



Economic Impacts of Natural Hazards on Vulnerable Populations in TONGA



Contents

List of abbreviations	ii
Executive summary	1
1 Hazard and exposure	2
1.1. Overview of risks	2
1.2. Cyclones	5
1.3. Earthquakes and tsunamis	5
1.4. Floods	5
1.5. Droughts	6
2 Vulnerability and impacts	7
2.1. Economic profile	7
2.2. Agriculture and fisheries	8
2.3. Tourism	10
2.4. Commerce and manufacturing	11
2.5. Housing and settlements	12
2.6. Low-income and informal workers	13
2.7. Gender	14
2.8. Youth	17
3 Coping mechanisms	20
3.1. Types of coping mechanisms	20
3.2. Adaptive social protection	20
3.3. Remittances	22
3.4. Financial inclusion	24
3.5. Insurance	26
3.6. Migration and relocation	27
3.7. Community-based support	28
4 Conclusions	30
4.1. Hazard, exposure, and vulnerability	30
4.2. Coping mechanisms	31
References	34

List of abbreviations

ADB	Asian Development Bank
CRED	Centre for Research on the Epidemiology of Disasters
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EM-DAT	Emergency Events Database
ESCAP	Economic and Social Commission for Asia and the Pacific
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
IFRC	International Federation of Red Cross and Red Crescent Societies
ILO	International Labour Organization
IMF	International Monetary Fund
INFORM	Index for Risk Management
MAFF	Ministry of Agriculture, Food, Forests and Fisheries (Tonga)
MSME	Micro-, small-, and medium-sized enterprises
OECD	Organisation for Economic Co-operation and Development
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
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
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme
WTO	World Trade Organization

Executive summary

Tonga is highly exposed to natural hazards, with cyclones regularly damaging property and causing long-term cumulative economic harm. Tropical cyclones are the principal hazard affecting Tonga, although the country is also exposed to earthquakes, tsunamis, flooding of low-lying areas, and droughts. Climate change is expected to exacerbate weather-related hazards.

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, carried out mostly on a subsistence basis, and is particularly vulnerable to cyclone damage, severely affecting the poorest and most vulnerable in the population. Climate change is expected to adversely affect agriculture and fisheries through increased frequency of extreme weather, sea level rise, and disruption of aquatic ecosystems. Other industries are often small-scale and dependent on natural resources and ecosystems which are also vulnerable to natural hazards and climate change.

Natural hazards disproportionately affect poor people, workers in the informal economy, women, and youths. 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. Extreme poverty is rare in Tonga, but there are significant levels of deprivation and hardship, especially in rural areas, and Tonga has high levels of informal and vulnerable employment and subsistence economic activity. Women and girls are disadvantaged and constrained economically, more often have livelihoods that depend on natural resources, and suffer increased incidences of gender-based violence during crises. Youths suffer long-term ill effects from disruption to education and employment caused by natural hazards, which can lead to long-term failure to develop human capital and permanently reduced employment prospects and incomes.

Support systems that can help poor and disadvantaged populations cope with the impacts of natural hazards include:

- **Social protection systems that can rapidly adapt** in crisis situations can support the immediate needs of affected people as well as longer-term reconstruction. Tonga has undertaken initial small-scale trials of scaling up its social protection systems to deliver cash payments for disaster relief and reconstruction, but experience in this area is still limited.
- **Remittances** make a very large contribution to poverty reduction, wealth creation, social protection, and economic growth in Tonga, and there is evidence from many countries worldwide that remittances support responding to and recovering from disasters.
- **Financial inclusion** can be a significant contributor to development, poverty reduction, and disaster resilience. Financial inclusion currently plays a limited role in disaster resilience in Tonga, apart from facilitating overseas remittances, but there is a good foundation of financial infrastructure and experience to build on so that financial inclusion could play a larger role in the future.
- **Insurance** can be an important tool for managing risks associated with natural hazards, but in Tonga, the majority of people and businesses have no insurance protection, coverage against natural hazards is difficult to obtain and expensive, and the national regulatory framework is inadequate.
- **Migration**, both internally and internationally, can support development and disaster resilience. Tonga has high levels of emigration, which is generally seen as a net benefit for the country. Relocation of settlements at risk, a highly sensitive issue, is under discussion.
- **Community-based support** mechanisms are a common way to manage risk, especially in rural and poor communities. Tonga has a strong culture of sharing between families and within communities, which is an important social protection mechanism during crises.

1. Hazard and exposure

1.1. Overview of risks

Pacific island countries are widely regarded as experiencing the highest risks associated with natural hazards in the world due to their high exposure to a variety of hazards, their geographical remoteness, and their dispersion across a large area (ADB [Asian Development Bank], 2018, p. 2; World Bank, 2017a, p. 81). Across the region, hydrological and meteorological events cause the majority of economic losses, with cyclones being the most serious hazard, while geo-hazards are the major cause of human loss (Utz, 2017, p. 81).

Tonga is ranked as the third 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). An International Monetary Fund (IMF) study estimates that Tonga has a 30% chance of suffering a significant¹ disaster related to natural hazards each year (Lee et al., 2018, p. 7). The Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) estimates that cyclones, earthquakes, and tsunamis cause average annual damage and losses equivalent to 4.3% of Gross Domestic Product (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, 2011, pp. 1, 5).

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). Tonga experiences an average of 1.6 tropical cyclones per year with damaging winds, rain, and storm surges (Kingdom of Tonga, 2019, p. 9; PCRAFI, 2011, p. 3). It is also located along the Pacific "Ring of Fire", placing it at risk of earthquakes and tsunamis, which are rare but cause extensive damage when they do occur (Kingdom of Tonga, 2019, p. 154; PCRAFI, 2011, p. 3). 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 [Commonwealth Scientific and Industrial Research Organisation], 2014, p. 282; Government of Tonga, 2018a, p. 18). A survey of people's 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).

¹ This analysis was based on the Emergency Events Database (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.

Different agencies, using different methodologies, provide different assessments of risk for Tonga.

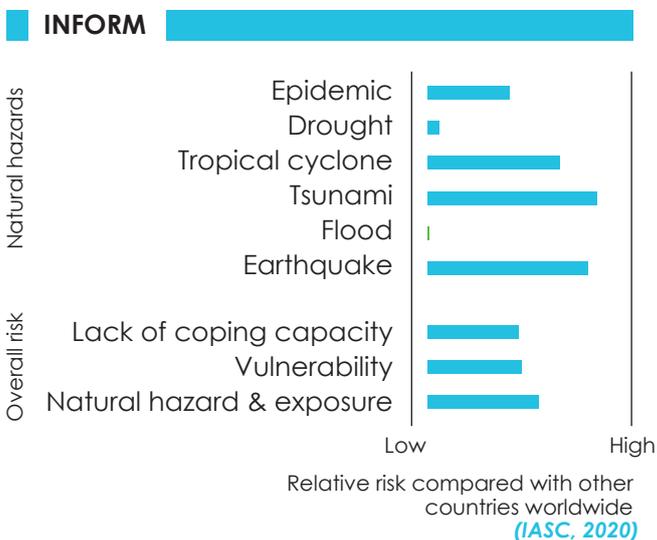
- **WorldRiskReport**² ranks Tonga as the third most hazardous country in the world due to its high exposure to natural hazards and lack of coping capacities. The ranking process uses 27 indicators and assigns countries scores ranging from 0 (least risk) to 100 (greatest risk) (Day et al., 2019, pp. 44, 56).
- **INFORM (Index for Risk Management)**³ assesses the relative risk of countries experiencing humanitarian crises, taking into account exposure to hazards, vulnerability of the population, and coping capacity. INFORM ranks Tonga 50th out of 191 countries on exposure to natural hazards (tied with Vanuatu), meaning that one-quarter of the countries of the world have a higher risk. It considers Tonga to have a particularly high risk of tsunamis, earthquakes, and cyclones, and a low risk of flood and drought (IASC [Inter-Agency Standing Committee Reference Group on Risk, Early Warning and Preparedness], 2020).
- **ThinkHazard**⁴ provides an overview of natural hazards at national and local levels. It considers Tonga to have a high risk of earthquakes and tsunamis, and moderate risks of most other hazards (GFDRR [Global Facility for Disaster Reduction and Recovery], 2020).
- **The Internal Displacement Monitoring Centre (IDMC)**⁵ models the risk of future population displacements, and projects the greatest risk for Tonga to be related to cyclones (IDMC, 2019).

² Developed by Ruhr University Bochum and Bündnis Entwicklung Hilft.
³ Developed by the Inter-Agency Standing Committee Reference Group on Risk, Early Warning and Preparedness and the European Commission.
⁴ Developed by the Global Facility for Disaster Reduction and Recovery (GFDRR) managed by the World Bank.
⁵ Part of the Norwegian Refugee Council, a humanitarian non-governmental organization.

Figure 1: Natural hazard forecasts

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)



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

*There are no rivers in Tonga *(GFDRR, 2020)*

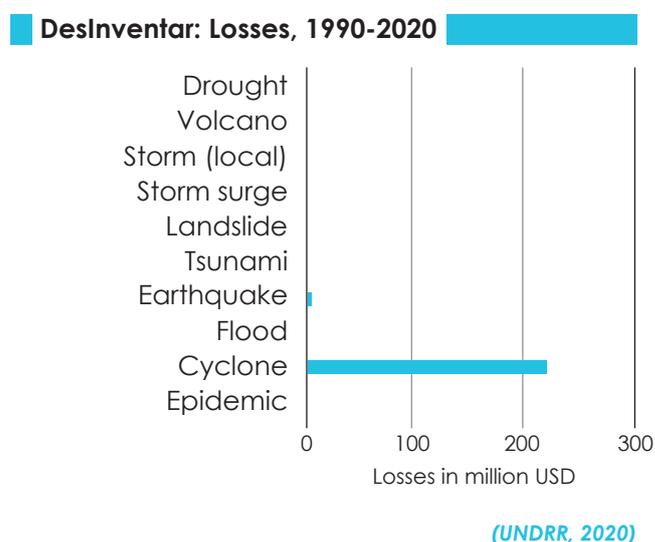
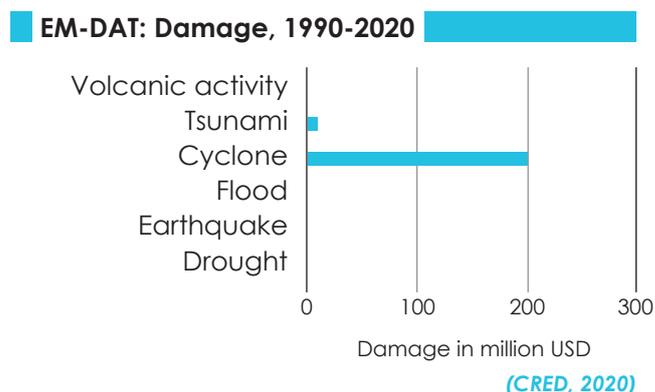
Internal Displacement Monitoring Centre	
Average expected number of displacements per year	
Cyclonic wind	1,051
Earthquake	168
Tsunami	10

(IDMC, 2019)

Agencies that record past disasters agree that cyclones have caused the greatest economic losses in Tonga. DesInventar⁶ and EM-DAT⁷

(Emergency Events Database) 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). For Tonga, both datasets agree that cyclones are the hazards that have caused the most damage and/or losses, although they differ slightly regarding the number of events and magnitude of damage and/or losses that they record (CRED [Centre for Research on the Epidemiology of Disasters], 2020; UNDRR [United Nations Office for Disaster Risk Reduction], 2020). PCRAFI has also compiled a database cataloguing more than 600 disasters across 15 countries in the region (PCRAFI, 2013, pp. 53–57). Of the 45 events recorded for Tonga, 33 were cyclones, along with eight earthquakes, three local storms, and one flood; no tsunamis, landslides, or storm surges were recorded. (PCRAFI, 2013, p. 57).

Figure 2: Historical disasters



PCRAFI: number of recorded disasters

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

(PCRAFI, 2013, p. 57)

⁶ Operated 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).

⁷ Operated by the Centre for Research on the Epidemiology of Disasters (CRED), Catholic University of Louvain.

1.2. Cyclones

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 losses caused by cyclones is estimated at 2.7% of GDP (PCRAFI, 2011, p. 5). Two major cyclones have hit Tonga in the past ten years: in 2014, Tropical Cyclone (TC) Ian caused damage and losses equivalent to 11% of Tonga's GDP; and in 2018 TC Gita caused damage and losses 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, 2018, p. 8, 2020b; WTO [World Trade Organization], 2019, 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).

Climate change is expected to lead to fewer but more powerful cyclones by the end of this century. The frequency of cyclones in Tonga is expected to decrease by 10% to 40%, but

global projections indicate that maximum wind speeds could increase by 2% to 11%, which would lead to exponentially higher damage; there are no forecasts of cyclone intensity specifically for Tonga (ADB, 2018, p. 5; Australian Bureau of Meteorology and CSIRO, 2014, pp. 293–294).

Global evidence shows that the economic damage caused by cyclones is long-lasting and cumulative. A study of the long-term economic impacts of tropical cyclones that examined 6,712 storm events found that the impact on GDP caused by a cyclone lasts at least twenty years, and that countries that are repeatedly exposed to cyclones experience a cumulative and effectively permanent loss to GDP. More powerful storms cause more long-term damage: each additional meter 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).

1.3. Earthquakes and tsunamis

Tonga is located on the Pacific “Ring of Fire”, placing it at risk of earthquakes and tsunamis (PCRAFI, 2011, p. 3). Such events are rare but can be extremely damaging when they do occur. 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, 2011, p. 3). On average, the country is expected to incur damage amounting to 1.7% of GDP due to earthquakes and tsunamis (PCRAFI, 2011, p. 5).

1.4. Floods

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 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 flooded or similar 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 3 and 17 cm by 2030, and between 9 and 31 cm by 2055, which will increase the impact of storm surges and coastal flooding (Kingdom of Tonga, 2019, p. 87).

1.5. Droughts

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 Niño⁸ 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 rainwater. During the 1997-1998 El Niño, for example, the government had to ship water to some islands in the Ha'apai group (WFP, 2012, p. 18).

The impact of climate change on the risk of drought is unclear. 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).

⁸ El 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. (Australian Bureau of Meteorology and CSIRO, 2014, pp. 347-348).

2. Vulnerability and impacts

2.1. Economic profile

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 [United Nations Development Programme], 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, 2019, p. 18). Remittances (see section 3.3) were equal to 41% of GDP in 2018 (World Bank, 2020b). Eighty-six percent of households 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, 2015, p. 34). The services sector, including commerce, trade, tourism, public services, and finance, contributes approximately 60% of GDP⁹ 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, 2020b). 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 Travel & Tourism Council, 2020). Agriculture and tourism are both particularly vulnerable to natural hazards (PCRAFI, 2015, p. 6).

Figure 3: Tonga GDP annual change

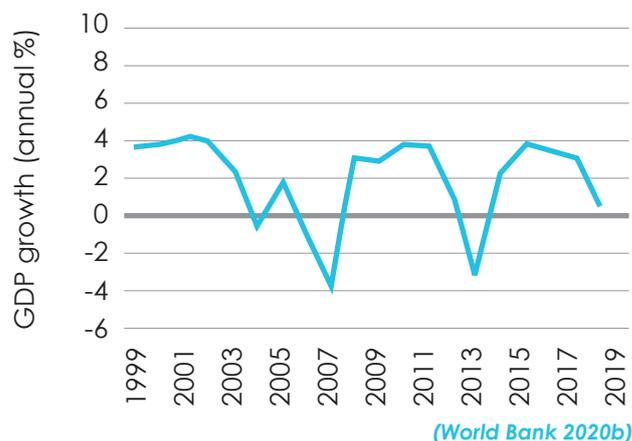
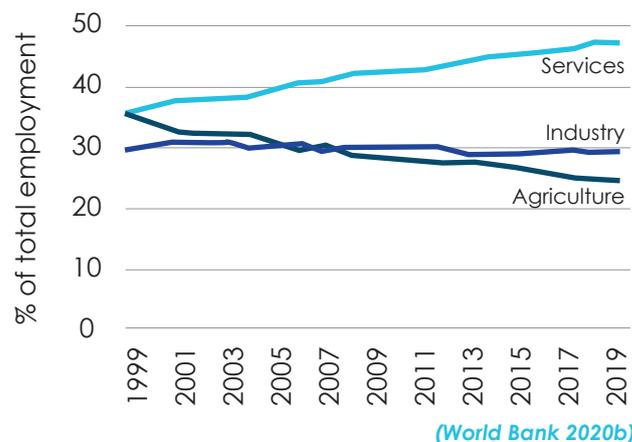


Figure 4: Tonga employment by sector



⁹ 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%.

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 2015-2016 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).

Table 1: Main activity conducted in the last seven days (ages 15 or older), according to the 2015-2016 Household Income and Expenditure Survey

	Males	Females
Employer	1%	0%
Self-employed	2%	3%
Employed in the public sector	10%	7%
Employed in the private sector	24%	12%
Producing goods for own consumption	28%	17%
Unpaid family worker in a business	7%	2%
Unpaid family help with basic household duties	0%	0%
Volunteer worker	1%	0%
Student	14%	14%
Homemaker	8%	38%
Non-working	5%	5%

(Tonga Statistics Department, 2017b, p. 192)

2.2. Agriculture and fisheries

Agriculture is the dominant economic activity in Tonga, but it is largely subsistence or semi-subsistence¹⁰ in nature with limited commercial-scale activity (Government of Tonga, 2018b, p. 42; MAFFF [Ministry of Agriculture, Food, Forests and Fisheries], 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 in the country. (World Bank, 2020b). About 86% of households engage in some form of agricultural production (including handicraft production), but only 5% of these do

¹⁰ Subsistence is defined 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).

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 finfish 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).

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 (9.9% of GDP) to 129.3 million (13.1% of GDP) (Kingdom of Tonga, 2018a, p. 17; WTO, 2019, 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; the forestry sector suffered 7% of the total damage and loss (due to the vulnerability of economically valuable tree species to high winds), while livestock and fisheries were less seriously affected, suffering

3% and 2% of the total damage and loss respectively (Kingdom of Tonga, 2018a, p. 23). Approximately 30-40% of coconut trees, 70-80% of fruit trees, 90% of banana trees, and 40-50% 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, 2019, 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, 2019, p. 14). Damage to tree crops (coconuts, breadfruit, mangoes, citrus), key cash crops (mulberry, sandalwood), and pandanus¹¹ were as high as 90% (WTO, 2019, p. 14). Subsistence and commercial fisheries are also affected by cyclones, primarily through damage to boats and equipment. TC Gita in 2018 damaged subsistence fishers' fish fences¹² and approximately 40% of all fishing boats on the affected islands of Tongatapu and 'Eua (IFRC, 2018, p. 4). TC Ian was reported to have damaged virtually all fishing gear on Ha'apai island (WTO, 2019, 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, 2019, p. 14).

Climate change is expected to adversely affect agriculture and fisheries 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

¹¹ A tree whose leaves are cut into strips and used for weaving baskets, mats, and other handicrafts.

¹² 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.

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).

2.3. Tourism

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, 2019, 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, 2019, 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). Across the Pacific region, impacts of climate change are expected to include 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, which will

negatively affect tourism development (Van Der Veeken et al., 2016, p. 53). In Tonga, tourists are already concerned about natural hazards including tropical cyclones, extreme weather, and tsunamis (Van Der Veeken et al., 2016, p. 59).

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, 2019, p. 14), but the impacts of TC Gita on tourism were expected to be short-term, with tourist arrivals and revenues slightly reduced in 2017-2018 but expected to return to normal the following year (Ministry of Finance and National Planning, 2018, p. 17).

2.4. Commerce and manufacturing

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, 2019, 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, 2019, 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 2016-2017 (Ministry of Finance and National Planning, 2018, p. 17; WTO, 2019, 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 leaves and is vulnerable to natural hazards and climate change (Government of Tonga, 2018a, p. 7).

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).

Exports of handicrafts in 2014-2015 accounted for approximately TOP 4 million (0.5% of GDP) (Government of Tonga, 2018b, p. 42).

TC 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 3.5 below) (Government of Tonga, 2018b, p. 51).

2.5. Housing and settlements

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% are built 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 standards (IFRC, 2016, 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 et al., 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).

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 and they have less access to social protection schemes, and they have limited savings and 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 [International Labour Organization], 2019, p. 4; SPC, 2018, p. 108; Utz, 2017, p. 90; Wehrhahn et al., 2019, p. 60).

The effects 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 et al., 2018, p. 4). The monetary value of damage to assets and losses to economic production does not sufficiently 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, 2019, p. 12).

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, 2019, 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, 2019, 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).

2.7. Gender

Worldwide, women and girls are disproportionately vulnerable to the effects of natural hazards and climate change (Bogdan et al., 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, financial resources and other economic assets, and basic rights (Utz, 2017, p. 90; Vincent et al., 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 at risk of being sold as a negative coping strategy (Bogdan et al., 2019, pp. iv–v; ILO, 2019, 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 (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, 2019, 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). In Tonga, groups identified as being particularly vulnerable to the impacts of TC Gita because of limited resources, particular needs and challenges, limited economic or social support networks, and in some cases, discrimination, included people living with disabilities, the elderly or widowed or those with chronic illnesses, young children, pregnant or breastfeeding women, female heads of households, single mothers (particularly those with a large number of dependents), and people with diverse sexual orientations and gender identities (CARE, 2018, pp. 5–6).

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). They also have increased tendencies 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).

Table 2: 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 labor) • Malnutrition • Sexual and gender-based violence during and after disasters 	<ul style="list-style-type: none"> • Mortality risks among men with heroic behavior 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 disaster 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 and 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 (risk of sexual harassment) • Rural women and women without access to resources • Women living in low-lying 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)

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' goodwill 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).

Gender-based violence in Tonga is widespread and is likely to be exacerbated by natural hazards.

In a 2009 survey, 45% of women reported that they had experienced physical, sexual, or emotional violence from an intimate partner, and 19% reporting physical and/or sexual violence in the 12 months preceding the survey (Jansen et al., 2012, p. 40). Violence against women and children is prosecuted and a 'no drop' policy¹³ 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 lighting¹⁴ 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 toilets and sleeping facilities, separation of children from family members, and a lack of support services (CARE, 2018, p. 5; IFRC, 2018).

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 impact 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;

¹³ 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).

¹⁴ 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).

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).

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 Tonga, 55% of the population is under 25 years old and 19% are aged 15-24 years¹⁵ (Tonga Statistics Department, 2017a, p. 10). 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 the Pacific Community], 2015, pp. 5–6, 18–19). There is, however, 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).

Figure 5: Tonga youth population (ages 15-24) as a percentage of total population

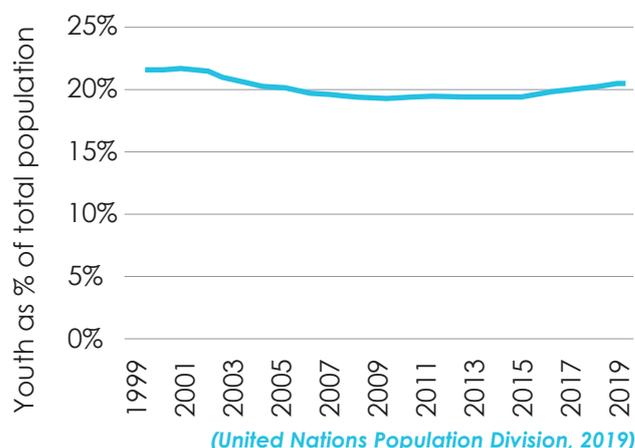
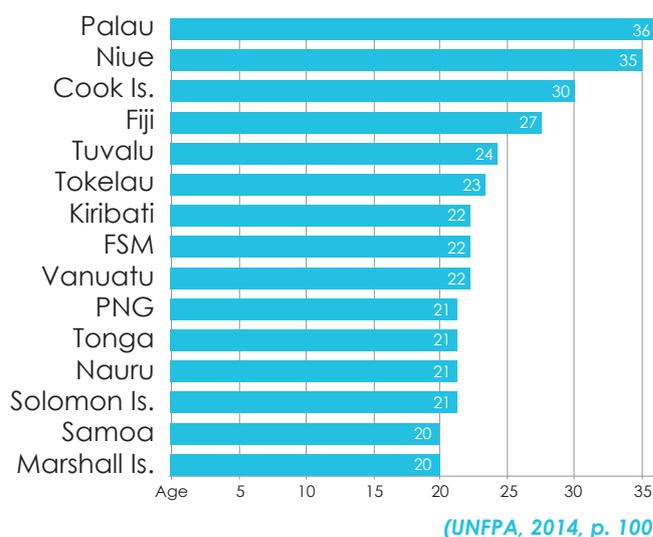


Figure 6: Median ages for Pacific region countries



¹⁵ Tonga also uses a national definition of youth that spans ages 15 to 34 years, which includes about one third of the total population (Tonga Statistics Department, 2019, p. 7).

2.8.1. Education

Globally, 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 crises, and many do not return (Barber, 2014, p. 11).

In Tonga, cyclones have damaged schools and disrupted education provision, but there appears to be no evidence available about the resulting outcomes for students. Although 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 et al., 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, 2018, 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, 2018, 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, 2019).

2.8.2. Employment

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, 2019, 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 crises 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).

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, 2020b). 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).

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).

3. Coping mechanisms

3.1. Types of coping mechanisms

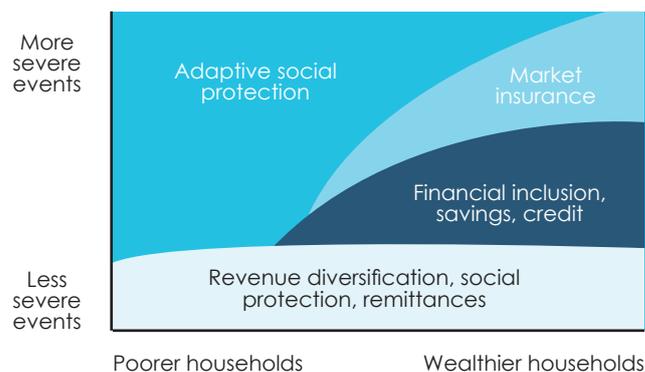
The **Global Facility for Disaster Reduction and Recovery** outlines four broad types of financial mechanisms for helping households cope with disaster risk (Hallegatte et al., 2017, pp. 11–13):

- **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 to 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.

3.2. Adaptive social protection

Scaling up social protection schemes quickly by providing cash payments or vouchers to people affected by humanitarian crises is increasingly common worldwide (Idris, 2017a, pp. 1–2; Save the Children and ACAPS, 2018, p. 12). Experience has shown that cash-based response is efficient and effective. It enables recipients to identify and prioritize their own needs, it supports dignity of recipients, it can be more timely and flexible than other types of assistance, and it supports the recovery of local

Figure 7: Financial coping mechanisms



(Hallegatte et al., 2016, p. 2017, pp. 11-13)

Two other disaster resilience mechanisms that are particularly relevant are:

Migration, including rural-urban migration, international migration, and the relocation of entire settlements, is also a widely used adaptation strategy 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).

markets (Fabre, 2017, p. 3; 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).

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; Save the Children and ACAPS, 2018, p. 12). Lessons learned after TC Pam (2015) and TC Winston (2016) demonstrated some of the weaknesses of in-kind aid, including the challenges of dealing with unnecessary or inappropriate donations, which delayed distribution of relief and imposed costs for storage and disposal: half of the food items sent to Vanuatu, for example, were expired by the time they were accessed and had to be destroyed (WTO, 2019, p. 2). 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).

Tonga's social protection programs are limited by regional standards. The Asian Development Bank's Social Protection Indicator¹⁶ 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 programs¹⁷: 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 cash payments of TOP 75 per month (approximately USD 33) (Government of Tonga, 2018b, p. 33). There are also two contribution-based pension schemes, the Retirement Fund Board (RFB) scheme for central 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).

¹⁶ ADB'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).

¹⁷ A 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, 2020a, p. 1).

3.3. 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 et al., 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 et al., 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 also take the form of goods and commodities – for example, non-perishable food, water, clothing, and footwear were priority items collected for Tonga after TC Winston (Pairama & Le Dé, 2018, p. 335). However, sending cash is often considered to be more useful than sending goods: in one study of migrants in New Zealand collecting goods to send to various Pacific islands in response to disasters, half of the donated goods were unusable or unnecessary, an experience which is supported by other studies (Pairama & Le Dé, 2018, p. 336). It is unclear how well remittances support disaster *preparedness*: some authors argue that there is good evidence that remittances have substantially

contributed 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 (Connell, 2015, p. 140), while other 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 be destabilizing by causing inflation and creating moral hazard (Ebeke & Combes, 2013).

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 et al., 2017, p. 15). For example, in Samoa, remittances following a tsunami in 2009 and TC Evan in 2012 were used to rebuild housing, recover agricultural production, and rebuild community facilities (Le Dé, Gaillard, & Wardlow, 2015, p. 3). 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 recent evidence suggests that migration has become cheaper and more accessible, and that remittances have contributed to reducing income inequality (Connell, 2015, p. 139; Le Dé, Gaillard, & Wardlow, 2015, p. 2).

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 world¹⁸ (World Bank, 2020b). Remittances are the main source of foreign exchange inflows, and are more reliable than exports (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, 2019, 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 (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 Connell, 2015, pp. 138–139). There is evidence from Tonga 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

Figure 8: Remittances received in Tonga



(World Bank, 2020)

impact on the relative wealth of households that receive remittances compared with those that do not (Brown et al., 2014, pp. 446–448).

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 Tonga. Remittances contribute to poverty alleviation and wealth creation, and “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 (Connell, 2015, p. 140; WTO, 2019, pp. 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, 2019, pp. 12–13). However, data on exactly how remittances are used during disasters do not appear to be available. This is generally true across the Pacific: most research on remittances has looked at their impacts on development, but very little work has been done on the role of remittances in disaster resilience (Campbell & Warrick, 2014, p. 31).

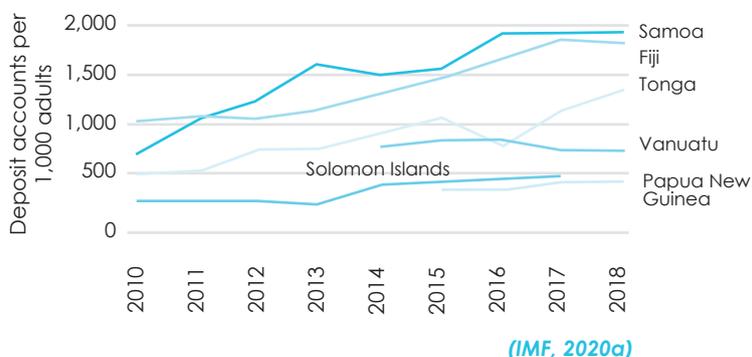
¹⁸ Followed by Haiti at 38.5%; no other country exceeds 30% (World Bank, 2020).

3.4. 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 et al., 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 from villages in Thailand, for example, showed that financial inclusion was more helpful for smoothing consumption in the face of income shocks than financial support from relatives, at least when smaller sums of money were involved (Kinnan & Townsend, 2012, pp. 291–293). 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).

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 is 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

Figure 9: Number of deposit accounts with commercial banks per 1,000 adults



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 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). The dominant 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 (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). Even for receiving overseas remittances, mobile money services have not yet captured significant market share from traditional money transfer services: 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). 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).

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, and 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 and experience of 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, 2018, 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 payments¹⁹ after TC Gita, suggesting that there is potential for financial inclusion to play a larger role (Hahm et al., 2019; Hobbs & Jackson, 2016).

¹⁹ Payments 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).

3.5. Insurance

Worldwide, insurance is recognized as an important tool for managing risks associated with natural hazards (Le Quesne et al., 2017, p. 11), **but the Pacific region is “one of the least insured regions in the world”** (Leith & Subramanian, 2013, p. 9). The insurance penetration rate²⁰ 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, 2018, p. 18).

In Tonga, the majority of 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, 2015, 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, 2015, p. 16).

Insurers only cover properties with an engineer's certification of compliance with cyclone wind loads (PCRAFI, 2015, 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, 2015, 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, 2015, p. 15), although relevant legislation was being drafted as of 2019 (National Reserve Bank of Tonga, 2019, p. 23). 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 et al., 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).

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, 2015, p. 33). However, the 2009 tsunami which destroyed 31% of all houses on the island of Nivatoputapu 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, 2015, 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

²⁰ An indicator of insurance industry development, calculated as the ratio of total insurance premiums to GDP.

only 70 insurance claims have been made, totalling an estimated USD 660,000 (1% of the total damage), also due to the low levels of insurance coverage (PCRAFI, 2015, 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).

3.6. Migration and relocation

Globally, 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 through the generation of remittances, reduced population pressures, and the transfer of 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 (Melde & Laczko, 2017, p. 86). However, studies consistently show that there is psychological or political resistance to climate change-related migration, with many economic, social, cultural, and psychological costs associated with both internal and international relocation, including risks such as loss of tradition, language, identity, livelihoods, and community cohesion (Campbell & Warrick, 2014, pp. 3, 24).

Migration is a well-established and deliberate strategy in Tonga for seeking economic opportunities for both skilled and unskilled workers (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, 2019, 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 (Connell, 2015, pp. 153–154).

Relocation of settlements at extreme risk due to natural hazards is 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). Across the Pacific, particular risks relate to land, including loss of identity, culture, family ties and community, and conflict and governance issues around customary land rights (Boege, 2011; Campbell, 2010; cited in Campbell & Warrick, 2014, p. 24). In most cases, except perhaps where communities have already experienced severe coastal erosion or flooding due to subsidence, residents typically resist suggestions of relocation and prefer in-place adaptation and sustainable management practices (Beyerl et al., 2018, p. 26; Connell, 2012).

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 (Connell, 2012, pp. 134, 136; Kingdom of Tonga, 2019, p. 100). Some low-lying islands in Tonga do not have the option of relocation because of their small size and limited land availability (Kingdom of Tonga, 2019, p. 118).

3.7. Community-based support

Community-based informal coping mechanisms are a common way to reduce risk in rural and poor communities (Germanwatch, 2020, p. 5; UNDRR, 2019, p. 14). 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. 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 may be overwhelmed by large-scale, long-term, or frequent events (Germanwatch, 2020, pp. 5–13).

Table 3: Strengths and weaknesses 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)

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 et al., 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).

4. Conclusions

4.1. Hazard, exposure, and vulnerability

Tonga is highly exposed to natural hazards, with cyclones regularly damaging property and causing long-term cumulative economic harm.

Tropical cyclones are the principal hazard affecting Tonga, although the country is also exposed to earthquakes, tsunamis, flooding of low-lying areas, and droughts (Kingdom of Tonga, 2019; PCRAFI, 2015; WFP, 2012). Climate change is expected to exacerbate weather-related hazards (Kingdom of Tonga, 2019).

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, 2019, 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, 2019, 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 Veeken 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, 2019, 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).

Natural hazards disproportionately affect poor people, workers in the informal economy, women, and youths.

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 [International Labour Organization], 2019, p. 4; Wehrhahn et al., 2019, p. 60; World Bank, 2017a, p. 90). 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, 2019, pp. 9–10) and Tonga has high levels of informal and vulnerable employment and subsistence economic activity (ILO, 2019, p. 4; Tonga Statistics Department, 2017a, pp. 10–14). In Tonga, gender inequality is a significant challenge, and women and girls are often excluded from decision-making roles, unable to own land, limited in economic opportunities, and suffer high levels of gender-based violence (CARE, 2018; Tonga Statistics Department, 2017a). Women are active in the informal economy, leading small and micro-enterprises and small retail shops, and making handicrafts (CARE, 2018; Government of Tonga, 2018a), which rely on locally available natural resources such as pandanus leaves which are vulnerable to natural hazards and climate change (Government of Tonga, 2018a, p. 7). Cyclones have damaged schools and disrupted education provision (Anderson et al., 2019, p. 54; IFRC, 2018, p. 4; Kingdom of Tonga, 2018a, pp. 40, 77), but there appears to be no evidence available about the resulting outcomes for students. 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). Natural hazards contribute to the under-development of the economy (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

and causing some short-term disruptions following specific disasters, do not appear to be available.

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.

Social protection schemes that are able to rapidly scale up in crisis situations can support the immediate needs of people affected as well as longer-term reconstruction. Tonga has used its existing social protection system to deliver emergency cash payments following

TC Gita (Government of Tonga, 2018b, p. 26), and has delivered cash-for-work programs as part of recovery efforts following the Niuatoputapu tsunami in 2009 and TC Ian in 2014 (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).

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 cost of sending remittances in the Pacific region is high by global standards, and many authorities have called for costs to be reduced, particularly during and after crises (Bettin et al., 2014, p. 17; 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 authorities recommend offering training to migrants and to recipients of remittances to encourage greater use of remittances for longer-term investment, including encouraging recipients to deposit funds in financial institutions to accumulate savings (Ebeke & Combes, 2013, p. 2252; Jayaraman et al., 2011, p. 538; Le Dé, Gaillard, Friesen, et al., 2015, p. 6). 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). In Tonga specifically, several observers argue that financial education campaigns could help encourage alternatives to traditional money transfer operators, such as mobile money services (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):

- Optimize 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.

Tonga has a moderate level of financial inclusion by regional standards, and some experience using cash transfers to support disaster resilience.

Globally and across the Pacific region, various experts recommend continuing to promote greater access to and use of financial services including developing more access points, agent networks, digital payment platforms, and mobile money (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). In Tonga specifically, 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).

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

Demand for insurance products could potentially be increased through public awareness and financial literacy campaigns (Schaefer & Waters, 2016, p. 99) and increasing access to financial services including developing channels such as mobile phones (ADB, 2018, 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, 2018, 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). In Tonga, as there is currently no national regulator for the insurance industry, establishing one is seen as a priority (PCRAFI, 2015, 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).

Migration is a well-established and deliberate strategy in Tonga for seeking economic opportunities for both skilled and unskilled workers (Connell, 2015). Globally and across the Pacific region, various authorities argue that migration should generally be supported and managed, and integrated into environmental, climate change, and urban planning policies (Campbell & Warrick, 2014, p. 30; Melde & Laczko, 2017, pp. 87–89, 93). There is a 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, and the links among climate change, adaptation options, and migration policy, and gender implications are of particular concern (Campbell & Warrick, 2014, p. 30; Melde & Laczko, 2017, pp. 89–92). 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 (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 (Connell, 2015, p. 175). 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. (Connell, 2012, pp. 134, 136; Kingdom of Tonga, 2019).

Informal coping mechanisms are a common way for communities to manage risk, especially in rural and poor communities, and 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). To support community resilience, traditional practices should be valued and the systems sustaining the mechanisms should be protected (UNDRR, 2019, p. 14). Policy interventions can, in principle, complement community mechanisms, but these are likely to be highly context-dependent (Takasaki, 2015, p. 75). 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.

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This publication is brought to you by the United Nations Capital Development Fund (UNCDF) as part of its foundational work under the Pacific Insurance and Climate Adaptation Programme being implemented jointly with the United Nations University, Institute for Environment and Human Security (UNU-EHS) and the United Nations Development Programme (UNDP). Brian Lucas is the author of this literature review report.



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