostly life insurance or accident coverage), only 6% have home insurance, and that 39% of uninsured adults do not know what insurance is (Central Bank of Samoa, 2015, pp. 32–37). Another study suggests higher levels of insurance coverage, reporting that approximately 20% of businesses and 10% of residential properties have cyclone insurance, and that the government insures major public buildings but not other infrastructure assets such as bridges and roads (PCRAFI, 2015b, p. 29). Following the 2009 tsunami, the government's post-disaster needs assessment noted that “it appears that housing insurance has been totally absent” in the areas affected (Government of Samoa, 2009, p. 37), and when TC Evan struck in 2012, only 8.3% of the value of the damage incurred by tourist accommodation properties and cultural heritage sites was insured

(Government of Samoa, 2013, p. 33). Cyclone insurance is available in the market, subject to an engineer certifying compliance with cyclone standards (storm surge is normally excluded), and coverage for earthquakes and tsunamis is normally included automatically (PCRAFI, 2015b, pp. 29, 31).

The insurance market in Samoa is small but competitive

(PCRAFI, 2015b, p. 29). As of 2018, the market includes six insurance companies (Deseret Mutual Benefit, Samoa Life Assurance Corporation, National Pacific Insurance Limited, Progressive Insurance Limited, Apia Insurance Company Limited, and Federal Pacific Insurance Limited) as well as four insurance brokers and 17 insurance agents (Central Bank of Samoa, 2019). The Central Bank of Samoa regulates national companies and the Samoa International Finance Authority regulates international insurance companies operating in the country (PCRAFI, 2015b, p. 29). The IMF argues that regulatory arrangements are unsatisfactory due to a lack of technical capacity on the part of the regulator and inadequate financial reporting and auditing practices (IMF, 2015, para. 43). Approximately 15% of the market is insured with overseas companies (PCRAFI, 2015b, p. 29).

Solomon Islands

In Solomon Islands, the vast majority of people and businesses have no insurance coverage against natural hazards. The non-life insurance penetration rate in Solomon Islands was 1.3% in 2012, which is low compared with other Pacific island countries (PCRAFI, 2015c, pp. 18, 33). Only 7% of Solomon Islanders report having insurance coverage, and only 9% of those have home insurance; most coverage consists of life, vehicle, or health cover (Central Bank of Solomon Islands, 2015b, p. 18). More than half of all adults say that they do not know what insurance is (Central Bank of Solomon Islands, 2015b, p. 18). The government has no insurance in place for government assets, but some state-owned enterprises do have insurance including earthquake and cyclone perils (PCRAFI, 2015c, p. 38). Insurance against cyclone and earthquake damage is commercially available

and – unusually for Pacific island countries – is automatically included in insurance products without any preconditions such as an engineer's report (PCRAFI, 2015c, pp. 18, 36).

The insurance market in Solomon Islands is limited in capacity. There are four licensed insurance companies, four insurance brokers, and two insurance agents in the country (ADB, 2019a, p. 2). The Central Bank of Solomon Islands licenses and regulates the industry (PCRAFI, 2015c, p. 32). Almost half (48%) of the market premium is placed with offshore insurers (PCRAFI, 2015c, p. 34). The Central Bank of Solomon Islands is seeking to support the development of micro-insurance products for rural households, but as of 2019, this objective "has not been progressed due to the challenge of interested players to provide this product" (Central Bank of Solomon Islands, 2020, p. 26).

Tonga

In Tonga, most people and businesses have no insurance coverage against natural hazards. The non-life insurance penetration rate in Tonga was only 0.9% in 2012 (Mahul et al., 2015, p. 23), which is well below the average for the Pacific region. Only 13% of adults report having any form of insurance (mostly life and health cover), while 22% report that they are unfamiliar with what insurance is (National Reserve Bank of Tonga, 2017, pp. 25, 36). Even motor vehicle insurance is not mandatory, which is unusual among Pacific island countries (PCRAFI, 2015d, p. 16). Coverage for earthquakes is typically included in property insurance policies, but coverage for cyclones is not included although it is available as an extension; insurance rates for cyclone (0.25%) and earthquake (0.15%) perils are average for Pacific island countries (PCRAFI, 2015d, p. 16). Insurers only cover properties

with an engineer's certification of compliance with cyclone wind loads (PCRAFI, 2015d, p. 15). Tonga has a national building code based on Australian and New Zealand standards, and although commercial buildings are inspected, there is a lack of supervision of residential construction (PCRAFI, 2015d, p. 34). Tonga has no legislation in place to regulate its insurance industry, which means that the solvency of domestic insurers is not assessed and there is a lack of consumer protection (PCRAFI, 2015d, p. 15), although relevant legislation was being drafted as of 2019 (National Reserve Bank of Tonga, 2019, p. 23).

Only a small number of households and businesses have benefited from insurance following recent disasters, likely because of low insurance penetration especially in outlying islands. Because Tonga has no insurance

regulator, good data on insurance claims are not available (PCRAFI, 2015d, p. 33). However, the 2009 tsunami which destroyed 31% of all houses on the island of Niuatoputapu as well as causing extensive damage to other property (Kingdom of Tonga, 2009, p. 6) is reported to have generated no insurance claims at all (PCRAFI, 2015d, p. 33), likely because of a lack of insurance coverage. TC Ian caused property damage estimated at USD 49 million in 2014, but insurance industry sources indicate that only 70 insurance claims have been made, totaling an estimated USD 660,000 (1% of the

total damage), also due to the low levels of insurance coverage (PCRAFI, 2015d, p. 33). In 2018, TC Gita struck Tongatapu and 'Eua, where the commercial activity of the country is concentrated, and approximately 30% of businesses affected by the cyclone reported that they had some form of insurance coverage (Government of Tonga, 2018b, p. 53). Among tourism accommodation businesses, 61% reported some form of insurance coverage, but only 44% were covered for cyclone damage (Government of Tonga, 2018b, pp. 53, 63).

Vanuatu

In Vanuatu, the vast majority of people and businesses have no insurance coverage against natural hazards. The non-life insurance penetration rate in Vanuatu was 2.1% in 2012 (PCRAFI, 2015e, p. 32), which is below the average for the Pacific region. Only 5% of adults have any kind of insurance, and this is mostly vehicle, health, or life cover; only 14% of people who do have insurance have coverage for their homes (Reserve Bank of Vanuatu, 2016a, pp. 27, 39). Nearly half (48%) of adults state that they do not know what insurance is (Reserve Bank of Vanuatu, 2016a, pp. 27, 39). Only 23% of MSMEs (58% in urban areas, 13% in rural areas) have any kind of insurance coverage (Reserve Bank of Vanuatu, 2016b, p. 42). Sources in the insurance industry estimate that 80% of clients are in Port Vila and the island of Efate, with 15% in Luganville and only 5% spread throughout the rest of the country (PCRAFI, 2015e, p. 34); the government concurs that there is virtually no insurance in the outer islands, no insurance in the agriculture sector, and no insurance products designed for MSMEs (Government of Vanuatu, 2015b, pp. 26–27). Insurance against cyclone and earthquake damage is commercially available, but cyclone insurance is not automatically included in standard property coverage and is available only by extension, and only for properties with an engineer's certification of compliance with

standards for cyclone wind loads (PCRAFI, 2015e, pp. 31–34). Following TC Pam, “many business owners who had not procured cyclone insurance folded in the aftermath of the storm, unable to reinvest sufficient savings in their businesses or to tap sources of credit” (WTO, 2019b, p. 31).

The insurance market in Vanuatu is constrained by its small size and by the difficulty and cost of obtaining reinsurance coverage from the global market. The market currently includes three local insurance companies (QBE Insurance, VanCare Insurance, and Tower Insurance), two external insurance companies (Capital Insurance and Lloyds Australia), and several additional agents, brokers, and managers, all licensed and regulated by the Reserve Bank of Vanuatu (Reserve Bank of Vanuatu, 2020). The market has limited capacity and regulatory requirements and high premiums inhibit obtaining coverage from overseas insurers (PCRAFI, 2015e, pp. 32–34). Insurance companies in Vanuatu have faced difficulties following recent disasters due to the scale of losses suffered: after Cyclone Uma in 1987, five of the eight insurance companies operating at the time had to close, and after an earthquake in 2002, two of the five insurers operating had to close, in both cases due to difficulty obtaining adequate reinsurance coverage (PCRAFI, 2015e, p. 37).

3.5. Migration

Net migration rates

Migrants per thousand population (positive values indicate net immigration, negative numbers indicate net emigration)

	Net Migration rate	Global rank
Fiji	-7.0	15
Papua New Guinea	-0.1	112
Samoa	-14.3	5
Solomon Islands	-2.5	39
Tonga	-7.7	11
Vanuatu	+0.4	133

(United Nations Population Division, 2019)

Participation in unskilled worker programs

Migrant workers in the New Zealand Recognized Seasonal Employer program and Australian Seasonal Worker Programme, 2017-2018

	Total workers	Workers per thousand population
Fiji	606	0.7
Papua New Guinea	216	0.0
Samoa	2,405	12.2
Solomon Islands	818	1.2
Tonga	4,689	45.1
Vanuatu	7,793	26.1

(ILO, 2019b, p. 16)

Globally and across the Pacific, migration both within a country and internationally is recognized as a positive adaptation strategy in response to natural hazards and environmental change (Melde & Laczko, 2017, p. 85). Voluntary, well-managed migration of individuals and communities can enhance the adaptive capacity of the migrant-sending community by generating remittances, reducing population pressure, and transferring knowledge and skills (Campbell & Warrick, 2014, p. 3). In one study of five countries around the world, migration in response to environmental change was linked to positive impacts on income and employment and a higher likelihood of adopting future preventive measures including using better building materials; "migrant households surveyed overwhelmingly indicated that migration had beneficial outcomes" (Melde & Laczko, 2017, pp. 86, 88). The ILO reports that across the Pacific, labor migration has produced benefits including employment, remittances, and increased education and skills development, although some countries have also suffered from the loss of skilled workers where migration

has been permanent rather than temporary or seasonal (ILO, 2019b, pp. vi–vii). The primary reasons for individuals to migrate are to seek economic opportunities and to strengthen kinship ties; climate change impacts are only a major driver of migration when they cause damaging events such as severe flooding or cyclones, or undermine livelihoods (Campbell & Warrick, 2014, p. 10; ILO, 2019a, p. 16). However, although the media and international community sometimes focus on extreme climate change scenarios that anticipate large-scale international population movements, such scenarios are not yet a reality and Pacific islanders reject the image of "climate refugees", preferring instead to emphasise positive adaptation strategies (Campbell & Warrick, 2014, p. 9). Samoa, Tonga, and Fiji have particularly high rates of emigration (ranking among the top 15 migrant-sending countries in the world by proportion of their population). Governments of all Pacific island countries generally seek to increase their numbers of migrants to ease local labor market pressures, increase remittances, and facilitate skills transfers (ILO, 2019b, p. 38).

Fiji

Fiji is a high labour mobility country, sending significant numbers of migrants to work overseas, including many in skilled roles.

Fiji's estimated net emigration rate in the period 2015 - 2020 is -7.0 per thousand people, the 15th highest in the world (United Nations Population Division, 2019). Fiji's diaspora is estimated at 222,600 people as of 2019 (IOM, 2020), which is 25% of the country's population. Fiji participates in the principal regional programs for unskilled seasonal labor migration, New Zealand's Recognised Seasonal Employer scheme and Australia's Seasonal Worker Programme, but secures relatively few places on these programs (606 workers in 2017-2018, or 0.7 workers per thousand population) compared with the most successful countries in the region, Tonga, Vanuatu, and Samoa. The country also has access to the New Zealand Pacific Access Category visa lottery scheme, which offers 250 places per year to Fijians (ILO, 2017a, p. 9, 2019b, p. 2). More significantly, however, "Fiji has the most advanced education and skills training systems in the Pacific region" (ILO, 2019b, p. 20) and has made good progress in aligning national training schemes with qualification frameworks in Australia and New Zealand (ILO, 2019b, p. 23), which have enabled it to become one of the few Pacific island countries able to access opportunities for skilled workers in Australia, New Zealand, and elsewhere (Curtain, Dornan, Doyle, & Howes, 2016, pp. 17-18; ILO, 2019b, pp. 3, 20). Fiji has also been able to access opportunities outside the Pacific region, for example sending more than a thousand migrants per year to work for private military

and security companies in the Middle East (these data cover the period from 2006-2011) and elsewhere in the Pacific region as well as some 450 athletes playing professional rugby in New Zealand, Australia, Europe, and elsewhere (ILO, 2019b, pp. 16, 20; Kanemasu & Molnar, 2017, p. 158). There are concerns that migration of skilled workers could potentially lead to "brain drain" in Fiji if skilled workers do not return or are not replaced (Curtain et al., 2016, pp. 35-36; ILO, 2019b, p. 37). There are indications that the current rate of outward migration is slowing and "further declines are anticipated based on current trends" (Government of Fiji, 2017a, p. 12).

Demand for rural-urban migration is likely to increase, driven by economic pressures and climate change (Campbell & Warrick, 2014, p. 3). Rural-urban migration trends are strong across the region and are expected to increase, with climate change expected to accelerate the growth of towns and cities, which could strain the capacity of urban areas to cope with the impacts of climate change and lead in turn to increased demand for international migration (Campbell & Warrick, 2014, pp. 2, 28). In Fiji, 54% of the population is located in three main urban areas, and the urban population is expected to rise to 61% in the next twenty years (Government of Fiji, 2017b, p. 41, 2017a, p. 12). Rural-urban migration is driven primarily by income differentials: average urban household income is approximately double average rural household income (Government of Fiji, 2017b, p. 41).

Papua New Guinea

Papua New Guinea sends very few migrant workers overseas. Papua New Guinea has performed very poorly in accessing seasonal worker programs in Australia and New Zealand, the principal destinations for Pacific island migrant workers (ILO, 2017a, p. 12). For example, in 2017/18, Papua New Guinea sent only 230 workers overseas, while countries like Tonga and Vanuatu, with much smaller populations, secured around 5,000 and 8,000 placements, respectively (Curtain, 2018, p. 2). This difference in success rates is attributed to Tonga and Vanuatu securing first-mover advantages by getting involved in these programs early; differences in the recruiting process, which in the smaller countries is organized by employers through their own agents or returning workers but in Papua New Guinea is organized by a government office which has been less efficient and effective; employer dissatisfaction with workers' skills and productivity; lack of publicity about opportunities; and cost barriers that hinder recruitment from rural areas (Curtain, 2018, pp. 5–12; ILO, 2019b, pp. 31–32). Other

authors suggest that cultural attachment to the land makes emigration an option that is not readily considered; immigration policies of the dominant powers in the region have historically deterred emigration from Papua New Guinea and other Melanesian⁴⁶ countries; and that weak education systems, labor markets, and the limited extent of formal employment in Papua New Guinea have limited people's ability to acquire appropriate education, skills, and experience to take up international opportunities (Montoya & Au, 2013, pp. 7–11, 16). The Papua New Guinea government supports migration by maintaining a “work-ready pool” of about 1,500 candidates and providing two weeks of pre-departure training for those who are selected (ILO, 2019b, p. 31; Voigt-Graf, 2017, pp. 11, 13), although interviews with one cohort of workers suggests that the selection process is influenced by personal connections and that in practice they only attended one or two days of training (Voigt-Graf, 2017, pp. 13, 37).

Samoa

Migration is a well-established strategy in Samoa for seeking economic opportunities for both skilled and unskilled workers. Samoan families strategically organize sending family members overseas, including selecting where to go and what sorts of opportunities to pursue, and even choosing to send different family members to different places to diversify risk (John Connell, 2015, p. 133). From 2015 to 2020, Samoa's net migration rate is estimated at -14.3 per thousand people, which is the fifth-highest emigration rate in the world among 201 countries and territories surveyed

(United Nations Population Division, 2019). The total number of Samoan migrants abroad was estimated by IOM as approximately 124,000 people in mid-2019, which is 63% of the population of the country (IOM, 2020); other authors suggest that “there are more Samoan-born Samoans living abroad than in the country itself” (John Connell, 2015, p. 129; Le Dé, Gaillard, Friesen, Pupualii, Brown, & Aupito, 2016, p. 133). The broader diaspora with ties to Samoa, including ethnic Samoans born overseas, is even larger: for example, there are currently 183,000 ethnic Samoans living in New Zealand (Statistics New Zealand, 2020).

⁴⁶Melanesia is a geographic and cultural region of the southwest Pacific that includes Papua New Guinea, Fiji, Vanuatu, Solomon Islands, New Caledonia, and parts of Indonesia.

Government policy in Samoa actively supports migration. Samoa is one of three Pacific countries (the other two are Kiribati and Tuvalu) that have adopted national labor migration policies setting out protection principles for migrant workers, outlining the responsibilities of government to ensure support for migrants, and developing strategies to increase safe labor migration (ILO, 2019b, p. 39). Samoa has benefited from labor migration programs in Australia and New Zealand, especially New Zealand's Recognised Seasonal Employer program, for which the government maintains a "work-ready list" of candidates (John Connell, 2015, p. 122), and its Samoan Quota visa lottery

program, which grants permanent residence to 1,100 Samoans per year (ILO, 2017a, p. 9; New Zealand Immigration, 2020). The migration of unskilled workers has been deliberately encouraged by the government, which has also sought to increase local skills to make migrants more competitive (John Connell, 2015, p. 154). Samoa is negatively affected by the loss of skilled workers, notably in the health and education sectors, but skilled workers send remittances which are sustained for a long time, and on balance "the economic costs of skilled migration are... probably outweighed by the benefits" (John Connell, 2015, pp. 150–154).

Solomon Islands

Solomon Islands is a "low labor mobility" country, sending very few migrant workers overseas compared with neighboring Pacific island countries. Solomon Islands has had severely restricted access to external labor markets and one of the lowest rates of outward migration in the world (Curtain et al., 2016, p. 1). The total number of emigrants from Solomon Islands is estimated at about 4,200 people, or about 0.6% of the population (IOM [International Organization for Migration], 2020). Low levels of migration are partly influenced by historical factors including colonial policies and post-colonial immigration policies in the region (Craig & Bedford, 2013; Curtain et al., 2016, p. 2), but are also linked to low levels of education, English literacy, and formal employment experience which do not prepare workers well for overseas opportunities (Curtain et al., 2016, p. 34; World Bank, 2017d, p. 68). Solomon Islands missed gaining "first mover advantage" (compared with neighboring countries) in taking advantage of important regional temporary worker programs (New Zealand's Recognized Seasonal Employer program and Australia's Seasonal Worker Programme), and had inadequate arrangements for sending migrant workers when the Seasonal Worker Programme

was launched, "causing reputational damage among employers that has been difficult to overcome" (World Bank, 2017d, p. 68).

The Solomon Islands government is actively promoting labor migration and seeking to dramatically increase the number of workers overseas. The government notes that labor migration produces significant benefits for addressing unemployment, generating income and increasing GDP, developing skills, increasing social development, and alleviating poverty (Solomon Islands Government, 2018, p. 5). A Labour Mobility Unit has been established to oversee and regulate the system for labor mobility, work with national stakeholders and registered recruiters, undertake marketing efforts overseas, provide health screenings for workers, and support workers through pre-departure briefings and training as well as pastoral care (Solomon Islands Government, 2018, pp. 9–15). In 2017–2018, Solomon Islands sent 665 workers to New Zealand, 175 workers to Australia, and 30 to Canada through labor mobility schemes, and the country has an ambitious target of increasing the total number of labor migrants by more than six times by 2023 (Solomon Islands Government, 2018, pp. 5, 8).

Tonga

Migration is a well-established and deliberate strategy in Tonga for seeking economic opportunities for both skilled and unskilled workers (John Connell, 2015). The population of Tonga declined from 2011 to 2016 by 2.6%, which is largely attributable to emigration (Government of Tonga, 2018a, p. 5). Between 2010 and 2015, Tonga had a net migration rate of -25.4 per thousand people, which was the second-highest emigration rate in the world (second only to Syria); in the period 2015-2020 emigration slowed to -7.7 per thousand, placing Tonga 11th in the ranking of emigrant-sending countries worldwide (United Nations Population Division, 2019). Tonga now has a diaspora that is approximately the same size as the entire population of the country (WTO, 2019b, p. 8) which not only sends large amounts of money as remittances (see section 3.3), it also has a major effect on the tourism industry: in 2013, at least 42% of international passengers arriving in Tonga were members of the diaspora visiting friends and relatives (the actual percentage

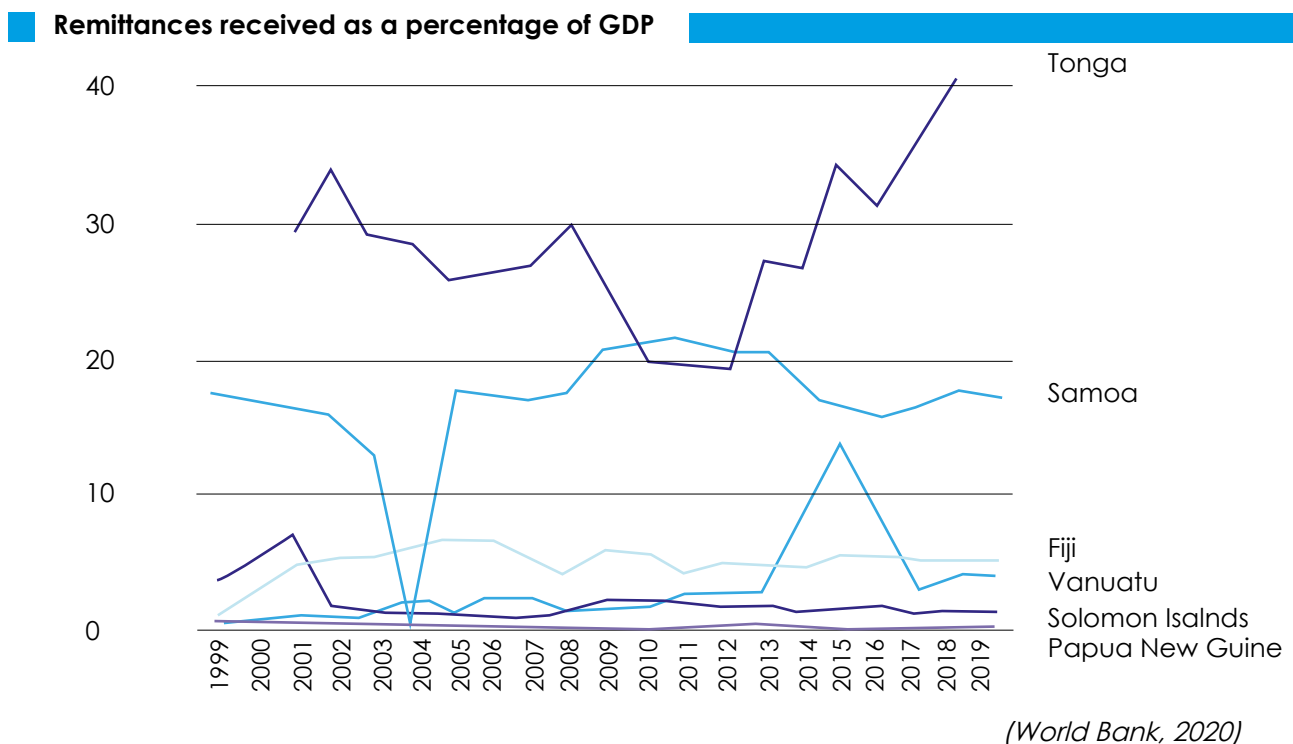
may be higher) (Perrottet & Garcia, 2016, p. 11). There is rural-urban migration from the outer islands to the core island of Tongatapu: net migration between 2011 and 2016 amounted to 1.2% of the population of Tongatapu in 2016 (Tonga Statistics Department, 2017a, pp. 13, 64–65) although the population of Tongatapu still dropped by 1.1% over the same period due to emigration overseas (Tonga Statistics Department, 2017a, p. 10; United Nations Population Division, 2019). Emigration of skilled workers leads to skill shortages in Tonga, although this “brain drain” is partially offset by return migration and largely offset by remittances, to the extent that the economic costs of skilled migration may be balanced or even outweighed by the benefits; emigration of unskilled workers, on the other hand (mostly to Australia and New Zealand), is considered a significant overall benefit and has been deliberately encouraged (John Connell, 2015, pp. 153–154).

Vanuatu

Vanuatu does not have a history of overseas migration for economic opportunities, but numbers of temporary migrants, especially seasonal workers, are increasing. Vanuatu has historically had few migration outlets, but has been sending increasing numbers of temporary workers overseas since the launch of New Zealand’s Recognised Seasonal Employer scheme in 2007 and Australia’s Seasonal Worker Programme in 2012 (ILO, 2019b, pp. v, 2, 37). For example, Vanuatu’s share of visas under the Australian Seasonal Worker Programme has increased from 8% in 2012-13 to 40% in 2017-18, amounting to 3,350 visas (Government of Vanuatu, 2015b, p. 89; Howes, 2018). Direct recruitment of workers for overseas employment is supported by the Vanuatu Department of Labour, which maintains “a work-ready pool of workers” (ILO, 2019b, p. 31). Vanuatu’s

overseas diaspora is estimated at about 7,300 people or 2.5% of the population (IOM, 2020), mostly in neighboring New Caledonia (ILO, 2019b, p. 21). A small-scale study of the effects of migration on food security in one village on Epi island found that migration reduced the availability of labor for agricultural production, and that remittances enabled and encouraged purchasing of food, including imported food, leading many households with migrant family members to abandon agriculture altogether and seek other income-earning opportunities (Craven & Gartaula, 2015). Rural-urban migration is a strong trend in Vanuatu, driven partly by environmental changes in places of origin, but also by people seeking jobs, education, health care, and other services (NDMO, 2018, p. 11).

3.6. Remittances



Remittances – money and goods sent by migrants back to their country of origin – are an important source of income for many low-income countries, both in normal times and following disasters (Pairama & Le Dé, 2018, p. 331). Worldwide, remittances have been increasing in recent years and currently amount to more than three and a half times the total value of official development assistance, with unrecorded remittances sent through informal channels possibly even greater (Pairama & Le Dé, 2018, p. 332). Remittances tend to be more stable than other international financial flows, and are countercyclical, often increasing to compensate for income shocks in migrants' home countries (Brown, Connell, & Jimenez-Soto, 2014, p. 434). A study of remittances sent by migrants working in Italy to 107 developing countries found that even when negative shocks occur in both the source and recipient countries, remittances remain countercyclical with respect to the recipient country (Bettin, Presbitero, & Spatafora, 2014). Remittances significantly increase following disasters, contributing to reconstruction and substituting for local financial systems which are not able to provide local credit (Bettin & Zazzaro, 2018,

pp. 481–482, 497). Remittances can take the form of goods and commodities, but sending cash is often considered to be more useful than sending goods: one study of migrants in New Zealand collecting goods to send to various Pacific islands in response to disasters showed that half of the donated goods were unusable or unnecessary, an experience which is supported by other studies (Pairama & Le Dé, 2018, p. 336)

Evidence from many countries worldwide shows that households that receive remittances are better able to respond to and recover from disasters than those that do not receive them, including rebuilding more quickly and avoiding negative coping strategies (Bettin & Zazzaro, 2018, p. 483; Le Dé, Gaillard, & Friesen, 2015, p. 538). Remittances help maintain consumption during crises and contribute positively to local economic activity (El-Zoghbi, Chehade, McConaghy, & Soursourian, 2017, p. 15). There is debate in the literature regarding the degree to which remittances contribute to reproducing existing inequalities: in the past, remittances have been more often received by middle- and upper-income families with better education

and with funds to pay for transportation and visas, who can then invest further in these assets, but there is evidence suggesting that as migration has become cheaper and more accessible, remittances have increasingly contributed to reducing income inequality (John Connell, 2015, p. 139; Le Dé, Gaillard, & Friesen, 2015; Le Dé, Gaillard, & Wardlow, 2015, p. 2). There is also some question in the literature about how well remittances support disaster preparedness: there is good evidence that remittances substantially contribute to welfare, increased consumption, and improved housing, and that there has been a shift in the use of remittances from consumption to investment where it is feasible to do so and opportunities exist (Bettin & Zazzaro, 2018, pp. 491, 497;

John Connell, 2015, p. 140), but on the other hand some authors argue that remittances are more often spent on basic needs such as food than on investments in adaptive capacity (Melde & Laczko, 2017, p. 86; Pairama & Le Dé, 2018, pp. 340–341). Remittances contribute to macroeconomic stability following disasters, except in a very few cases where they reach very high levels, in excess of 17% of GDP, where they can cause inflation and create moral hazard (Ebeke & Combes, 2013). Across the Pacific region, however, research on remittances has generally looked at impacts on development with very little work on the role of remittances in disaster resilience (Campbell & Warrick, 2014, p. 31).

Fiji

Fiji receives substantial funds from remittances, which contribute to poverty reduction, wealth creation, social protection, and economic growth. The total value of remittances received in Fiji was 5.2% of GDP in 2019 (World Bank, 2020e), which is lower than other Pacific island countries as a percentage of GDP, but higher in dollar terms. Almost a quarter (23%) of adult Fijians receive remittances, with more women (28%) than men (19%) receiving them (Reserve Bank of Fiji, 2015, p. 28). At the household level, a survey carried out in 2005 indicated that 42% of all households in Fiji receive remittances, and also noted that migrants send remittances to households other than their own (20% of households without any migrants received remittances) as well as to churches and other community organizations (Brown et al., 2014, p. 441). There is evidence from Fiji that remittances support poverty alleviation, wealth accumulation, and economic growth, particularly among poorer households. One study, for example, found that remittances are used for education and housing expenditures, and that they are associated with crop diversification and increases in production of cash crops (Xing, 2018, pp. 42–43). A study that attempted to quantify the impact of remittances in Fiji estimated that without remittances, poverty rates would likely increase from 34% to 42.9%, and found a strong positive

impact on the relative wealth of households that receive remittances compared with those that do not (Brown et al., 2014, pp. 446–448); another estimated that at the national aggregate level, a 1% rise in remittances as a percentage of GDP would increase per capita output by 0.12% (Jayaraman, Choong, & Kumar, 2011, p. 537).

Although there is good evidence that remittances provide resources to help recipients manage economic shocks, there is a lack of information about exactly how remittances have been used for disaster relief and recovery in Fiji. Post-disaster needs assessment reports in general terms that “following a disaster people in Fiji help themselves with the assistance of family/community (either those at home or abroad with cash remittances)” (Government of Fiji, 2013), that repairing and rebuilding housing relies on “a combination of government support, household savings, family remittances and local credit” (Government of Fiji, 2016, p. 120), and that “private sector workers and those dependent on remittances were least likely to have been impacted by the cyclone” (Fiji Food Security and Livelihoods Cluster, 2016, p. 5). However, specific data on the value of remittances received following disasters and how these funds are used do not appear to be available.

Papua New Guinea

International remittances are a negligible source of income in Papua New Guinea, but domestic remittances from urban workers to rural households are more common.

Remittances have been valued at no more than 0.25% of GDP throughout the past twenty years, and have been decreasing both in dollar terms and as a percentage of GDP⁴⁷ since the early 1990s; in 2019 remittances reached their lowest level in at least 40 years, at USD 2.5 million or 0.01% of GDP (World Bank, 2020e). Papua New Guinea sends very few migrant workers overseas, both as a proportion of its population and compared with neighboring Pacific island countries (see section 3.5). Sending domestic remittances from workers in urban areas to their families in rural areas is fairly common, however: it has been estimated that 49% of the population received remittances in 2009-10 (National Statistical Office, 2009, p. 120), of which the majority were likely to be domestic although a breakdown of international versus domestic remittances does not appear to be available. A study in 2014 looking at two provinces estimated that 60% of the population in those provinces received remittances (Sibley et al., 2015). Most formal domestic remittances are sent via the post office, even though only 40% of the population can access a postal outlet; the quantity of domestic remittances sent through informal channels or hand-carried is not known but is probably larger (Ganesh et al., 2016, pp. 75, 80; Sibley et al., 2015, p. 42). The 2009-10 Household Income and Expenditure Survey reports that remittances amounted to an average of PGK 445 (approximately USD 163) per recipient in 2009-10 (National Statistical Office, 2009, p. 120).

There is good evidence globally and regionally that remittances help recipients manage economic shocks, but there is a lack of information about how remittances have been used in Papua New Guinea, particularly for disaster relief and recovery purposes.

Regarding Papua New Guinea, there appears to be a scarcity of research on remittances for all purposes. One study of low-skilled migrant workers participating in the Australian Seasonal Worker Programme in 2016 found that these workers remitted an average of AUD 3,350 (approximately USD 2,490) each to spouses, parents, children and other relatives, most of which was spent on everyday expenses, health-related and education-related expenses, and customary obligations; some workers said that remittances had also been used for livestock, farming or fishing inputs, or to start or invest in a business (Voigt-Graf, 2017, p. 2). However, household incomes of workers who participated in the program for several years were no higher than those of first-time participants, and there was no relationship between the number of seasons that workers participated in the program and ownership of durable household goods; the authors conclude that remittances were mostly used to support immediate needs, including distribution through the *wantok* system (customary and reciprocal obligations to assist members of one's cultural group; see section 3.8), rather than being used for productive investments (Voigt-Graf, 2017, p. 33).

⁴⁷The decline in value as a percentage of GDP is in part due to domestic economic growth increasing more quickly than remittances, but the general trend in dollar terms has been downwards since the early 1990s.

Samoa

International remittances are a major source of income for Samoa, which is ranked 10th in the world in terms of remittances received as a percentage of GDP (World Bank, 2020e). Amounts received have typically ranged between 15% and 22% of GDP over the past 37 years, with the most recent figure being 17.3% of GDP in 2019 (World Bank, 2020e). Remittances are about three times the value of exports and are worth substantially more than the value of foreign aid (John Connell, 2015, p. 133). A survey led by the Central Bank of Samoa in 2015 found that 56% of adults reported receiving remittances from overseas in the past year (Central Bank of Samoa, 2015, p. 17) and it is widely assumed that at least 90% of households receive remittances (John Connell, 2015, p. 133). Samoa has a large diaspora, with strong cultural values that include reciprocal duties to help family and community members (Le Dé et al., 2016, pp. 140–141; Parsons et al., 2018, pp. 655–656). Three-quarters of people receiving remittances receive them regularly, at least once per quarter (Central Bank of Samoa, 2015, p. 24). Money is overwhelmingly (92%) sent via Western Union, with 4% being hand-delivered in case and only 4% sent via bank transfer, mobile money services, or other means (Central Bank of Samoa, 2015, p. 51). In addition to money, 64% of households in Samoa receive in-kind remittances, including food and clothing, appliances like televisions, microwave ovens, refrigerators, and even construction materials and cars (John Connell, 2015, p. 136; Le Dé et al., 2016, p. 137).

Remittances in Samoa support consumption levels and social welfare, and reduce the proportion of the population in poverty (ILO, 2019b, p. 37). Most recipients (69%) report spending remittances on personal expenses such as food and utilities, 40% report using the money for traditional ceremonies (such as weddings, funerals, and church obligations), 35% use the money for other emergencies, 30% for education costs, and 25% use the money

for other purposes (Central Bank of Samoa, 2015, pp. 18–19). There is also evidence of more diverse uses including housing, community projects, education, investment in agriculture, and as start-up capital for shops and other small businesses (John Connell, 2015, p. 137). For example, a study published in 2001 reported that half of all market vendors in Apia, all of whom received remittances, said that remittances had been used as capital for the purchase of seeds, fertilizer and tools to engage in food production for sale (Muliaina 2001, p. 28, cited in John Connell, 2015, p. 137). A study of one village in Samoa after TC Evan found that poor households had less access to remittances than middle- and upper-income households (because poorer households had fewer family members able to take up work overseas, and lower levels of education providing access to better-paying jobs), and that poor households without access to remittances became more vulnerable after the cyclone (Le Dé, Gaillard, & Friesen, 2015, pp. 549–550).

Remittances to Samoa have reliably increased by large amounts following disasters caused by cyclones and tsunamis (Campbell & Warrick, 2014, p. 23; Costella & Ivaschenko, 2015, p. 41; Le Dé et al., 2016, pp. 131, 134). Remittances following the 2009 tsunami, for example, were 3.6 times as high as in a non-disaster year (Le Dé et al., 2016, p. 136). Samoan migrants in New Zealand reported that after the 2009 tsunami they not only sent higher levels of remittances and more in-kind remittances, but also sent remittances to a wider range of relatives and their broader communities (often through churches), and travelled to Samoa themselves to deliver aid and help their communities (Le Dé et al., 2016, pp. 137, 142).

There is good evidence that remittances have helped recipients recover from the impacts of natural hazards in Samoa. Remittances help households meet basic needs during periods of crisis, particularly when livelihoods that rely on natural resources are less productive,

including seasonal fluctuations, shocks related to El Niño events, climate trends, and disasters (Campbell & Warrick, 2014, p. 23). Studies of coastal villages in Samoa found that remittances were “one of the most important resources” used by households to cope with disasters, because remittances were available very quickly (within hours or days of the event), were flexible, and addressed households’ specific needs, compared with the slower, more generic, and limited support provided by the government and NGOs (Le Dé, Gaillard, Friesen, et al., 2015, pp. 657, 665–669). Recipients of remittances reported that following both the 2009 tsunami and TC Evan in 2012, remittances were “mostly directed to deal with immediate security needs”, including rebuilding and repairing houses, recovering agricultural production, rebuilding community facilities, and supporting other essential expenses such as food, healthcare, and clothing; recipients also

noted that that even though most households received assistance to support housing repairs, this aid was not sufficient and remittances were used to complement this aid (Le Dé, Gaillard, & Friesen, 2015, p. 547; Le Dé, Gaillard, & Wardlow, 2015, p. 3; Le Dé, Gaillard, Friesen, et al., 2015, pp. 665, 668). Anecdotal evidence from remitters also supported the conclusion that remittances were used to restart businesses, repair houses, and buy water tanks (Le Dé et al., 2016, p. 136). Remittances were also helpful indirectly in enabling people to access other resources: following TC Evan, low-interest loans were made available (by the Central Bank of Samoa through the Samoa Housing Corporation) to households that had low or no income or assets but did have a family member working overseas who could assist in repaying the loan or serve as a guarantor (Le Dé, Gaillard, & Friesen, 2015, pp. 545–546).

Solomon Islands

International remittances are only a minor source of income for households in Solomon Islands. Amounts received have fluctuated between 0.5% of GDP and 2.5% of GDP over the past 20 years, most recently contributing 1.4% of GDP in 2019 (World Bank, 2020e). A survey led by the Central Bank of Solomon Islands in 2015 estimated that 36% of adults had received remittances in the past year, but most of these are domestic remittances, with only 11% of people receiving money from overseas (Central Bank of Solomon Islands, 2015b, p. 12). The Central Bank of Solomon Islands study reports that about one-third of people receive remittances every quarter (Central Bank of Solomon Islands, 2015b, p. 13), while a World Bank study reports that one quarter of rural

households receive remittances from family members working outside the village, usually in Honiara (World Bank, 2017d, p. 90). Remittances are overwhelmingly (68%) received in cash (Central Bank of Solomon Islands, 2015b, p. 13).

There is a lack of information about how remittances have been used in Solomon Islands, including for disaster relief and recovery purposes. In Solomon Islands, there appears to be a scarcity of research on the impacts of remittances in the country, both from a development perspective and from a disaster resilience perspective. The 2012-2013 Household Income and Expenditure Survey indicates that overseas remittances make up about 0.2% of households’ cash income (Solomon Islands National Statistics Office, 2015, pp. 57–58).

Tonga

Tonga receives more remittances as a percentage of its GDP than any other country in the world, and remittances make a large contribution to poverty reduction, wealth creation, social protection, and economic growth. The value of remittances received in Tonga in 2018 was 40.7% of GDP, which is the highest level of remittances as a proportion of GDP in the world⁴⁸ (World Bank, 2020e). Remittances are the main source of foreign exchange inflows, and are more reliable than exports (John Connell, 2015, p. 126). Tonga has a large diaspora, approximately the same size as the population of the country, with traditions and values that include expectations of sending money and goods home (Hahm et al., 2019, p. 5; Jimenez-Soto & Brown, 2012, p. 426; WTO, 2019b, p. 8). Migration for economic opportunities is facilitated by the Tongan government and by large seasonal worker programs in Australia and New Zealand, and is broadly seen as valuable and inevitable (John Connell, 2015). At the household level, a survey in 2005 indicated that 91% of all households in Tonga receive remittances (Brown et al., 2014, p. 441); another survey in 2016 found that 70% of adults reported receiving remittances within the past year (National Reserve Bank of Tonga, 2017, p. 21). Migrants also send remittances to households other than their own, such as extended family members and friends (78% of households without any migrants received remittances) (Brown et al., 2014, p. 441), and to churches and other community organizations (18% of all remittances go to such organizations) (Brown et al., 2014, p. 441; Macpherson and Macpherson, 2011, cited in John Connell, 2015, pp. 138–139). The largest mobile phone network in Tonga, Digicel, facilitates low-cost money transfers from Australia and New Zealand (John Connell, 2015, p. 147–148). However, 83% of

Tongans who receive overseas remittances do so through Western Union, followed by bank transfers and hand delivery of cash as the second and third most used mechanisms (Hahm et al., 2019, p. 16).

There is good evidence that remittances contribute to poverty reduction and to managing economic shocks, but a lack of information about exactly how remittances have been used for disaster relief and recovery in Tonga. There is evidence that remittances “have a strong impact on poverty reduction, in terms of both the extent and depth of poverty” (Jimenez-Soto & Brown, 2012, p. 426). A study that attempted to quantify the impact of remittances estimated that without them, poverty rates would likely almost double from 32% to 62%, and found a strong positive impact on the relative wealth of households that receive remittances compared with those that do not (Brown et al., 2014, p. 446–448). “The positive association between remittances and the accumulation of physical assets also indicates that migrant households among the poorest are likely to be much better insulated against negative income shocks than the non-migrant households in the same income category” (Brown et al., 2014, p. 448). Remittances provide a fiscal buffer both at the household level and for MSMEs, because remittance flows are typically unaffected by local crises and can increase in times of need (John Connell, 2015, p. 140; WTO, 2019b, p. 12–13). For example, following TC Gita in February 2018, remittances to Tonga grew by TOP 4.4 million (18.5%) to reach a monthly high in March of TOP 28.0 million (WTO, 2019b, p. 12–13). However, data on exactly how remittances are used during disasters do not appear to be available.

⁴⁸Followed by Haiti at 38.5%; no other country exceeds 30% (World Bank, 2020).

Vanuatu

International remittances are a small but increasingly important source of income for households in Vanuatu. Amounts received have been gradually trending upwards over the past two decades, reaching 3.8% of GDP in 2019, with a significant surge in 2015 and 2016 following TC Pam (World Bank, 2020e). The Government of Vanuatu estimates that 15% of urban and 38% of rural households receive remittances (Government of Vanuatu, 2015b, p. 89). A survey led by the Reserve Bank of Vanuatu and the Vanuatu National Statistics Office in 2016 estimated that 27% of adults had sent remittances, and 33% of adults had received remittances in the previous 12 months; most of the latter (72%) receive remittances from within Vanuatu rather than from overseas (Reserve Bank of Vanuatu, 2016a, p. 24). Most people (72%) report spending remittances on short-term personal expenses such as food and utility bills, 34% report spending on education

costs, and smaller proportions report spending on housing, health, and other costs (Reserve Bank of Vanuatu, 2016a, p. 25). Remittances (which are mostly domestic rather than international) are most often sent through Western Union (55%) or hand-delivered in cash (21%) (Reserve Bank of Vanuatu, 2016a, pp. 24–25).

There is good evidence globally and regionally that remittances provide resources that help recipients manage economic shocks, but there is a lack of information about exactly how remittances have been used for disaster relief and recovery in Vanuatu. In 2015 following TC Pam, remittances spiked to five times the average of the previous 15 years (World Bank, 2020e), suggesting a significant overseas response to the disaster, but data on exactly how remittances are used during disasters do not appear to be available.

3.7. Resettlement of Communities at Risk

Fiji

Relocation of settlements at extreme risk of natural hazards is generally considered a last resort with potentially severe social and cultural impacts. Global experience with planned relocation of settlements has identified many risks, including landlessness, unemployment, homelessness, social marginalization, reduced access to common-property resources, food insecurity, increased morbidity and community disarticulation (Cernea, 1997, cited in Campbell & Warrick, 2014, p. 24). The ILO, for example, argues that internal migration “deepens vulnerabilities” and “is not a durable solution to climate change”, except where linked to stable formal employment (ILO, 2017b, p. 144). Across the Pacific, particular risks relate to land, including loss of identity, culture, livelihoods, family ties and community cohesion, as well as conflict and governance issues around customary land rights (Campbell & Warrick, 2014, pp. 3, 24). In most cases across the Pacific, except perhaps where communities have directly experienced impacts such as severe

coastal erosion or flooding due to subsidence, residents typically resist the idea of relocation, and prefer in-place adaptation and sustainable management practices (Beyerl et al., 2018, p. 26; John Connell, 2012).

Fiji has undertaken several small-scale village relocations, and the government expects relocation to become “a more common response to climate related events in the future” (Government of Fiji, 2018a, p. 5). In 2017, the government identified 830 communities as being in need of relocation due to climate-related impacts, with 48 being in urgent need (Government of Fiji, 2017a, p. 102). The village of Vunidogoloa (population approximately 140), in Cakaudrove Province, was the first entire village to be completely relocated, in 2014; Denimanu (population approximately 170) and Vunisavisavi (population approximately 100), also in Cakaudrove Province, were partially relocated in 2012 and 2015 respectively; and

Narikoso (population approximately 105), in Kadavu Province, is now in the process of planning for partial retreat and is undertaking earthworks (McMichael, Katonivualiku, & Powell, 2019, pp. 325–329; Piggott-McKellar, McNamara, Nunn, & Sekinini, 2019, p. 5). In the cases of Vunidogoloa, Vunisavisavi, and Narikoso, relocation was determined to be necessary due to coastal erosion, higher tides, flooding, storm surges, and saltwater intrusion, after other efforts such as seawalls, wave breaks, and mangrove regeneration had failed (McMichael et al., 2019, p. 330–331). In Denimanu, relocation was a response to the destruction of 19 houses, constituting half of the village, by TC Evan in 2012 (Piggott-McKellar et al., 2019, p. 5). The relocations were funded primarily by the government and international agencies with some contributions from villagers, and were short-distance moves within customary land, so villagers were able to continue traditional farming and fishing practices (McMichael et

al., 2019, pp. 332–333). While the relocations resulted in improved housing and village facilities, there were also reports of unwelcome disruptions to traditional culture and complaints that some works were not finished as promised or were not completed to desired standards (McMichael et al., 2019, pp. 333–334; Piggott-McKellar et al., 2019, p. 8). Relocation of a village is a highly sensitive undertaking, and different studies do not fully agree in their assessment of the process in relation to community participation. The Vunidogoloa relocation, for example, has been described by one study as “an exemplary precedent” with full participation of the residents (Tronquet, 2015, p. 140), while other studies argue that the government applied pressure on the community and that community decision-making processes were manipulated to force decisions (Bertana, 2020), or that the process was consultative but not genuinely participatory (Piggott-McKellar et al., 2019, p. 13).

Papua New Guinea

In Papua New Guinea, resettlement of communities due to the impacts of natural hazards has been attempted, but has often failed to produce positive, sustainable outcomes. An estimated 267,000 people in Papua New Guinea were displaced due to natural hazards from 2008 to 2019 (IDMC, 2019). IOM estimates that 32,125 people were currently displaced in 2017, mostly due to volcanoes or flooding (IOM, 2017, p. 6). This type of displacement is particularly problematic in Papua New Guinea, which is a highly diverse and divided country with distinct and competing ethnic groups and tribes; displacement can lead to tensions and conflict between groups competing for limited land and resources (ILO, 2017b, p. 144). Displaced populations frequently report conflicts with host communities; overcrowding; limited access to land, natural resources, and essential services such as education, health care, and water and sanitation services; lack of employment or other livelihood opportunities; and lack of safety, security, and freedom of movement (IOM, 2017, pp. v, 17–19). In Papua New Guinea, land ownership issues are typically

the greatest constraint to resettling displaced populations (ACAPS, 2018, p. 5). Some attempts at relocation have been successful, when supported by traditional practices and access to land, but “thousands of Papua New Guineans have lived in displacement for over a decade without a durable solution” (IOM, 2017, p. 5). Some examples include:

- In some parts of the Highlands, when drought and frost severely affect agricultural production, traditional practices allow large numbers of people to temporarily relocate to lower elevations and share the livelihoods of unaffected communities until they can return home (Campbell & Warrick, 2014, p. 18).
- A post-disaster assessment of four communities following the 2018 earthquake found that in two communities, people who had lost their homes decided not to return because they were able to obtain access to land by verbal agreement with current landowners, while in a third community, people were unable to establish new locations for their gardens and

therefore intended to return to their original sites as soon as possible (the fourth community suffered little damage and did not have to relocate) (Roche et al., 2018, p. 9).

- The Carteret Islands are a group of six small islands with a population of about 3,000 people, suffering from coastal erosion, saltwater intrusion, high tides, storm surge, and sea level rise (Boege & Rakova, 2019, p. 3; Dannenberg, Frumkin, Hess, & Ebi, 2019, pp. 6–7). Multiple attempts to resettle portions of the population in the 1980s, 1990s, and 2000s failed, largely due to difficulties obtaining suitable land for resettlement, lack of local participation in the planning process, conflicts with existing communities in the areas selected for resettlement, lack of ongoing government support, and concerns on the part of the Carteret Islanders about changes to livelihoods and loss of cultural heritage, identity, and dignity (Boege & Rakova, 2019, p. 8; Edwards, 2013, pp. 63–64; UNDP, 2016b, p. 6). As of the end of 2018, ten families were living on a site provided by the Catholic Church with the intention of preparing it for others to follow, but there were ongoing difficulties related to obtaining clear legal title to the land (Boege & Rakova, 2019, pp. 4–7).
- The population of Manam Island, about 9,000 people, was evacuated to temporary care centers on the New Guinea mainland in 2004 after volcanic eruptions made the island uninhabitable. Islanders were given little support, had reduced access to land and water, were not integrated into the local community, had difficulty adapting to growing new crops and reduced fish catches, lacked access to education and employment, and suffered weakening of traditional governance and social structures. Violent conflicts arose between the islanders and local residents. Plans to relocate the Manam Islanders from the care centers to a more permanent settlement have been under discussion since 2006 (Melde, De Bruyckere, Vigil, & Gemenne, 2017, p. 50). Many Manam Islanders are still living in the care centers, but many have returned home despite ongoing volcanic eruptions, believing that they were better off coping with the volcano than with the food shortages and violence experienced in the care centers (John Connell, 2012; John Connell & Lutkehaus, 2017); As of 2018, the population on the island had returned to about 7,000 people (ACAPS, 2018, p. 1).

Samoa

In Samoa, populations in vulnerable coastal areas have been relocated inland following major disasters, but available land is limited.

Although communities at risk may be aware of dangers, they are often reluctant to take the drastic step of relocating pre-emptively, and only become willing to actually relocate after an event like a major tsunami or cyclone (Government of Samoa, 2009, p. 43; Koskinen-Lewis, Carvalho, Dias, Fernandes, Diogo, Taulealo, Evalu, & Simi, 2016, p. 6). Following the 2009 tsunami, affected communities relocated inland to higher ground which was already owned by the communities, with extensive support from the government and international agencies that included: building 502 new

homes; building new schools; installing services including water, sanitation, electricity, and roads; and assistance to re-establish livelihoods that included tools, planting materials, livestock, fingerlings and fishing boats (Koskinen-Lewis et al., 2016, p. 6). Following TC Evan in 2012, the prime minister of Samoa called for people to relocate to higher ground, but land is expensive, most land in Samoa is customary land that cannot be sold and the supply of freehold land is limited, and family ties to ancestral lands make it difficult to live in a village that one does not belong to (Government of Samoa, 2013, p. 59; Meldau, 2013, p. 57). The post-disaster needs assessment for TC Evan concluded that “most of the households seem to favor in situ

reconstruction, as it is the easiest and most affordable option for them" (Government of Samoa, 2013, p. 59).

Relocated populations often return to their original homes due to the practical advantages of living on the coast. Most populations in Samoa that were relocated following cyclones in the 1990s eventually returned to their original coastal locations, as there is a strong preference for living on the coast (Government of Samoa,

2009, pp. 43–44). Similarly, following the 2009 tsunami, families began to return to the coast within one year to rebuild livelihoods around the tourism industry, and within five years, coastal areas had their pre-tsunami utilities and services largely restored and some people have rebuilt homes on the coast, although their permanent homes mostly remain inland where their plantations are located (Koskinen-Lewis et al., 2016, p. 6).

Solomon Islands

In Solomon Islands, attempts have been made to relocate several settlements in response to natural hazards, with access to land being the main barrier to relocation efforts. Internal relocation of settlements due to the impacts of climate change, including sea level rise, is discussed in the *National Adaptation Programmes of Actions* as an important policy option despite "serious political, economic and socio-cultural implications" as well as the major barrier of land ownership (Talo, 2008, pp. 42, 80, 86–87). About 87% of land in Solomon Islands is customary land, controlled by tribes and clans in accordance with traditional usage that varies from one cultural group to another across the country (Allens, 2018). One recent academic study reports an anonymous senior government official as saying that several communities in the country are seeking to relocate but have been unable to proceed because of a lack of available land, or because of land disputes in potential resettlement locations, and that there is an increasing risk of unmanaged resettlement into informal settlements (Ha'apio, Wairiu, Gonzalez, & Morrison, 2018, p. 362). Some examples of attempts to relocate populations include:

- April Ridge, Honiara: Following floods in 2014, plans were made to relocate households from a riverside informal settlement in Honiara to a safe location at April Ridge, in East Honiara

(Ha'apio, Gonzalez, & Wairiu, 2019, p. 516). The government began to survey and divide the land into 268 lots, but received more than 1,000 applications which took more than a year to finalize, and required settlers to pay fees to acquire long-term leases, which most could not afford (Ha'apio, Morrison, Gonzalez, Wairiu, & Holland, 2018, pp. 4, 11; Keen & McNeil, 2016, pp. 1–2). In the meantime, politicians allegedly offered land to supporters to win favor and to free up public buildings that were being used as temporary shelters, and more than a hundred people (mostly, but not entirely, legitimate flood refugees) moved to the area before the official allocation process was completed (Keen & McNeil, 2016, p. 1). By the time the lot allocations were completed, the area was substantially settled, and conflicts emerged between the first wave of squatters and later arrivals including legal leaseholders (Keen & McNeil, 2016, pp. 1–2).

- Mondo/Keigold village, Ranogha island: In 2007, following a tsunami that struck Mondo village on Ranogha island, villagers decided to move inland to a location called Keigold, 145 metres above sea level, which was already under the control of the local chief (Ha'apio et al., 2019, p. 516). The new village received a new school, clinic, church, and water and sanitation facilities, all with

significantly better facilities than at the former location in Mondo, and new houses were constructed of sawn timber and iron roofs (Filho et al., 2020, p. 184). Even with all of these supports, however, the majority of those who moved were reluctant to leave their original village, and although 103 households agreed to move from Mondo to Keigold, 21 households later refused to relocate or returned to Mondo despite the village being declared unsafe by the authorities (Ha'apio et al., 2019, p. 516; Ha'apio, Wairiu, et al., 2018, p. 355, 363).

- Taro Island to Choiseul: Most of Taro island lies less than two metres above sea level and its population (currently 800 to 1,200 people) has experienced three evacuations due to tsunamis and seismic activity. Plans

for permanently relocating to a new site on the nearby larger island of Choiseul began in 1994. Plots of land for a new townsite were purchased by the provincial government in the early 1990s and in 2011, and a Local Planning Scheme, developed with the residents of Taro island and approved in 2016, set out plans for the new community (Benintende, 2019; Dannenberg et al., 2019, p. 7). It is hoped that relocation will progress gradually over the next ten to twenty years, but more work still remains to be done to undertake feasibility studies and technical assessments for infrastructure such as roads, water, power, waste and wastewater management, and funding from the national government appears to have dried up as of 2018 (Benintende, 2019; Haines, 2016).

Tonga

In Tonga, relocation of settlements is a “sensitive topic” but is being considered in development plans (Kingdom of Tonga, 2019, p. 98). Suggestions for relocating settlements and/or restricting development have been made for vulnerable areas on Tongatapu and Ha'apai (Kingdom of Tonga, 2019, pp. 99, 186), where the government has suggested that relocation is the most effective adaptation option despite requiring “new and additional financial, technical and human resources from the communities/villages, government and development partners” (Kingdom of Tonga, 2019, p. 186). After the 2009 tsunami in Niuatoputapu, some residents were resettled

inland, but residents resisted relocation even though 31% of all of the houses on the island had been destroyed, along with much public infrastructure (Kingdom of Tonga, 2009, p. 6). “The Tongan government sought to resettle them (and the hospital and other public buildings) on higher ground more than 10 metres above sea level, but many wished to remain on their own land close to the coast” and only some residents (the exact number is unclear) were eventually resettled inland (John Connell, 2012, pp. 134, 136; Kingdom of Tonga, 2019, p. 100). Some low-lying islands in Tonga do not have the option of relocation.

Vanuatu

In Vanuatu, several settlements have been relocated in response to natural hazards, and a national policy on relocation exists. People in Vanuatu are generally reluctant to resettle except as a last resort, prefer in-situ adaptation measures, and are concerned with maintaining cultural and livelihood links should resettlement occur (Perumal, 2018, p. 46). However, there are numerous examples of relocations taking place, including:

- Tegua island, 2005: a small coastal community of about 58 residents was relocated inland after suffering repeated flooding from high tides and cyclones, an earthquake, and a tsunami. The move was supported by strong traditional knowledge, belief systems, and local identity; strong social networks, collective action, and clear leadership; and availability of land and marine resources (Warrick, 2011).
- Mataso island, 2015: As a consequence of TC Pam in 2015, some communities were temporarily relocated, but lack of consultation with the community led to isolation and poor integration in the new locations (Perumal, 2018, p. 54–55).
- Ambae island, 2017 and 2018: Eruptions of the volcano Manaro Voui led to the government evacuating the entire population

of approximately 11,000 people to other islands for a month in 2017, and then again in mid-2018 for approximately six months; 4,178 people had returned to Ambae by mid-March 2019 (IDMC, 2018, p. 31; IOM, 2019; PCRAFI, 2018, pp. 2–5; Radio New Zealand, 2019a; WTO, 2019b, p. 27).

In 2018, Vanuatu published a comprehensive policy on internal displacement, covering people who have been relocated or are at risk of relocation due to natural hazards or other reasons, as well as addressing people living in informal settlements and internal migrants.

The policy aims to minimize the drivers of displacement and relocation; minimize their negative impacts; work towards durable solutions for displaced populations; ensure that displaced people and host populations can make voluntary and informed choices and participate in planning solutions; facilitate well-managed and safe migration; promote access to disaster-resilient housing; and integrate human mobility into other sectoral policy areas (NDMO, 2018). Vanuatu (along with Fiji and Kiribati) is considered to be a leader in incorporating relocation, internally displaced peoples' rights, and cross-border movements into governance arrangements (IDMC, 2018, p. 29).

3.8. Community-Based Support

Globally and in the Pacific region, community-based informal coping mechanisms are a common way to reduce risk in rural and poor communities (Germanwatch, 2020, p. 5). Community-based mechanisms rely on reciprocal exchange and trust in tight-knit social networks, and are well-suited to coping with relatively small-scale natural hazards that affect only a few community members at a time. Across the Pacific, strong extended family ties play a critical role in coping with

disasters (Fletcher et al., 2013, p. 6). Pacific island countries tend to have “a strong tradition of informal social protection, with sharing of resources – in normal times and in times of emergency – common within families and the broader community, including sharing of cash or other items like food, clothing and tools” (Hobbs & Jackson, 2016, p. 23). However, community-based mechanisms can be overwhelmed by large-scale, long-term, or frequent events (Germanwatch, 2020, p. 5–13).

Strengths and challenges of informal / community-based risk-sharing arrangements

Strengths	Challenges
<p>Adapted to local conditions: Local knowledge of environmental conditions and understanding of needs, capacities and gaps</p> <p>Suitable for idiosyncratic risks affecting a small number of individuals at a time</p> <p>Low transaction costs: easier to determine the risk and impacts of shocks to a group member or household as well as the resulting needs</p> <p>Trust: Emphasis on trust and reciprocity; strong relationships and extensive information-sharing in small communities lowers risk of fraud</p> <p>Affordability: Flexible and affordable for the poorest members of the community</p>	<p>Suitability: Traditional coping strategies are often only suitable for “familiar” and idiosyncratic natural events</p> <p>Traditional values and structures: Not necessarily inclusive; may manifest and strengthen existing power structures</p> <p>Limited coverage of risks: unable to deal with systemic risks that affect the whole community</p> <p>Put under stress by climate change: increasingly frequent extreme weather events can push arrangements to their capacity limits</p> <p>Migration: climate change can cause long-term migration of community members for work, which can lead to weakening ties, reducing trust, and weakening coping mechanisms</p>

(Germanwatch, 2020, p. 13)

Fiji

In Fiji, rural communities often support their own members as well as neighbouring communities following extreme weather events. Community-based agricultural and fishing traditions and traditional safety nets provide a reliable source of assistance for many shocks (Government of Fiji, 2016, p. 30). A study of farming and semi-subsistence communities on western Viti Levu, for example, noted that people made preparations in advance to provide rice and shelter to neighbours during the cyclone season, and people affected by disasters sought refuge in neighbouring communities before receiving government assistance (Singh-Peterson & Iranacolaivalu, 2018, p. 16). Another study in Cakaudrove Province in northern Fiji found that, after Cyclone Ami in 2003, people whose houses were not damaged intensified their fishing to help kin-group members with

housing repair or construction (Takasaki, 2015, pp. 55–56). Following TC Evan in 2012, more than half of the affected households reported that they relied on “unconditional help from relatives/friends” (see section 3.1), making this by far the most commonly-mentioned coping strategy; relying on help provided by government was mentioned only half as often as relying on friends and relatives (Government of Fiji, 2017b, p. 67). A study comparing the impacts of weather-related disasters in 2012 on Viti Levu showed that community resilience was more effective for TC Evan, for which communities had two days’ warning during which people could make preparations for themselves and assist neighbors, compared with river flooding earlier that year, which came with only five hours’ warning (Gawith et al., 2016, p. 2102–2107).

Papua New Guinea

Papua New Guinea has strong traditions of mutual support within tribes and ethnic groups that contribute to disaster resilience.

Family, extended family, religious organizations, clans, villages and local governments all provide coping and recovery mechanisms (Sithole, Naser, Guadagno, & IOM, 2015, p. 13). Traditions of reciprocity and family obligations are fundamental to local culture, and “caring for members of the village is a way of life” (CFE-DM, 2019, p. 15). Obligations of mutual aid extend through the system of *wantok* – literally “one talk” or “one language” – referring to people of the same ethnic and cultural group, who speak the same language, and to the ties of reciprocity that bind them together (CFE-DM, 2019, p. 15; Naser, 2015, p. 22). The *wantok* system is a network for mutual assistance in normal times (for example, as a way of obtaining help with heavy tasks such as building or moving a hut, or planting crops), and in times of disaster it can be leveraged for support with relief and recovery, ensuring that resources are shared by the community in times of crisis, and substituting for formal mechanisms of social protection and insurance (Ganesh et al., 2016, p. 71; Sithole et al., 2015, p. 13). For example, in the highlands, members of high-altitude communities may be able to migrate downwards and obtain support from their *wantoks* in the valleys during times of frost and drought (Sithole et al., 2015, p. 11).

Samoa

Samoa has a strong culture of community-based support, traditional governance systems, faith-based organizations, and traditional knowledge that contribute to disaster resilience.

Social cohesion provided by family and village ties is a core feature of Samoan culture that encourages cooperation, mutual assistance and risk pooling amongst an extended family or community (Government of Samoa, 2009, p. 84). Disaster preparedness at the village level in Samoa involves community institutions including schools, churches, traditional governance structures (which play major roles

“*Wantok* is a traditional welfare system for the tribe wherein everything revolves around the well-being of the tribe and no one is left to go hungry or homeless” (CFE-DM, 2019, p. 16). However, capacity to provide support can be overwhelmed by large-scale or long-term events, and conflicts do arise when one group attempts to relocate into lands controlled by another group. It must also be emphasized that although reciprocal support is offered within an ethnic and cultural group defined by *wantok*, violent conflict between *different* ethnic groups are common in Papua New Guinea.

Traditional knowledge also plays a role in disaster resilience in Papua New Guinea.

Knowledge of environmental conditions allows communities to forecast certain kinds of hazards and give warnings to reduce risks and cope with emergencies (Sithole et al., 2015, p. 1). Traditional designs for buildings are adapted to local hazards: for example, coastal communities in Oro build houses on stilts to reduce the impact of tides and flooding, and use specifically selected local materials to resist wind and ensure limited damage in case of collapse (Sithole et al., 2015, p. 10). Villages develop strategies to increase food and water security, such as cultivating specific crops to resist specific hazards, and preserving food and storing water in advance of the rainy season and potential flooding (Sithole et al., 2015, p. 10–11).

in village life and also link to formal national government institutions), and women's groups (Fletcher, Thiessen, Gero, Rumsey, Kuruppu, & Willetts, 2013, p. 6). Samoans have strong religious ties, and churches play a crucial role in everyday life and an important role in leading disaster resilience efforts (Beyerl et al., 2018, pp. 35–36; Fletcher et al., 2013, p. 5; Meldau, 2013, p. 53). In times of crisis, churches often serve as emergency shelters or coordination points; for example, a study following the 2009 tsunami reported that one particular church was “the first to be on the

ground when the tsunami hit" delivering relief supplies and funds "even before the Red Cross and government representatives came in to do their assessments" (Fletcher et al., 2013, p. 5). Samoans demonstrate strong attitudes of self-reliance in coping with natural hazards: in a survey undertaken in 2011-2012, only 10% of respondents agreed that the government would supply them with all necessities or ensure that impacts of environmental change would not affect them, and 57% disagreed that

they were helpless in avoiding the impacts of environmental change (Beyerl et al., 2018, pp. 37–38). In many instances, especially in rural areas lacking official emergency shelters, displaced families stayed with extended family members or other host families⁴⁹ (Government of Samoa, 2013, p. 110). A tradition of communal house building, based on family and community efforts, supports post-disaster reconstruction (Government of Samoa, 2013, p. 61).

Solomon Islands

Solomon Islands has strong traditions of mutual support within communities and kinship groups that contribute to disaster resilience.

The principal social protection mechanism in Solomon Islands is a system of reciprocal obligations called *wantok* (literally meaning "one talk" or "one language") that binds together people of the same community or kinship group. The informal social network provides a safety net during times of hardship, with inter-household transfers in the form of loans, gifts, and cash remittances sent within the Solomon Islands being routine (Ha'apio et al., 2019, p. 520; World Bank, 2017d, p. 90). The *wantok* system is a critically important mechanism for saving lives and helping families and communities recover after disasters resulting from natural hazards as well as personal crises (Ha'apio et al., 2019, pp. 515–518; ILO, 2015, p. 2). However, traditional social protection mechanisms have limits in communities with limited resources or experiencing aggregate shocks (ILO, 2015, p. 2), and they can perpetuate social norms such as discrimination against women (ADB, 2019a, p. 1). The obligation to provide support to family and community members can also undermine economically successful businesses and individuals: *wantok* obligations have been implicated in high rates of MSME loan defaults

and business failures, as money is diverted from business purposes to supporting relatives and other non-business expenses (ADB, 2008, cited in Ministry of Commerce Industry Labour and Immigration, 2016, p. 2), and "the obligation to provide support is particularly strong when it is known that the potential patron has regular access to money – for example a formal job, own business, student allowance, or royalties" (World Bank, 2017d, p. 90).

Traditional or customary governance institutions play a very large role in daily life and in disaster resilience in Solomon Islands

(World Bank, 2017d, p. xiii). Customary institutions govern most land in the country, and "for most Solomon Islanders, access to customary land provides a place to live, access to water, a source of food, an opportunity to earn a livelihood, and a foundation for social identity and belonging" (World Bank, 2017d, p. xiii). Customary and church systems of authority play a critical role in maintaining social order, dealing with disputes, and conflicts over resources, particularly in rural areas and informal urban settlements (World Bank, 2017d, p. xiii). These local governance systems vary across the country: for example, Anuta island has hereditary chiefs in a hierarchical structure with some degree of communal decision-making,

⁴⁹In one example, one urban family was reported to have hosted and fed two large families totaling 40 people (Government of Samoa, 2013, p. 110).

while Savo has a system of “big men” (chiefs) and elders governing alongside democratically elected representatives who sit in the provincial parliament (Kelman, 2019, p. 409).

Traditional knowledge and practices also play a role in disaster resilience in Solomon Islands.

In some parts of the country, traditional methods of preserving and storing food, storing water, and cultivating resilient crops are followed, but these practices are being affected by increasing dependence on rice both in the daily diet and as an expected provision in disaster response (Solomon Islands Government, 2015, p. 14; Vaike & Salili, 2020, p. 18). Traditional building practices include elevating concrete floors to

keep them dry during heavy rains; constructing low, aerodynamic buildings to withstand cyclone winds; and using light, local materials such as palm leaves for roofing to reduce the danger of flying debris during cyclones (Field, Barros, Mach, Mastrandrea, Yohe, et al., 2014, p. 53; Solomon Islands Government, 2015, p. 14; Vaike & Salili, 2020, p. 18). Rural Solomon Islanders often have a main house near the coast and a second house inland near their food garden, which can be used when threatened by coastal hazards (Solomon Islands Government, 2015, p. 14). Schools are encouraged to have school food gardens to supplement diets (Solomon Islands Government, 2015, p. 14).

Tonga

Tonga has a strong culture of sharing between families and within communities, which is an important social protection mechanism during crises (Hobbs & Jackson, 2016, p. 72).

Respondents to a study of local perceptions of cyclones in Tonga and other Pacific islands reported well-established routines for preparing for incoming cyclones, which included a significant focus on helping others in their communities prepare, particularly the elderly and those with disabilities (Magee, Verdon-Kidd, Kiem, & Royle, 2016, p. 1098). Churches are focal points for the community, serving as emergency shelters during disasters (Government of Tonga, 2018b, p. 31) and facilitating assessments following disasters due to their close links with their communities

and their understanding of members' and community needs (Kingdom of Tonga, 2018b, p. 8). Church-based giving and receiving is very strong; Tongans make considerable cash contributions to churches during normal times, and churches provide support to the community in the form of cash and vouchers following disasters (Hobbs & Jackson, 2016, pp. 23, 72). One church in Tonga has been reported to supplement the incomes of its members by matching the government's monthly pension payments (Hobbs & Jackson, 2016, p. 27). Churches often organize collective remittances, facilitating both the collection of goods from migrants overseas and the distribution of goods when they arrive in the country (Pairama & Le Dé, 2018).

Vanuatu

Vanuatu has a strong culture of community-based support, traditional knowledge, traditional governance systems, and faith-based organizations that all contribute to disaster resilience.

Vanuatu has long experience with natural hazards, and communities have well-established coping mechanisms for extreme weather events, which have been credited with contributing to the low death toll resulting from TC Pam (Government of Vanuatu, 2015b, p. 37;

Handmer & Iveson, 2017, p. 63). People in rural Vanuatu have a strong sense of community, high levels of social participation, and high levels of trust that helped maintain calm in the recovery period and supported collaborative work (Balaei, Wilkinson, & Potangaroa, 2019, p. 715). One month after TC Pam, 72% of affected households reported that they had completed repairs sufficient to meet their own

perceived immediate needs, mostly without any external support (60%) or with support only from family and friends (24%) (REACH, 2015, p. 24). Some examples of communities undertaking preparation and recovery efforts on their own include:

- On the island of Erramango, the community disaster committee identified safe houses, organized an evacuation, and organized people to cut down trees in advance to avoid damage when they fell, and to store water. After the cyclone, the community committee conducted assessments, liaised with the relevant authorities, and cleared the airstrip so that relief supplies could be delivered, five days later (CARE, 2015, cited in Barber, 2018, p. 145).
- On Emae, people from three communities worked together to clear the coastal road of debris without any coordination from government (Jackson et al., 2017, p. 369).
- In urban areas on Efate island, residents reported mutual help between family members and at the neighborhood level included hosting those who lost their houses, sharing food and providing emotional support (Rey et al., 2017, p. 268).
- In the village of Laonkarai on Efate Island, where water supply systems were severely damaged, residents collaborated to share water resources within and between villages, repaired roofs and gutters, cleaned water catchments, removed obstacles, and fixed water pipes to restore creek-fed and rainwater-harvesting water supply systems using materials and equipment at hand (Balaei et al., 2019).

- A study of villages on the islands of Pele, Moso, and Tanna described how communities work together to move people to evacuation centres, help those who are in need, secure the houses, store water, collect and store breadfruit and bananas, preserve food, and cut down trees and trim leaves of plants to reduce storm damage (McNamara & Prasad, 2014, p. 127).

Local traditional governance structures provide leadership, coordination, and information during crises (Fletcher et al., 2013, p. 6). A study looking at one village on Tongariki island after TC Pam, for example, described how the village chief was central to coordinating and prioritizing reconstruction work, and in collecting food and money for those in greatest need (Jennings et al., 2020, p. 32–33). Faith-based (predominantly Christian) organizations were also an important coping mechanism, with churches used as emergency shelters and church groups playing an important coordinating role in disaster response (Fletcher et al., 2013, p. 5). One study notes that self-reliance in remote rural communities can also mean that reconstruction efforts use locally-available materials that are not robust, and that progress can be slow: in one village recovering from TC Pam, most of the village was still rebuilding four years after the cyclone (Jennings et al., 2020, p. 34). Another study notes that traditional knowledge and cooperation systems may be in decline, with younger people being “more interested in modernity than tradition” and some traditional adaptations being lost while reliance on government, NGOs and international aid increases (Handmer & Iveson, 2017, p. 63).

4. Conclusions

4.1. Hazard, Exposure, and Vulnerability

All six countries reviewed in this report have significant risks arising from cyclones, which bring high winds, heavy rain, and both coastal and inland flooding. Cyclones arise every year across the Pacific, and are the most significant hazard facing most of the countries examined. Most of the countries (except for Samoa, which is the smallest country in area) experience an average of one or more cyclones every year. Climate models forecast that most Pacific island countries are likely to experience a decrease in the frequency of cyclones of between 10 % and 40% by the end of the century, depending on the country, but that maximum wind speeds are likely to increase by 2% to 11%, which would lead to higher damage, and that rainfall within 100 km of cyclone centers could increase by around 20% (ADB, 2018a, p. 5; Australian Bureau of Meteorology and CSIRO, 2014). Global evidence shows that the economic damage caused by cyclones is long-lasting and cumulative (Hsiang & Jina, 2014).

All six countries are also located on or next to the Pacific “Ring of Fire”, an zone of seismic activity that circles the Pacific Ocean, where about 90% of all earthquakes and 75% of all volcanoes in the world occur (National Geographic, 2017). All six countries are at risk of earthquakes and of tsunamis, which are caused by undersea earthquakes and threaten low-lying islands and coastal areas where the vast majority of the population of Pacific islands lives. Volcanoes are also a major hazard in Papua New Guinea, and a less severe hazard in other countries.

Natural hazards disproportionately affect poor people, workers in the informal economy, and women. Poor people tend to be more exposed to hazards than wealthier people, are more severely affected by hazards, and have fewer resources available to them to cope when disasters do occur (Hallegatte et al., 2017, p. 4; ILO, 2019, p. 4; Wehrhahn et al., 2019, p. 60; World Bank, 2017a, p. 90). In all six countries examined in this report:

- **Poverty** is a significant issue, and there are high levels of informal and vulnerable employment and subsistence economic activity, which are insecure and particularly vulnerable to natural hazards.
- **Gender equality** is a major problem because of traditional social norms. Women and girls are often excluded from political participation, suffer from poor access to services and infrastructure, have limited economic opportunities and limited control over land and other economic resources, and suffer high levels of gender-based violence. Disasters affect women and girls more severely than men and boys because their traditional domestic roles tend to become more difficult and time-consuming under disaster conditions, because women's livelihoods are often less secure and more severely affected by damage to natural resources that they depend on, and because gender-based violence often increases in crises.
- **Education** is often disrupted by natural hazards, which damage schools and other infrastructure, displace people, and cause students to be withdrawn from school. However, there is little evidence available about the resulting impacts on educational outcomes for youth.

- **Youth employment** is a significant challenge, with youths typically suffering from a lack of formal employment opportunities and often remaining unemployed or under-employed in the informal or subsistence economy. However, there is a scarcity of evidence about how natural hazards affect the employment prospects of youth, other than generally inhibiting economic growth.

Fiji's agriculture and fisheries industries, and micro-, small, and medium sized enterprises, are particularly vulnerable to damage caused by natural hazards. These sectors are critical sources of livelihoods for a large proportion of the population: 36% of all employment is in agriculture (World Bank, 2020e), half of all rural households have some involvement in subsistence fishing (Government of Fiji, 2016, p. 48), and 60% of employment across all sectors is in MSMEs (Paul, 2016, p. 22). Damage to crops and fisheries can take many years to recover: following TC Winston, agricultural production in some areas was not expected to return to pre-cyclone levels for five to ten years, and some fisheries could take 12 years to recover (Government of Fiji, 2016, pp. 12, 50–51). Many MSMEs, such as food processing, handicrafts, weaving, and tourism-related products, rely on agricultural production, and many are home-based businesses that suffered when homes were damaged or destroyed (Government of Fiji, 2016, pp. 60, 76, 102). The tourism sector is more resilient to natural hazards, apart from the small, often home-based, businesses that produce handicrafts and other articles for the tourist trade (Government of Fiji, 2016, p. 60).

Papua New Guinea's economy is dominated by subsistence agriculture, which is highly vulnerable to natural hazards, and by the mining, oil, and gas industries. The majority of Papua New Guinea's population is supported by rural livelihoods through subsistence and semi-subsistence agriculture (Gwahirisa et al., 2017, pp. 395–396), which is vulnerable to

rapid-onset hazards such as volcanoes and earthquakes, slow-onset hazards like drought, and the long-term impacts of climate change which are expected to significantly worsen food insecurity by the middle of the century (Rosegrant et al., 2015, p. 80).

Samoa's relatively small economy, dominated by tourism and subsistence agriculture, is highly vulnerable to natural hazards. Tourism is nature-based and highly dependent on coastal ecosystems vulnerable to damage from natural hazards and climate change (ILO, 2019a, p. 23; Parsons et al., 2018, p. 644; Perrottet & Garcia, 2016, pp. 12–13; Wong et al., 2012, p. 136). Natural hazards have caused significant harm to the tourism sector, mostly through damage to accommodation properties, with the heaviest impacts falling on small, family-run businesses (Government of Samoa, 2009, p. 34). Agriculture is extremely important in Samoa, with 97% of all households engaging in agricultural production of some form, mostly for subsistence purposes (Samoa Bureau of Statistics, 2016, p. 1), and agriculture suffers harmful impacts from cyclones and tsunamis, and is vulnerable to the effects of climate change which are expected to include more frequent and extreme rainfall events, longer dry spells and drought events, extreme winds, high air and water temperatures, and rising sea levels (Government of Samoa, 2013, p. 18).

Subsistence agriculture is the main economic activity for the vast majority of Solomon Islanders. Agriculture and fisheries accounted for 22% of GDP in 2018 (Central Bank of Solomon Islands, 2019), but provides livelihoods for 75% to 87% of the population (Government of Solomon Islands, 2013, p. 30, 2014, p. 20; Huber & Fischer, 2020, p. 10). Natural hazards and climate change impair economic development in many industries (Filho et al., 2020, p. 179), but subsistence farmers are particularly vulnerable to their effects (ILO, 2017b, p. 139).

Tonga's relatively small economy, dominated by subsistence agriculture and small, often home-based, businesses, is vulnerable to natural hazards. Agriculture is the dominant economic activity but is mostly carried out on a subsistence basis with limited commercial-scale activity (Government of Tonga, 2018b, pp. 24, 41; WTO, 2019b, p. 14). Cyclones cause extensive damage to crops and equipment, severely affecting the poorest and most vulnerable in the population (Kingdom of Tonga, 2018a, p. 17; WTO, 2019b, p. 14). Climate change is expected to adversely affect agriculture and fisheries through increased frequency of extreme weather, sea level rise, and disruption of aquatic ecosystems (Government of Tonga, 2018a; Kingdom of Tonga, 2019). The tourism industry depends on the health of coastal ecosystems, which are vulnerable to natural hazards and climate change (Kingdom of Tonga, 2019, p. 99; Van Der Veeke et al., 2016), and recent cyclones have caused significant damage to accommodation businesses which are largely MSMEs (Government of Tonga, 2018b, p. 64;

Kingdom of Tonga, 2018a, p. 31; WTO, 2019b, p. 14). Tonga's commerce and manufacturing sectors are small and include a significant proportion of activity consisting of home-based production of handicrafts (Tonga Statistics Department, 2017b, pp. 187–188), which are dependent on local natural resources for raw materials, which in turn are vulnerable to natural hazards and climate change (Government of Tonga, 2018a, p. 7).

Vanuatu's relatively small economy, dominated by tourism and subsistence agriculture, is highly vulnerable to natural hazards. Tourism is nature-based and highly dependent on coastal and inland ecosystems, which are vulnerable to damage from natural hazards, although even in the case of TC Pam, the industry suffered only short-term losses and was able to recover within a year (Eriksson et al., 2017, p. 52; WTO, 2019b, p. 31). Agriculture is vulnerable to damage from cyclones and droughts, and the population of Vanuatu relies heavily on subsistence agriculture for livelihoods and food security (REACH, 2015, pp. 34–35).

4.2. Coping Mechanisms

Recovering from disasters can offer opportunities to not just repair damage and restore pre-existing conditions, but to “build back better” to improve future resilience if coping mechanisms are designed appropriately (United Nations, 2015, para. 32). The Global Facility for Disaster Reduction and Recovery (GFDRR), managed by the World Bank, identifies three important elements to building back better (Hallegatte et al., 2018):

- **Building back stronger** ensures that repaired and reconstructed assets are more robust and resilient, better adapted to current and future needs, and use the best available and most productive technologies.
- **Building back faster** restores assets and incomes of affected populations sooner,

reduces cumulative losses, and reduces the resources needed to support affected populations through the recovery period. This requires recovery plans, agreements, financial arrangements, and materials to be put in place in advance of disasters occurring.

- **Building back more inclusively** ensures that post-disaster support reaches all affected population groups, including the poor and marginalized, and particularly including women and girls, who are the most vulnerable to natural hazards and who experience the most serious consequences when disasters strike. This requires the development of adaptive social safety nets that can react to shocks, with delivery mechanisms that cover vulnerable populations.

4.2.1. Adaptive Social Protection

Most of the countries reviewed in this report do not have social protection schemes that are able to scale up in crisis situations to support disaster relief and recovery. Most of the countries examined have very limited social protection schemes, and only Fiji (and, to a very limited extent, Tonga) has experience leveraging existing social protection systems for disaster relief and recovery purposes.

Fiji has demonstrated the ability to scale up its social protection schemes to deliver cash payments for disaster relief. Various agencies recommend continuing to use these mechanisms to respond to future disasters and to further formalize and institutionalize them by developing standard operating procedures and guidelines and ensuring that existing policies and legislation are supportive (Government of Fiji, 2017b, p. 119; Hobbs & Jackson, 2016, p. 10; Mansur, Doyle, & Ivaschenko, 2017, pp. 48–49; Save the Children and ACAPS, 2018, pp. 7–8). There may be opportunities to update and extend existing social protection databases to enable geographic targeting, extending benefits to “near-poor” households that are just outside poverty thresholds of existing programs, or providing varying levels of benefits depending on recipients’ income levels, special needs, or the severity of particular disasters (Government of Fiji, 2017b, pp. 72, 120; Mansur et al., 2017, p. 50; Save the Children and ACAPS, 2018, p. 7). Payment of cash benefits is efficient and effective, but may need to be complemented by strategies to provide other forms of temporary emergency support where markets are not operational, and to pre-position key supplies in advance of the cyclone season to ensure availability in case of need (Mansur et al., 2017, p. 50; Save the Children and ACAPS, 2018, pp. 7–8). Experience from TC Winston suggests that there is a need to improve public communication about social protection programs so that recipients are aware of the

support available and how to access it (Mansur et al., 2017, p. 51; Save the Children and ACAPS, 2018, p. 8).

Papua New Guinea has no broad-based social protection schemes suitable for rapidly scaling up to support disaster relief and recovery, and there appears to be little or no discussion about the role that adaptive social protection could play in disaster relief and recovery in the country. A World Bank review of the New Ireland Old Age and Disability Pension made recommendations for improving the operation of the scheme, and for learning from this experience to design a national pension scheme, but made no mention of using the scheme for disaster relief and recovery (Sibley et al., 2014). The National Policy on Social Protection notes that social protection systems “can be an effective means of getting funds to communities coping with the effects of a disaster” and “can reduce the effect of a disaster on households”, but does not specifically address how these objectives are to be achieved other than calling for the creation of a fund to be used by the National Disaster Office and Defense ministry to support disaster response (Department for Community Development & Religion, 2015, p. 17).

Samoa’s social protection programs are limited in scale and are not currently used for disaster relief efforts. In Samoa, there are currently no formal policies, procedures, or structures incorporating cash transfers into disaster response planning (Hobbs & Jackson, 2016, p. 30), and there do not appear to be any current efforts to develop such initiatives. The country has an established social protection cash transfer program in the form of the Senior Citizens Benefit Fund, and financial inclusion is generally good, all of which suggest that there is a foundation for cash transfers to play a role in coping with future disasters. A 2012 AusAID report provides the following recommendations

for social protection programs in Samoa, although they do not focus specifically on disaster resilience (Amosa & Samson, 2012, p. 52):

- The Senior Citizens Benefit Fund should be recognized as a key pillar of social protection and maintained with inflation-linked adjustments to payments;
- The government should consider a benefit program for people with disabilities, building on the experience of the Senior Citizens Benefit Fund;
- The government and development partners should undertake an evaluation of cash transfer programs to assess the contribution of social protection programs to social and economic development; and
- The government should ensure continued improvement in the quality of social services, particularly healthcare, education and water and sanitation in more remote rural areas.

Solomon Islands has no social protection schemes suitable for rapidly scaling up to support disaster relief and recovery (ADB, 2019b, p. 16; Huber & Fischer, 2020, p. 20). A comprehensive study of the feasibility of cash and voucher programming in Solomon Islands recommended: working with financial service providers and internet service providers to develop capacity for cash transfers; encouraging financial service providers to establish systems for mass registrations of bank accounts and other transfer systems; partnering with local banks to help open new bank accounts; providing financial literacy training; supporting and training small businesses and fresh food market vendors to increase their disaster resilience and ability to scale up; encouraging financial service providers to improve and/or adapt banking infrastructure in rural areas; and focusing efforts and expectations on areas where feasibility is

highest (Huber & Fischer, 2020, p. 6). The World Bank notes that is “a clear case for formal social protection systems for poor and vulnerable households” but that there is also a need to better understand the role of informal social protection systems when designing contextually appropriate formal systems, and warns that experience in other Melanesian countries suggests that “there is virtually no chance of securing [domestic] political support for such systems, at least in the medium-term” (World Bank, 2017d, p. xix).

Tonga has used existing social protection system to deliver emergency cash payments following Tropical cyclone Gita and has delivered cash-for-work programs as part of recovery efforts following the Niuatoputapu tsunami in 2009 and TC Ian in 2014 (Government of Tonga, 2018b, p. 26; Hobbs & Jackson, 2016, pp. 29, 46, 51). As part of future preparedness and recovery efforts, the government has expressed an intention to develop a poverty registry to facilitate targeting of assistance during disasters (Government of Tonga, 2018b, p. 34) and to develop a cash-for-work program to engage unemployed youth in repairing and rebuilding homes (Government of Tonga, 2018b, pp. 32, 75). The Cash Learning Partnership, a global humanitarian network working on policy, practice and research in cash and voucher assistance, argues that there is a sufficiently strong foundation of financial infrastructure, microfinance, and social protection experience in Tonga to enable the use of cash transfers for emergency assistance, although noting that financial services are significantly weaker on the outer islands (Hobbs & Jackson, 2016, pp. 65, 86). The network recommends that the government and humanitarian actors should: further develop knowledge, policies, and assessment tools; incorporate cash transfers within the emergency cluster system; train and sensitize government officials in scaling

up social protection systems in emergencies; and collaborate with telecommunications and financial services providers in the private sector to improve coordination and preparedness for future disaster responses (Hobbs & Jackson, 2016, pp. 65, 86). A significant concern for the government and civil society actors is that cash transfers could risk damaging traditional self- and community-recovery approaches, and could lead to excessive dependency on cash assistance in the future (Hobbs & Jackson, 2016, p. 65).

Vanuatu has no social protection schemes suitable for rapidly scaling up to support disaster relief and recovery. A UNICEF report argues that the lack of social protection and other social welfare services "limits the ability of the Government to lift vulnerable persons out of poverty and support economic growth" (Anderson et al., 2017b, p. 5). A feasibility

study by Oxfam concluded that cash transfer programs could be considered as part of a possible emergency response in some parts of Vanuatu, depending on local capacities, but recommended that: training and pilot-testing should be undertaken to fill capacity gaps; policies for cash transfer amounts should be set appropriately to meet needs; research should explore how to most effectively assist groups disproportionately affected by disasters; procedures for assessing the capacities of markets should be established as part of initial needs assessments; financial service providers should be encouraged to extend services to rural and remote areas; systems for mass registration of recipients and establishing cash-out points should be established; and a gender and protection analysis should be undertaken (Holt & Hart, 2019, pp. 4–5).

4.2.2. Financial Inclusion

Across the Pacific region, various experts recommend ways of increasing financial inclusion although there is limited evidence about the extent to which financial inclusion supports disaster resilience. Various experts recommend promoting greater access to and use of financial services including developing more access points, agent networks, digital payment platforms, and mobile money systems (El-Zoghbi et al., 2017, p. 27; ESCAP, 2019, p. 24; Klapper et al., 2016, p. 9). In the longer term, efforts could be made to increase financial literacy and awareness, especially among marginalized populations (ESCAP, 2019, p. 23); develop regulatory frameworks that accommodate poorer households and improve consumer protection to increase trust in the financial system (ESCAP, 2019, p. 23); and incentivize the private sector to develop

financial services that are resilient in crisis environments (El-Zoghbi et al., 2017, p. 27).

Fiji has a relatively high level of financial inclusion that contributes to disaster resilience; expansion of and is an important component of disaster recovery efforts. The Reserve Bank of Fiji set out objectives in the National Financial Inclusion Strategic Plan for 2016-2020 that include increasing the proportion of the population served by formal financial institutions from 64% to 85%, including at least 50% women (Reserve Bank of Fiji, 2016, p. 11). Specific targets include empowering women, youth, and people living with disabilities by linking with civil society organizations and MSMEs, developing tailored products and services, and overcoming regulatory barriers; developing and strengthening financial infrastructure; supporting the development of digital financial

services; developing new products and services that are relevant, affordable, and accessible; improving financial literacy and consumer protection; strengthening public-private sector collaboration and partnership; and improving the collection of data to inform policy and practice (Reserve Bank of Fiji, 2016, pp. 11–15). An ADB report recommends development of “a comprehensive consumer education program for financial services” (Wehrhahn et al., 2019, p. 57) and encouraging the use of digital financial services much more widely by people and MSMEs for routine household and business transactions, noting that this would likely strengthen disaster resilience and improve MSMEs’ access to credit (Wehrhahn et al., 2019, p. 62).

Papua New Guinea has a moderate level of financial inclusion by regional standards, but there appears to be no current focus on the role of financial inclusion in supporting disaster resilience. In Papua New Guinea, ESCAP recommends improving mobile telephone network performance, investing in basic infrastructure such as access to electricity, and investing in increasing financial literacy and awareness of financial services (Hahm et al., 2019, pp. 20–23). Papua New Guinea’s *National Financial Inclusion Strategy* calls for: supporting the innovative use of technology for scaling up financial access; expanding of digital finance services to reach remote parts of the country; expanding micro-insurance coverage; improving financial literacy and financial education at all levels of the education system; introducing a consumer protection framework for regulated financial institutions; enhancing access to and usage of finance in the informal economy, in agriculture, and among MSMEs; involving the natural resources sector in financial inclusion; improving the collection and use of data on financial inclusion to identify opportunities; and integrating financial inclusion in local and national government planning and

implementation processes (Bank of Papua New Guinea, 2016, p. 4).

The level of financial inclusion in Samoa is similar to other Pacific island countries and other lower-middle-income countries on most indicators, and the country has little or no experience with cash transfers in disasters. In Samoa, ESCAP suggests promoting awareness, education, and consumer confidence about financial services, and stimulating the development of digital financial services by making government payments to individuals through bank transfers and mobile money systems rather than in cash (Hahm et al., 2019, pp. 20–24). The Central Bank of Samoa suggests that financial inclusion could be increased through financial literacy education, particularly focusing on insurance and mobile money; revisiting guidelines to allow bank agents to open new accounts as well as providing transactions; reducing minimum-balance requirements; and using remittances as an entry point for broadening financial inclusion, leveraging them to encourage people to take up other products and services (Central Bank of Samoa, 2015, p. 38). Samoa’s National Financial Inclusion Strategy calls for increasing increase access to and use of financial services, with particular attention to increasing access for women and for people in rural areas, developing products and services that suit the needs of more people including rural and low-income people, developing products and services designed for MSMEs and entrepreneurs, promoting digital financial services including payment systems and mobile money services, developing inclusive insurance products and services, providing financial education for children and adults, improving consumer protection, an improving sector-wide coordination (National Financial Inclusion Taskforce, 2017, pp. 2, 11–12). The IMF suggests promoting new financial technologies (fintechs) including mobile money and payment

systems, promoting digital and financial literacy, increasing competition in the financial sector, collecting more and better data on financial inclusion and financial services, continue working to establish a credit bureau and personal property registry, promote the economic use of customary land, improve financial business education, and review and reform the Small Business Loan Guarantee Scheme to strengthen risk sharing and improve financial reporting (IMF, 2015, para. 57, 2019, para. 13).

Solomon Islands has low levels of financial inclusion by regional standards and there is no significant experience of using financial inclusion to support disaster resilience.

In Solomon Islands, ESCAP suggests that fostering cross-border mobile money services and improving mobile telephone network performance are key policy considerations (Hahm et al., 2019, p. 20). The Central Bank of Solomon Islands suggests that financial inclusion could be increased by encouraging banks to establish agents on more islands, tapping into strong savings practices that already exist, increasing financial education, and addressing the disparity between women's and men's financial inclusion (Central Bank of Solomon Islands, 2015b, p. 19). Priority areas identified in the National Financial Inclusion Strategy 2016-2020 are: increase the reach and quality of digital financial services including mobile wallets, banking agent platforms, and digital payments in government and large businesses; improve delivery of financial services to MSMEs; include women, youth and rural adults in the national financial sector through supporting savings, financial literacy, savings clubs, and mobile money; promote financial resilience by integrating financial literacy into the school curriculum, expanding microinsurance coverage, promote savings and pension products for the informal and rural economies, supporting semi-formal

savings clubs, and developing financial literacy training for rural areas; and develop consumer protection mechanisms and national standards for financial agents (Central Bank of Solomon Islands, 2015b, p. 11).

Tonga has a moderate level of financial inclusion by regional standards, and some experience using cash transfers to support disaster resilience. In Tonga, increasing financial education and consumer confidence should be priorities (Hahm et al., 2019, pp. 17–18, 24). The Tongan government could support financial inclusion by encouraging the use of bank transfers or mobile money for payments to citizens (Hahm et al., 2019, p. 23). The government has expressed interest in supporting the expansion of microfinance facilities for business affected by TC Gita, with particular attention to meeting the needs of women handicraft producers (Government of Tonga, 2018b, p. 56).

Vanuatu has a moderate level of financial inclusion by regional standards, but little experience using cash transfers to support disaster resilience. In Vanuatu, ESCAP suggests that fostering cross-border mobile money services and improving mobile telephone network performance are key policy considerations (Hahm et al., 2019, p. 20), and recommend supporting the development of mobile money operators to reduce costs and increase convenience of domestic and international money transfers (Hahm et al., 2019, p. 22). A survey undertaken by the Cash Learning Partnership found that government and humanitarian respondents from Vanuatu felt that there was potential for using cash transfers in emergency response in the core islands but that most outlying islands lacked markets with sufficient capacity, and highlighted concerns included lack of knowledge and practical experience implementing cash and voucher programs, poor access to financial

services, risk of fraud, poor coordination among the organizations that would be involved, and a potential to undermine longer-term development programming (Hobbs & Jackson, 2016, p. 29). The Reserve Bank of Vanuatu suggests that financial services providers could explore ways to “improve the fit between their products and their clients’ needs” (Reserve Bank of Vanuatu, 2016a, p. 30). Vanuatu’s National Financial Inclusion Strategy aims to increase the number of active users of formal and semi-formal financial services and develop MSME financing products by: creating an enabling

policy environment and financial infrastructure; promoting and fostering inclusive products, services and channels; supporting MSME financing; and strengthening financial literacy and consumer empowerment (Reserve Bank of Vanuatu, 2018, p. 23). The strategy notes that financial inclusion helps people mitigate shocks and manage expenses related to unexpected events including disasters (Reserve Bank of Vanuatu, 2018, p. 11), but does not recommend actions specifically aimed at improving disaster resilience.

4.2.3. Insurance

In all of the countries examined in this report, the majority of people and businesses have no insurance covering natural hazards, and there are substantial barriers inhibiting demand and availability of insurance products. Demand for insurance products could potentially be increased by increasing financial, insurance and risk management literacy and awareness among beneficiaries, insurers, distribution channels and governments (Schaefer & Waters, 2016, p. 99), supporting the development of a wider range of products, and increasing access to financial services including developing channels such as mobile phones (ADB, 2018a, p. 18). However, the poorest and most vulnerable people cannot afford insurance at market prices and may require some form of support (Schaefer & Waters, 2016, pp. 92–93). The insurance industry also requires support to develop new products tailored to local market conditions including improving the availability and use of local risk data (ADB, 2018a, p. 18). Parametric or index-based insurance could potentially be simpler, more transparent, and cheaper than indemnity insurance, but requires considerable technical capacity, data, communications capacity, and public awareness and education (ESCAP, 2015, pp. 17–19; Lucas, 2015, pp. 4–5). Globally, insurers often fail to target the MSME sector and insurance products are often not well-adapted to the needs of MSMEs (Chatterjee & Wehrhahn, 2017, p. 3; GIZ, 2019, p. 1).

In Fiji, households and businesses have limited access to insurance against natural hazards, and no agricultural insurance products are available. In Fiji, in addition to the measures suggested above, demand for insurance products could potentially be increased through improving regulations to raise public trust and confidence, undertaking a comprehensive consumer education program for financial services including insurance, improving access to international insurance markets, and developing mechanisms to enable wider pooling of risk (Wehrhahn et al., 2019, pp. 33, 43, 65, 67). The high cost of insurance has been noted as a particular barrier for MSMEs in Fiji (Naidu & Chand, 2012). The insurance industry would benefit from support to develop new products (for homeowners and for businesses) tailored to local market conditions, which could involve changes to underwriting standards (ADB, 2018a, p. 18; Wehrhahn et al., 2019, pp. 46, 64), improving the availability and use of local risk data (ADB, 2018a, p. 18), or improving insurance companies’ financial reserves and mechanisms for pooling or reinsuring risk (Wehrhahn et al., 2019, pp. 47, 64–65). Conventional agricultural insurance products would be unaffordable for farmers in Fiji, and while index-based insurance may have potential, there is a lack of agricultural and weather data necessary to develop risk models (Maher & McCaffrey, 2012). A feasibility study on agriculture insurance in Fiji in 2017

recommended that an index-based insurance product covering wind, flood, and drought risks for sugarcane, dalo, cassava, ginger, coconut, and pineapple could be feasible, but recommended subsidizing premiums to make the product affordable (Fiji Crop and Livestock Council, 2017, cited in Wehrhahn et al., 2019, p. 52).

In Papua New Guinea, there may be some limited opportunities for expanding coverage by developing products tailored to local conditions. A World Bank “pre-feasibility” study of agricultural insurance concluded that the potential for agricultural insurance was limited but that there might be potential to develop indemnity-based or parametric insurance products to cover some cash crops and that “potential next steps include the implementation of a full feasibility study for agricultural insurance, the design and implementation of crop insurance pilots, the creation of an Agricultural Insurance Committee, and the creation of a Technical Support Unit” (World Bank, 2016a, pp. 21–22). *The National Financial Inclusion Strategy 2016–2020* calls for setting up an industry working group, enhancing knowledge and data on insurance services, introducing a regulatory framework for micro-insurance, further exploring the possibilities for agricultural insurance, supporting insurance providers in developing innovative products, assessing the possibility of including life and health insurance within pension schemes, and improving awareness of insurance among the population (Bank of Papua New Guinea, 2016, pp. 50–51). The strategy notes that the regulatory framework for micro-insurance needs to be clarified (Bank of Papua New Guinea, 2016, p. 19).

In Samoa, the IMF argues that insurance sector regulation is weak and in need of reform.

An IMF report notes that Office of Insurance Commissioner under the Central Bank of Samoa relies on off-site supervision and lacks technical capacity, argues that financial reporting and auditing practices are inadequate and policyholder’s rights are not properly protected,

and recommends that procedures should be better documented and staff training should be a priority (IMF, 2015, paras. 43–44).

In Solomon Islands, the National Financial Inclusion Strategy has called for expanding micro insurance through product and channel innovation (Central Bank of Solomon Islands, 2015b, p. 10) but it is unclear what progress is being made.

In Tonga, there is currently no national regulator for the insurance industry, and establishing a regulator is seen as a priority (PCRAFI, 2015d, p. 35) and legislation for the licensing of insurance companies and other non-bank financial institutions was being drafted as of 2019 (National Reserve Bank of Tonga, 2019, p. 23). The government’s post-disaster assessment of TC Gita recommended encouraging more businesses to insure structures and assets and reducing risks by retrofitting and constructing buildings in compliance with the building code (Kingdom of Tonga, 2018a, p. 28).

In Vanuatu, the government is seeking to encourage the development of insurance products tailored to local conditions. The government “considers the absence of microinsurance a key market failure that should be addressed to facilitate private sector growth”, noting that the absence of suitable insurance products for MSMEs is a barrier to investment, and calls for studying potential designs for insurance products suitable for informal markets and for the establishment of a private microinsurance market in Vanuatu (Government of Vanuatu, 2015b, p. 27). The government also recognizes the need to improve and enforce building standards and practices and to work with small builders and professionals to ensure uptake of improved standards (Government of Vanuatu, 2015b, p. 40). Vanuatu’s National Financial Inclusion Strategy calls for the development of inclusive insurance products that meet the needs of the excluded population, including insurance for MSMEs and value chains in the agriculture, fisheries and tourism sectors (Reserve Bank of Vanuatu, 2018, p. 25).

4.2.4. Migration

Globally and across the Pacific region, there is a consensus that migration has beneficial outcomes and should generally be supported, managed, and integrated into environmental, climate change, and urban planning policies (Campbell & Warrick, 2014, p. 30; Melde & Laczko, 2017, pp. 87–89, 93). A World Bank report recommends that “Pacific governments should prioritize labour mobility schemes and monitor their progress at the highest levels”, invest in relevant education and training, and invest in marketing strategies for their workers, and work to mitigate potential negative social impacts on families and communities (Curtain et al., 2016, pp. 33–37). The ILO recommends that Pacific island countries should promote labor mobility and seek opportunities both within and beyond the Pacific region, improve education and employment skills, and incentivize migrants to return home (ILO, 2017b, p. 127). The ILO also encourages countries that receive migrant workers to ensure that migration policies support development in source countries, to expand opportunities for low-skilled workers, to improve integration for new migrants, and to increase opportunities for migrants from countries particularly threatened by sea level rise (ILO, 2017b, p. 128). The Pacific Qualification Framework seeks to align national education and technical training standards across the Pacific, and Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga, and Vanuatu have all “made progress in their development of national qualifications agencies and national qualifications frameworks” aligned with this framework (ILO, 2019b, p. 23). The World Bank notes that there is a risk of “brain drain” for countries with skilled workers attracted to work overseas, and recommends that both migrant-sending and migrant-receiving countries should address this issue in migration policies, through skills development strategies (Curtain et al., 2016, pp. 35–36). There is a general lack

of knowledge about migration and climate change across the Pacific and a need for better information about international and internal migration trends, the economic and social characteristics of migrants and vulnerable populations, the links among climate change, adaptation options, and migration policy, and the gender implications of migration (Campbell & Warrick, 2014, p. 30; Curtain et al., 2016, p. 36; Melde & Laczko, 2017, pp. 89–92).

Fiji has a large and established diaspora and a substantial body of skilled and unskilled migrant workers. *Fiji’s National Adaptation Plan* for climate resilience “seeks to facilitate orderly, safe, regular and responsible migration and mobility of people” (Government of Fiji, 2018b, p. 15), in line with the Sustainable Development Goals. The government of Fiji regulates recruitment agents, and the National Employment Centre supports migration of unskilled workers (mostly fruit pickers) including coordinating with the governments of the countries receiving migrant workers, supporting registered recruitment agents, and providing pre-departure training for workers (Sloan, 2019). Migration of skilled workers could lead to “brain drain” in Fiji, which should be addressed as part of a national skills investment strategy (Curtain et al., 2016, pp. 35–36; ILO, 2017a, p. 21, 2019b, p. 37) but it is uncertain whether current policies are addressing these concerns.

Experts who have reviewed Papua New Guinea’s existing systems for supporting labor migration have made several recommendations for improvement. Papua New Guinea has been described as lacking a proactive strategy to attract overseas employers and work with them through effective intermediaries, and lacking resources to manage the recruitment process efficiently and provide appropriate support to migrants (Curtain, 2018, p. 21). The ILO notes that Papua New Guinea could make

greater efforts to promote workers to overseas employers, improve pre-departure training and assistance, and offer reintegration assistance for returning workers to help them transfer skills developed overseas (ILO, 2017b, p. 127) and also suggests that all Pacific island countries that have not developed national labor migration policies could consider examining the experiences of countries that have done so (notably Kiribati, Samoa, and Tuvalu), to help develop more effective national labor migration policies (ILO, 2019b, p. 39). Interviews with one cohort of participants in the Australian Seasonal Worker Program suggested that Papua New Guinea should increase the publicity given to the program, improve the selection process to fit candidates to jobs more effectively and more transparently, reduce barriers to participation affecting workers from outside Port Moresby, investigate ways of helping returning workers transition to improved and sustainable livelihoods once back in the country, improve pre-departure training with a component on occupational health and safety, arrange better support for workers overseas including workplace site visits, increase opportunities for training and skills development, improve pastoral care for workers, investigate the impacts of recruiting married versus unmarried workers, investigate strategies for encouraging the productive investment of remittances, consider providing reintegration assistance, and introduce transparent complaint procedures (Voigt-Graf, 2017, pp. 36–41). An ACP Observatory on Migration study in 2013 recommended that labor migration might be increased by improving education and training in rural areas for low-skilled workers, encouraging return migration of skilled workers, fostering seasonal worker schemes for Papua New Guineans to work in neighboring countries, setting up a recruitment agency to support job-seekers, and streamlining institutional processes such as strengthening commercial trade relations and simplifying visa procedures (Montoya & Au, 2013, pp. 33–35).

Migration is a well-established strategy in Samoa for seeking economic opportunities for both skilled and unskilled workers.

In Samoa, the government pursues policies that encourage and support migration, including upgrading skills (especially in health and education), developing new skills (such as financial literacy), supporting new categories of skilled workers (such as nurse practitioners), developing more liberal telecommunications regimes to reduce transaction costs, and seeking to identify and expand employment opportunities overseas for local workers (notably in New Zealand and Australia) (John Connell, 2015, paras. 175–177). The importance that Samoa places on supporting migration is demonstrated by the fact that engagement with New Zealand's Recognised Seasonal Employer program "is based at the highest level, in the Prime Minister's Office, rather than in the Ministry of Labour which is the usual practice elsewhere" (John Connell, 2015, p. 175). Samoa suffers from "remarkably sparse" data on migrants and migration, perhaps because "migration is regarded as a free choice and not to be constrained in any way" (John Connell, 2015, p. 178).

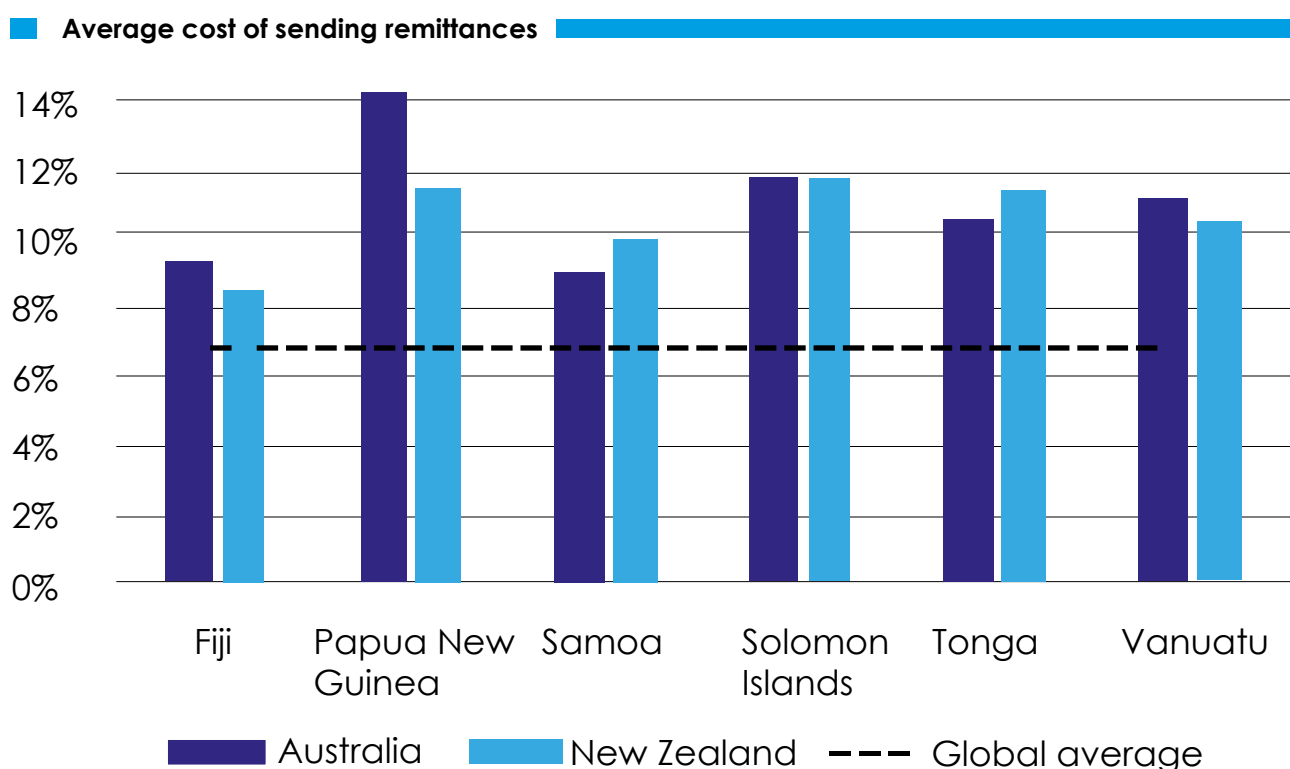
The Solomon Islands government is actively promoting labor migration and seeking to dramatically increase the number of workers overseas.

The World Bank made a series of recommendations in 2017 that included: revising the process of recruiting workers to increase supervision of recruitment agents and increase the capacity of the government's Labor Mobility Unit to handle recruitment; improving the marketing of Solomon Islands as a source of labor; improving coordination across government to deliver a more effective program, maintain recruitment and training standards, and better engage with stakeholders (World Bank, 2017d, p. 69). Many of these recommendations appear to be reflected in the government's recently-adopted Labour Mobility Strategy (Solomon Islands Government, 2018, pp. 9–15).

Migration is a well-established strategy in Tonga for seeking economic opportunities for both skilled and unskilled workers (John Connell, 2015). Tonga benefits significantly from its migrant population, particularly through remittances which are received by the vast majority of households in the country, and as a result the government “is more concerned with encouraging than preventing migration”, especially of unskilled workers (John Connell, 2015, pp. 153–154, 175). The government is seeking to try to address the skills shortage caused by emigration of skilled workers, encourage return migration, reduce transaction costs for remittances, and help identify overseas employment opportunities for unskilled temporary workers (John Connell, 2015, p. 175).

Vanuatu does not have a history of overseas migration for economic opportunities, but numbers of temporary migrants, especially seasonal workers, are increasing. Vanuatu has only a small diaspora and has historically had limited seasonal migration, although numbers of temporary workers are now increasing (ILO, 2019b, pp. v, 2, 37). The Vanuatu Department of Labour supports recruitment of workers for overseas employment by maintaining “a work-ready pool of workers” (ILO, 2019b, p. 31). The Vanuatu government is also working on harmonizing national qualifications with the Pacific Qualification Framework to facilitate migration of skilled workers (ILO, 2019b, p. 23).

4.2.5. Remittances



Remittances make an important contribution to poverty reduction, wealth creation, social protection, and economic growth in many countries, and there is evidence from many countries worldwide that remittances support responding to and recovering from disasters. The cost of sending remittances in the Pacific region is high by global standards, and many experts have called for costs to be reduced,

particularly during and after crises (Bettin et al., 2014, p. 17; John Connell, 2015, p. 143; Hahm et al., 2019, p. 24; Le Dé, Gaillard, Friesen, et al., 2015, p. 5; Melde & Laczko, 2017, p. 88). Remittances require functioning financial and communications systems, so it should be a high priority to ensure that these systems are operational as soon as possible after a disaster (Ebeke & Combes, 2013, p. 2251; Le

Dé, Gaillard, Friesen, et al., 2015, p. 4). Across the Pacific region, some experts recommend offering training to migrants and to recipients of remittances to encourage greater use of remittances for longer-term investment, including increasing access to financial institutions and credit, and encouraging recipients to deposit funds to accumulate savings (Ebeke & Combes, 2013, p. 2252; Jayaraman et al., 2011, p. 538; Le Dé, Gaillard, Friesen, et al., 2015, p. 6; Melde & Laczko, 2017, p. 88). Other measures identified region-wide that can help support remittances in disaster situations include increasing migrants' access to financial services in host countries (Bettin et al., 2014, p. 17), ensuring that systems are in place to enable people to identify themselves, including temporary identification papers if needed (Le Dé, Gaillard, Friesen, et al., 2015, p. 5), and supporting tracing and contacting family members affected by disasters (Le Dé, Gaillard, Friesen, et al., 2015, p. 5).

Fiji receives substantial amounts of remittances which contribute to poverty reduction, wealth creation, social protection, economic growth, and disaster resilience. One academic study of the impact of remittances in Fiji recommends developing the financial sector to channel remittance inflows into the banking system, incentivizing recipients of remittances to deposit them in the banking system to accumulate savings and investment (possibly by offering higher interest rates for foreign currency deposits), and reducing the cost of sending and receiving remittances (Jayaraman et al., 2011, pp. 538–539). On the other hand, another study of the impact of remittances in Fiji and Tonga advises caution regarding attempts to channel remittances into the formal financial sector, observing that current informal channels are efficient and “are functioning quite well in the absence of policy interventions” and that “whatever policies are considered in relation to remittance flows and their uses, it is imperative that the functioning of the existing informal

social protection system they provide should not be undermined” (Brown et al., 2014, p. 449). However, the authors do suggest designing and targeting formal social protection systems so as to complement informal remittances, reducing the costs of remittances, and broadening the use of mobile phone based financial services (Brown et al., 2014, p. 449).

International remittances are a major source of income for households in Samoa, and make a large contribution to poverty reduction, wealth creation, social protection, and economic growth. Samoan, Tonga, and Fijian migrants in New Zealand highlighted the following priorities from their perspective: transaction costs; reliable communication with family members during and after a disaster; encouraging the investment of remittances in disaster preparedness; and closer collaboration among governments, faith-based organizations, and local NGOs to organize collective remittances (Pairama & Le Dé, 2018, pp. 337–340). Policy recommendations for Samoa arising from an IOM research and capacity-building project include (Le Dé, Gaillard, & Wardlow, 2015, p. 5):

- Keep financial and telecommunications systems operational, provide transportation to money agents and banks, and provide internet access in emergency shelters;
- Support documentation such as temporary identification cards and family tracing;
- Support migrants by informing them about available money transfer options, reducing or eliminating fees during and after crises, enabling migrants to return home temporarily without jeopardizing jobs or visa status, supporting them to travel to disaster-affected locations, and investing in budget training both for both migrants and beneficiaries;
- Integrate remittances in post-disaster assessments and improve social protection systems to target populations without access to remittances; and

- Include remittances in recovery programs by ensuring that recovery aid complements remittances, remittances are taken into account as part of household income streams, and giving households without access to remittances skills, support, and priority in migration schemes.

Tonga receives more remittances, as a percentage of its GDP, than any other country in the world, and remittances make a large contribution to poverty reduction, wealth creation, social protection, and economic growth. Several experts argue that financial education campaigns could help encourage alternatives to traditional money transfer operators, such as mobile money services (John Connell, 2015, p. 143; Hahm et al., 2019, p. 23), which are less expensive and would allow a greater proportion of the value of remittances to reach beneficiaries. A technical assistance program in Tonga operated by the Organisation of African, Caribbean and Pacific States and the European Union recommends a wide range of measures to support the flow of remittances, and although these recommendations do not directly address disaster relief and resilience, they would contribute to those objectives (Villacres, 2017):

- Optimise regulatory frameworks for preventing money laundering and the financing of terrorism and invest in capacity building and tools for compliance;

- Reduce the cost of sending remittances by encouraging competition, supporting emerging actors and new financial technologies, removing the country's tax on foreign exchange, and improving financial literacy;
- Encourage the use of remittances for longer-term investment; and
- Engage with the diaspora more actively.

Remittances are a negligible source of income in Papua New Guinea, Solomon Islands, and Vanuatu because of low levels of labor migration. Region-wide, experts have made many recommendations for improving the impacts of remittances (discussed above), but most recommendations are of limited relevance to these countries because they send very few migrant workers overseas. In Solomon Islands, domestic remittances have been identified as particularly significant, and the Central Bank of Solomon Islands recommends in the 2015 Financial Services Demand Side Survey that the country needs “an accessible domestic remittance solution” as a safer and more cost-effective solution to personally delivering cash, which is the method currently used by about 70% of those who send or receive domestic remittances, but it makes no recommendations regarding international remittances, which are only about one-tenth of domestic remittances (Central Bank of Solomon Islands, 2015a, pp. 12–13).

4.2.6. Resettlement

The need to relocate communities at risk of natural hazards has been recognized across all six countries reviewed in this report. Populations are generally reluctant to relocate, and it often happens that some members of a community either refuse to move or eventually return to their original homes. Recommendations for resettlement initiatives emphasize the importance of community participation and empowerment, providing community services in the new location, and preserving livelihoods and cultures. Access to land and natural resources are major barriers to relocation in most cases, and resettled populations often

end up in conflict with their new neighbors after relocation.

Fiji has undertaken several small-scale village relocations, and the government expects relocation to become “a more common response to climate related events in the future” (Government of Fiji, 2018a, p. 5). National guidelines and independent studies have emphasised the importance of full and genuine community participation and respect for rights, empowerment, culture, and livelihoods (Bertana, 2020; Government of Fiji, 2018a; Piggott-McKellar et al., 2019; Tronquet, 2015, p.

140). The country's *National Adaptation Plan* for climate resilience calls for strengthening sub-national development planning processes to integrate mobility issues including relocation (Government of Fiji, 2018b, p. 52). The government has published official guidelines to guide the process of planned relocation in response to climate change and disasters (Government of Fiji, 2018a, p. 5).

There have been multiple attempts to relocate settlements at extreme risk of natural hazards in Papua New Guinea, but these have often failed to produce positive, sustainable outcomes.

Resettlement is invariably unwelcomed by resettled people and by host communities, and has often been equated with disempowerment and loss of autonomy. Governments are often reluctant to intervene, are rarely strategic, find it difficult to deal with uncertainty, and are often unable or unwilling to address local concerns including conflicts between 'hosts' and 'guests' (John Connell & Lutkehaus, 2017, pp. 24–25). The following recommendations have been made by various agencies and experts suggesting how outcomes for displaced people might be improved (Boege & Rakova, 2019, p. 14; John Connell & Lutkehaus, 2017, pp. 24–25; IOM, 2017, pp. 22–23):

- Community involvement: ensure that resettled groups and host communities are fully and meaningfully involved in all stages of the resettlement process, taking into account the needs, interests, and expectations of all stakeholders and recognizing that resettled populations are not homogeneous and that indecision, fragmentation, and division can exist within the population.
- Livelihood and inclusive development planning: provide for appropriate livelihoods, skills development and livelihood diversification for displaced populations, ensuring food security, access to land and other resources, and opportunities for inclusive social and economic development.
- Service provision: provide humanitarian assistance including water, sanitation,

education, and shelter assistance and improve safety and security where people are resettled.

- Policy and institutional coordination: develop holistic national policies and integrate stakeholders including international actors, state institutions, local customary institutions, and civil society institutions, to provide the necessary social, physical and legal infrastructures for success
- Traditional knowledge: acknowledge and integrate traditional knowledge with modern climate science.
- Exit strategies: develop exit strategies so that temporary relocations do not become indefinite, and support displaced people in planning and management of return, resettlement, or reintegration.
- Conflict sensitivity: recognize the conflict potential inherent in resettlement, and conduct resettlement programs in a conflict-sensitive way.
- Time and resources: resettlement requires substantial lead time, consultation, financial resources and management ability, all of which are rarely available, but resettlement has been least successful where responses to hazards required speed.
- Advance planning: develop flexible contingency plans in advance to help ensure an effective response and accommodate uncertainty, noting that this requires an unusual level of collaboration between scientists, local people and government officials.

In Samoa, policies on relocating populations at risk are under discussion but have not been firmly established. Samoa's *National Disaster Management Plan* notes that there is a need to "find durable solutions to displacement which may include return to places of origin, local integration or resettlement" and to "formulate public policies, where applicable, aimed at addressing the issues of prevention or relocation, where possible, of human

settlements in disaster risk-prone zones, subject to national law and legal systems" (Ministry of Natural Resources and Environment, 2018, pp. 14, 35). In rural coastal areas, some families have opted to resettle inland using land previously used for agriculture, while in the Apia urban area some have left their normal residences and people with adequate resources have bought land further inland (Nelson, 2020, p. 36). The government has started a consultative process to address the loss of land to coastal erosion and inundation (Nelson, 2020, p. 36). Barriers that will need to be resolved if relocation is to be a viable option for populations at risk include the lack of available and affordable land, and the challenge of breaking customary ties between a family and its ancestral lands (Meldau, 2013, p. 57). Practical recommendations for managing relocation processes, arising from case studies in Samoa and in São Tomé, include (Koskinen-Lewis et al., 2016, paras. 6–7):

- Engage with the community and leadership at each stage of a relocation process;
- Provide compensation to landholders or occupiers, and if a relocation site is already occupied, consider compensation, training, or livelihood assistance for the host community;
- Ensure access to livelihoods and services in relocation areas, and include the host population, if any, as well to defuse potential conflict;
- Keep families together to maintain the social fabric of a community;
- Plan for staffing needs on the part of agencies implementing the relocation process; and
- Prevent return, but ensure coastal access for communal, leisure, social, and small commerce use including fishing, tourism, and other coastal-based livelihoods.

There have been multiple attempts to relocate settlements at extreme risk of natural hazards in Solomon Islands, with mixed results. In Solomon Islands, land ownership issues have been a major barrier to resettlement of populations at risk (Ha'apio,

Wairiu, et al., 2018, p. 362; Talo, 2008, pp. 42, 80, 86–87). A review of two instances of relocation recommends that the government, international development partners, and local communities should collaborate on developing policies on resettlement that build the long-term adaptation capacity of communities; communities must lead the decision-making process about their relocation and transformation; and governments should invest in building long-term resilience as well as addressing short-term issues including tenure (Ha'apio, Wairiu, et al., 2018, p. 363). Lessons from another case study suggest that resettlement can be both a crisis response and a more measured response to slow-onset problems; resettlement can be used to jump-start new projects such as improved provision of public services, and to bring together a broad assortment of stakeholders to collaborate; the resettlement process can be used to deploy measures that help communities leapfrog stages of development, such as switching from kerosene to solar power; disaster risk reduction and climate change adaptation measures can be mainstreamed into planning and design processes; and integrated approaches can support improvements and collaborations in environmental conservation or remediation (Filho et al., 2020, p. 185). Vanuatu, Fiji, and Kiribati are considered to be leaders in resettlement policy and practice, and guidelines developed in these countries may offer models to consider in the Solomon Islands (Benintende, 2019; IDMC, 2018, p. 29).

In Tonga, relocation of settlements is a sensitive undertaking but is being considered in development plans for some vulnerable areas, and some relocation of settlements has taken place as part of reconstruction efforts, notably following the 2009 tsunami in Niuatoputapu (John Connell, 2012, pp. 134, 136; Kingdom of Tonga, 2019). Tonga's Third National Communication on Climate Change notes that community relocation "needs to be considered quite seriously in the coming decade", identifying multiple vulnerable locations but noting that the availability of land and financing are significant challenges (Kingdom of Tonga, 2019, pp. 98, 135–137).

Several settlements in Vanuatu have been relocated in response to natural hazards, and a comprehensive national policy on relocation exists. Vanuatu's national policy is considered to be a leader in incorporating relocation, internally displaced peoples' rights, and cross-border movements into governance arrangements (IDMC, 2018, p. 29). It includes guidance aiming to minimize the drivers of

displacement and relocation; minimize their negative impacts; work towards durable solutions for displaced populations; ensure that displaced people and host populations can make voluntary and informed choices and participate in planning solutions; facilitate well-managed and safe migration; promote access to disaster-resilient housing; and integrate human mobility into other sectoral policy areas (NDMO, 2018).

4.2.7. Community support

All of the countries reviewed in this report have strong cultures of community-based support, traditional knowledge, traditional governance systems, and faith-based organizations that contribute to disaster resilience. Recommendations for disaster relief and reconstruction call for understanding, recognizing, preserving, and working alongside these existing practices which are deeply embedded in local culture.

In **Fiji**, UNDRR recommends that traditional practices should be valued and the systems sustaining the mechanisms should be protected to support community resilience (UNDRR, 2019b, p. 14). Effective early warning systems are helpful in giving communities time to respond to hazards (Gawith et al., 2016, p. 2102). Policy interventions can, in principle, complement community mechanisms, but these are likely to be highly context-dependent (Takasaki, 2015, p. 75).

In **Papua New Guinea**, an IOM report suggests integrating local knowledge into national and local level policies and programs through holding national and local meetings and exchanges to spread indigenous knowledge;

integrating indigenous knowledge in school curricula; using a variety of culturally-appropriate media to communicate indigenous knowledge; integrating indigenous knowledge and practices into community-based disaster preparedness; and training community leaders and teachers (Sithole et al., 2015, pp. 15–16).

In **Samoa**, understanding and incorporating the roles, functions, and strengths of traditional governance systems and their links to national government systems is considered to be important to support disaster risk reduction and recovery and climate change adaptation (Fletcher et al., 2013, p. 6; Government of Samoa, 2009, p. 22). Churches, in particular, play a central role in leading disaster resilience efforts and should be part of any interventions (Beyerl et al., 2018, pp. 35–36). Traditional knowledge and coping strategies are important mechanisms for enhancing disaster resilience, and “it is important that traditional ways of operating and supporting local communities are understood by external organizations seeking to offer support and provide humanitarian response” (Fletcher et al., 2013, p. 8). Blending the new construction of European-type houses with traditional knowledge of architecture, local

building materials, and community-oriented life style may improve the resilience of buildings to natural hazards (Government of Samoa, 2013, p. 62). Cash-for-work programs have, in at least one instance, appeared to undermine traditional community support mechanisms by creating expectations of payment for work that would previously have been undertaken by community members voluntarily, so should be considered carefully within the local context (Fletcher et al., 2013, p. 7).

In **Solomon Islands**, the *wantok* system is a significant contributor to disaster resilience, and should be understood and taken into account in building resilience and adaptation capacity (Ha'apio et al., 2019, pp. 515–518, 524; ILO, 2015, p. 2). Academic studies suggest that the national government should “create the conditions to enable communities and local governments to organize themselves and respond with self-initiatives for adaptation measures, custom-made for the specific local contexts, rather than focusing on centrally-planned mitigation” (Ha'apio et al., 2019, p. 524). The government is increasingly recognizing the importance of traditional knowledge and is taking steps to capture traditional approaches to disaster risk reduction and disaster risk management (Vaike & Salili, 2020, p. 18); for example, the government's Meteorological Services Division has a Traditional Knowledge Project that aims to record, archive, and revive traditional knowledge to enhance weather prediction and community resilience to extreme weather events and disasters (Meteorological

Services Division, 2017). Local traditional governance institutions are also extremely important and can vary across the country, and any national initiatives must take local systems into account and coordinate with them (Kelman, 2019, p. 409).

Tonga has a strong culture of sharing between families and within communities, which is an important social protection mechanism during crises (Hobbs & Jackson, 2016, p. 72). In Tonga, churches play an extremely important role in daily life and in responding to disasters (Hobbs & Jackson, 2016, p. 72), so coordination with local churches and their international networks could be beneficial for disaster relief and recovery efforts.

In **Vanuatu**, the national Climate Change and Disaster Risk Reduction Policy calls for working collaboratively with and strengthening the capacity of local (including provincial and community) groups, traditional governance systems, and faith-based organizations working on climate change and disaster risk reduction decision-making and implementation (Government of Vanuatu, 2015a, pp. 9, 18–19). The government recognizes traditional knowledge and practices in disaster resilience and aims to collect and record them, incorporate them into planning, make traditional knowledge accessible to decision-makers, and include traditional knowledge in school curricula (Government of Vanuatu, 2015a, p. 14).

Annex: Background and Methodology

This project is part of the Climate Risk Insurance Research Collaboration (CRIRC), a joint initiative of the United Nations University Institute for Environment and Human Security (UNU-EHS), the Munich Climate Insurance Initiative (MCII), the University of the South Pacific (USP), The University of the West Indies (UWI) and the United Nations Pacific Financial Inclusion Programme (PFIP). CRIRC partners undertake academic and policy-related research, share international experience, and develop programmes to support disaster risk finance, insurance and social protection.

This report was commissioned to produce a summary of evidence about the economic impacts of natural hazards on poor and vulnerable populations in Fiji, Vanuatu, Tonga, Solomon Islands, Samoa and Papua New Guinea, based on the most current academic and professional literature available. The results are available in the form of this combined report addressing all six countries, and also as six individual country reports.

The project aimed to answer the following research questions:

- 1. What are the principal natural hazards** that affect each of the countries of interest (Fiji, Vanuatu, Tonga, Samoa, Solomon Islands, and Papua New Guinea)?
- 2. How do these natural hazards affect people** in vulnerable economic sectors, particularly small-scale agriculture and fishing, workers in the informal economy, and micro, small, and medium-sized enterprises in retail and tourism; and in vulnerable segments of the population, particularly women, youth, and migrants?
- 3. What support systems and coping mechanisms are available** to support these sectors and populations?

- 4. What are the gaps in these support systems,** and what opportunities might exist for strengthening them?

The scope of the project was defined to include:

- **Countries of interest:** Fiji, Vanuatu, Tonga, Samoa, Solomon Islands, and Papua New Guinea.
- **Natural hazards:** All natural hazards that are reported in the literature as significantly affecting the countries of interest, including weather- and climate-related hazards, geophysical hazards, and rapid- and medium-onset events (including drought), but excluding slow-onset events such as sea level rise.
- **Economic sectors:** The project is primarily concerned with people whose livelihoods derive from small-scale agriculture and fishing, workers in the informal economy, and micro, small, and medium-sized enterprises in the tourism and retail sectors.
- **Vulnerable populations:** The project is concerned with segments of the population that are most vulnerable to natural hazards in each country, notably people who are poor and live in hazard-prone areas, with women, youth, and migrants being of particular interest.
- **Impacts:** The project will search for evidence of micro-economic impacts of natural hazards on the populations of interest, focusing on direct, short-term economic losses and immediate aid and reconstruction needs, which could in principle be compensated through insurance mechanisms, with limited attention on the implications for long-term development. It will not address macro-economic impacts, nor impacts on safety, health and life.

- **Coping mechanisms:** The project will provide an overview of compensation and coping mechanisms available to the populations of interest, including official aid and relief programmes as well as informal and community-based support systems, and present evidence, where available, about compensated and uncompensated losses, gaps in support systems, and opportunities for strengthening support systems to improve disaster resilience.

This project followed a “quick scoping review” research methodology, incorporating some of the rigorous procedures for searching for evidence that are used in systematic reviews and rapid evidence reviews but with limited scope, informal appraisal of evidence, and no classification or mapping of materials, as appropriate to the resources available for the project. An initial search for evidence used systematic keyword searching

in Scopus (scopus.com), Web of Science (webofknowledge.com), Google Scholar, and Google, using keywords for countries, the Pacific region, and various natural hazards. In addition, websites of organizations known to be working on relevant issues were searched, and a project steering group was consulted for inputs. As the project progressed, further evidence was collected in an organic fashion by following up references in bibliographies of materials selected for inclusion to identify other relevant materials, and by targeted searching using Google to fill in information gaps. Selection of source material was biased towards meta-reviews, country-wide studies, and studies that look at hazards as a class rather than as individual incidents. Materials were only examined when they were freely available to the public online, or were available online through subscriptions accessible through the researcher's affiliations. Only material published in English was included.

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