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FINANCIAL TOOLS FOR SMALL-SCALE FISHERS IN MELANESIA

COMPONENT 1: CLIMATE RISK REVIEW – FIJI

About this document

This desktop assessment forms part of Component 1 of the GEF* project, 'Financial Tools for Small-Scale Fishers in Melanesia,' executed by WTW in collaboration with the World Wide Fund for Nature (WWF). The goal of this desktop assessment is to understand how fishing communities in Fiji are exposed to critical climate and disaster risks. This review summarises the relevant climate and geophysical hazards, their impacts on communities and their ability to cope and adapt. Collectively, these considerations, alongside other data gathered through other project activities, will inform the development of an insurance product that supports fishing communities' resilience to climate risks while protecting the ecosystems on which they depend.

* This project is supported by the GEF through the Challenge Program for Adaptation Innovation, with funds from the Least Developed Countries Fund (LDCF) and Special Climate Change Fund (SCCF). This publication was co-funded by the Global Environment Facility. Its contents are the sole responsibility of the authors and do not necessarily reflect the views of the GEF Secretariat.

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Definitions and Acronyms

Definitions

The following definitions are drawn from the Intergovernmental Panel on Climate Change (IPCC), where available.

Climate risk: The potential for adverse consequences for human or ecological systems. In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human or ecological system to the hazards. (IPCC)

Climate hazard: A physical process or event (hydro-meteorological or oceanographic variables or phenomena) that can harm human health, livelihoods, or natural resources (World Bank)

Geophysical hazard: A physical process or event that can harm human health, livelihoods, systems, or natural resources (World Bank)

Exposure: The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected. (IPCC)

Vulnerability: The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt. (IPCC)

Disaster risk: The likelihood over a specified time period of severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery. (IPCC)

Adaptation: In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects. (IPCC)

Adaptive capacity: The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities or to respond to consequences. (IPCC)

Acronyms

ECMWF	European Centre for Medium-Range Weather Forecasts
EEZ	Exclusive Economic Zone
ENSO	El Niño-Southern Oscillation
IPCC	Intergovernmental Panel on Climate Change
LMMA	Locally Managed Marine Area
NASA	National Aeronautics and Space Administration
NDMO	National Disaster Management Office
NOAA	National Oceanic and Atmospheric Administration
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
PCRIC	Pacific Catastrophe Risk Insurance Company
PICTs	Pacific Island Countries and Territories
PNG	Papua New Guinea
SPCZ	South Pacific Convergence Zone
SPREP	South Pacific Regional Environment Programme
SST	Sea Surface Temperature

Executive Summary

Introduction

Climate change is already affecting the Melanesian region disproportionately through rising temperatures, sea-level rise, flooding, coastal erosion, an increase in extreme weather events, coral reef bleaching, and ocean acidification.

The Pacific frequently experience tropical cyclones and flooding causing an average annual direct loss of USD 284 million.[1] With a combined population of fewer than 10 million people, annual losses are the highest in the world per a capita basis. As global warming continues, climate-related hazards such as tropical cyclones and extreme rainfall, are predicted to intensify. Over time, chronic climate hazards that manifest slowly, such as sea level rise, and the consequent increase in frequency and severity of high tide and storm surge inundation, will have a more significant impact. For low-lying atolls across Fiji and PNG, and many coastal communities on the main islands, even a small rise in sea level will have huge consequence in terms of loss of land, and other impacts such as saltwater intrusion. Additionally, the effects of marine heatwaves and ocean acidification are contributing to the deterioration of marine ecosystems that serve as crucial habitats for fish and other marine invertebrates. According to the IUCN, ocean warming is expected to have a significant impact on fishery yields and the distribution of fish stocks, particularly for small-scale coastal fisheries.[2] In Fiji and PNG, coastal communities are reliant on fish for livelihood and dependent on fish for protein, with estimates indicating that fish provide up to 90% of animal protein intake in rural areas and 40–80% in urban areas.[3] Thus, climate-related hazards threaten the lives and livelihoods of coastal communities leading to their increased vulnerability.

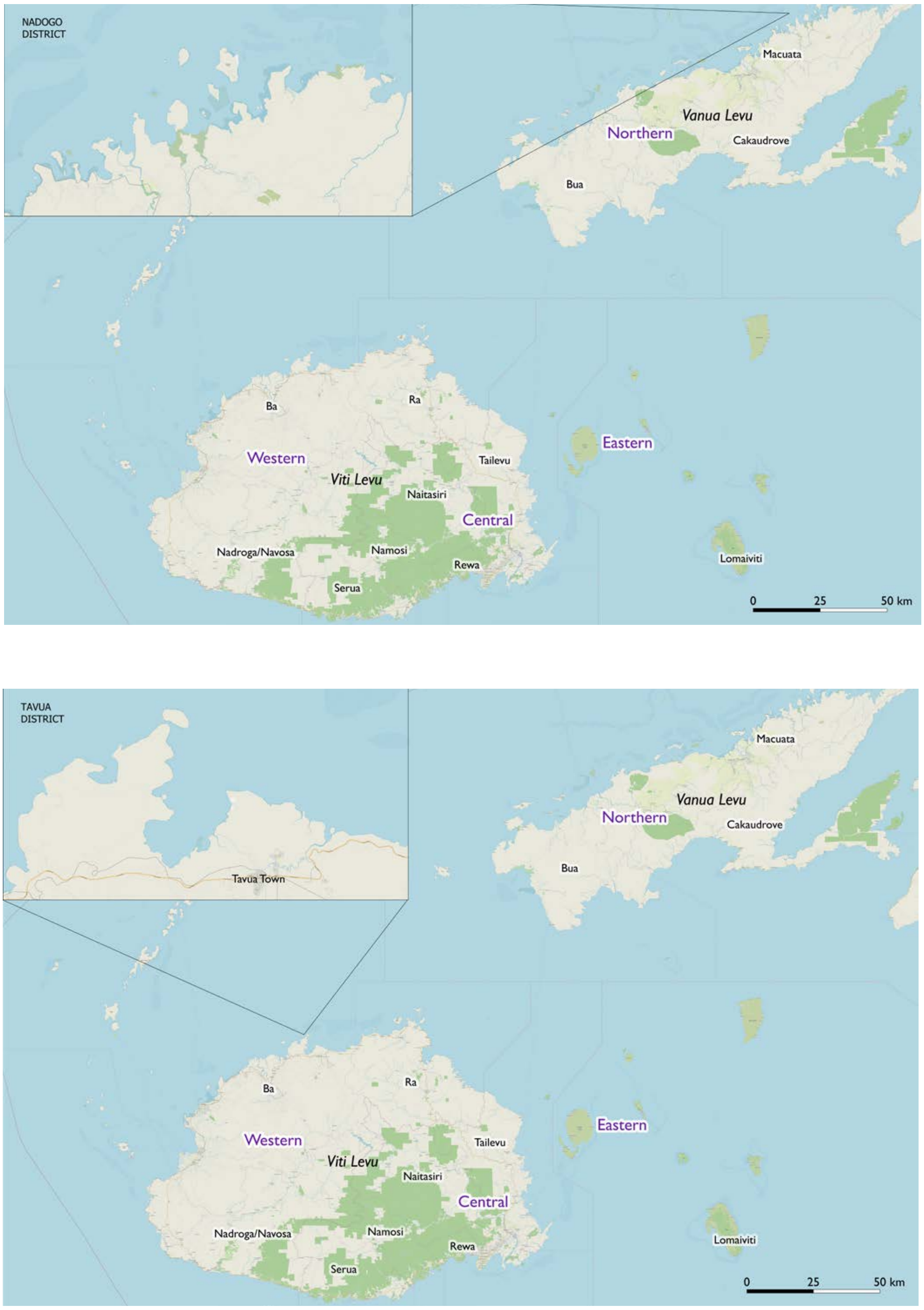
For this project, Fiji and PNG were selected as they are exceptionally vulnerable to the impacts of climate hazards. This desktop assessment focuses on Fiji, taking into account the two communities of interest to the project, and aims to understand how fishing communities are exposed to and impacted by climate hazards. This report begins by providing an overview of climate hazards that have historically impacted Fiji, although it is to be noted that records of historical impacts were incomplete and may not accurately reflect future risk. It then summarises the exposure and vulnerability factors relevant to the target communities, and the existing disaster response and financing mechanisms used, at both a community level and government level.

[1] Brown et al., 2014. Evaluating ecosystem-based adaptation for Disaster Risk Reduction Fiji. Available at: https://library.wmo.int/index.php?lvl=notice_display&id=16468#.ZEEEUs7MKUk

[2] IUCN, 2016: D. Laffoley and J.M. Baxter, (eds), "Explaining ocean warming: Causes, scale, effects and consequences", Gland, Switzerland: IUCN (2016). 456 pp: http://dx.doi.org/10.2305/IUCN.CH.2016.08.en

[3] Farmery et al., 2020. Aquatic Foods and Nutrition in the Pacific. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7761396/

Figure 1: Map of Fiji indicating the two focus sites



What are the main climate hazards impacting Fiji?

The table below provides a summary of the main climate hazards and climate change impacts relevant to Fiji.

Hazard	Description	Data Sources
Flood	**Occurrence:** Rainy season of November to April. Particularly severe during negative ENSO years. **Climate Change Impact:** Some inconsistencies in modelling. Extreme rainfall is projected to increase. Tropical cyclone-associated rainfall is projected to increase. **Key Events:** 2009 (Tropical Depression 04F), 2012 (2 floods linked to tropical depressions and TC Evan), 2016 (linked to TC Winston)	Fiji Meteorological Service NASA Global Precipitation Measurement ECMWF ERA5
Drought	**Occurrence:** Mainly shorter, seasonal droughts, rather than multi-year events. 80% of meteorological droughts since 1920 are associated with positive ENSO years. **Climate Change Impact:** Unclear. Climate models differ in their projections because of insufficient data and understanding of changes in rainfall variability during dry season. **Key Events:** 1987, 1992, 1997/98, 2003, 2010	Fiji Meteorological Service NASA Global Precipitation Measurement ECMWF ERA5 NOAA Standardised Precipitation Index (SPI) NASA Normalised Difference Vegetation Index (NDVI) / Enhanced Vegetation Index (EVI) and Evapotranspiration (ET).
Disease	**Occurrence:** Vector-borne and waterborne diseases are often associated with wet conditions and high temperatures. Dengue fever has often occurred alongside negative ENSO years. **Climate Change Impact:** Increases in temperature, extreme rainfall, and severe tropical cyclones may increase the risk of outbreaks. **Key Events:** 2016 (typhoid fever associated with TC Winston)	N/A

Sea Level Rise	**Occurrence:** Between 1992 and 2009, the sea level in Fiji has increased by 5.5 mm per year, twice the rate of the global average. This amplifies the effects of storm surge and has already led to relocation of communities. **Climate Change Impact:** Additional 7 cm rise from 2008 levels projected by 2050 under an RCP 8.5 emissions scenario, and 4 cm in an RCP 4.5 scenario.	Pacific Sea Level Monitoring Project gauges.
Tropical Cyclone	**Occurrence:** Fiji has significant exposure to tropical cyclones. These occur during the South Pacific cyclone season of November-April. **Climate Change Impact:** Climate change projections show a decrease in the frequency of tropical cyclones; however, the proportion of severe tropical cyclones is expected to increase, and cyclone-associated rainfall. **Key Events:** 1979 (TC Meli), 1993 (TC Kina), 2016 (TC Winston), 2020 (TC Yasa)	IBTrACS Fiji Meteorological Service NOAA
Rising Sea Temperatures/Ocean Acidification	**Occurrence:** Between 1982 and 2019, a total of 82 marine heatwave events have occurred in Fiji, with a typical duration of 5 to 40 days. **Climate Change Impact:** Ocean acidification and SST will continue to increase, resulting in damage to coral reefs and ecosystem disruption reducing the availability of fish stock. **Key Events:** 2011, 2016	NOAA Coral Reef Watch NOAA OISST NASA GISTEMP Pacific Sea Level Monitoring Project gauges
Temperature Changes	**Occurrence:** Hot days occur primarily during the rainy season of November to April. **Climate Change Impact:** Fiji is projected to be 1.2 to 1.9°C warmer in a 2°C warmer world. In the next twenty years, hot days (defined as being over 35°C) will become twice as frequent.	Fiji Meteorological Service

Understanding the key assets and livelihoods exposed and how communities are impacted

Formal analysis of the exposure and vulnerability of Pacific Islands is currently lacking. Studies estimate, however, that 91% of Fiji's total population lives within 10km of the coast, which is key to understanding their significant exposure to climate hazards and ocean-related threats. In 2010, PCRIC estimated the total replacement cost of buildings, infrastructure and crops to be 22.2 billion USD. In addition to physical capital, natural capital assets are also important; natural capital provides critical ecosystem services that often reduce the impact of climate hazards and are of particular importance for fisheries-based livelihoods.

Key natural assets for Fiji include over 6,700km² of coral reefs and 385km² of mangroves, providing valuable coastal protection services. Additionally, the fishing industry is Fiji's third largest natural resource sector, with a large proportion of the population undertaking subsistence fishing. Although the Ministry of Fisheries has overall responsibility for fisheries, inshore fishing is governed by the qoliqoli system and the system of Locally Managed Marine Areas (LMMAs). Inshore fisheries in Fiji are subject to substantial fishing pressure, and climate change will only amplify this, making sustainable management of fisheries increasingly important.

The IFRC Climate Centre estimates that up to 4% of the Fijian population may be pushed into poverty each year by 2050 due to climate-related disasters.[4]

The rural population, whose subsistence fishing and agriculture livelihoods are particularly at risk, is particularly vulnerable; however, alternative livelihood options are limited. Race, socioeconomic status and gender are also significant vulnerability modifiers in Fiji. The number of informal settlements in Fiji is rising, and these are often poorly constructed and more vulnerable to climate hazards. Gender norms also make women particularly vulnerable in emergency settings, with women experiencing both sexual coercion and violence in shelters and evacuation sites in the aftermath of Cyclone Winston (2016), and reduced financial resilience and access to resources to help them recover from a disaster.

What existing disaster response and financing mechanisms are there?

The Fiji National Disaster Management Plan outlines the roles and responsibilities of government agencies involved in disaster management and a National Disaster Risk Reduction Policy for 2018-2030 has also been adopted to mainstream risk reduction at every level. Despite these plans, there is currently no financing framework to support this, which limits the ability of the government to fully operationalise them. Dedicated disaster risk funds only amount to F$3 million, resulting in budget reallocations and dependence on donor funds to finance disaster response. Nonetheless, Fiji is actively engaging with the Pacific Catastrophe Risk Insurance Company (PCRIC) on the possibility of taking out an insurance policy which would provide funds upon the occurrence of a triggering tropical cyclone.

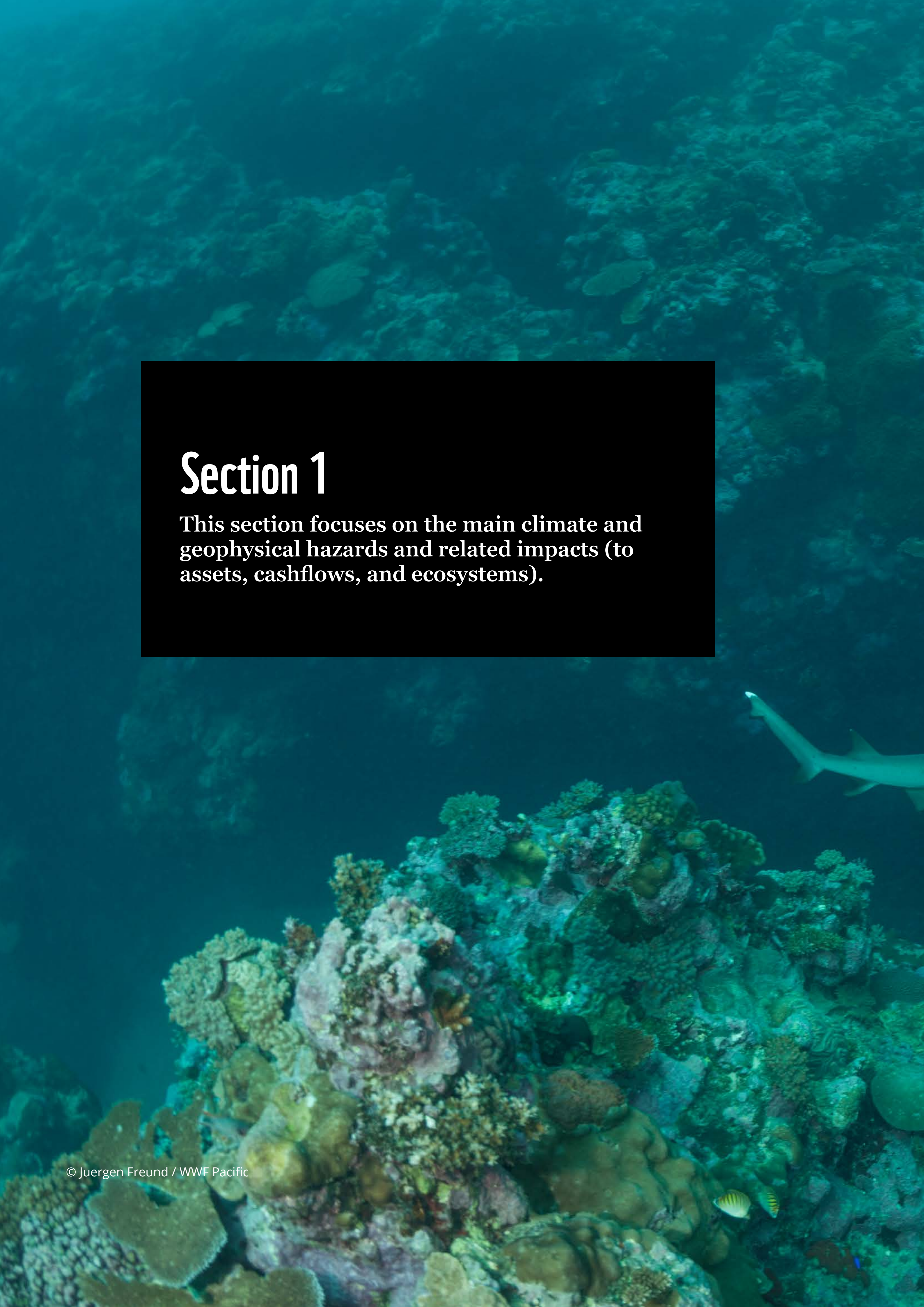
Currently, vulnerable populations are reached in the aftermath of a disaster by topping up payments from social protection schemes; however, these cannot be scaled horizontally to include people who are not normally eligible.

National bank account ownership rates are relatively high at 81%; however, these are much lower in rural communities and amongst women. Insurance penetration is also low at 15%, meaning that rural communities do not have much of a financial safety net. They do, however, undertake a range of adaptation practices including the elevation of houses in flood-prone areas, stocking up on food and water, and shifting to alternative seafood/fish in the aftermath of a flood or tropical cyclone.

Conclusion

It is clear that Fiji faces growing levels of climate risk. For fishing communities in particular, the impact on their livelihoods and the natural assets upon which they depend, will be severe. Although disaster risk management and response are relatively well institutionalised in Fiji, there is a clear lack of appropriate and readily-available government-level financing to support these communities, and a lack of financial resilience within communities themselves. Building this financial resilience is critical, and this project aims to respond to that need.

[4] IFRC and RCRC Climate Centre, *Climate Change Impacts on Health and Livelihoods: Fiji Assessment* (2021)



Section 1

This section focuses on the main climate and geophysical hazards and related impacts (to assets, cashflows, and ecosystems).

Climate Hazards

Introduction

Fiji is an archipelago state located in Melanesia. It comprises 332 islands, with the communities selected for engagement (Tavua District and Nadogo District) located on the two largest islands, Viti Levu and Vanua Levu, respectively. Fiji's climate is classified as oceanic tropical. Fiji is one of the most exposed countries in the world to climate hazards, with this only amplified by climate change, and is heavily affected by the South Pacific Convergence Zone (SPCZ) and the El Niño Southern Oscillation (ENSO) phenomenon. With 35% of Fijians living below the poverty line, addressing resilience to climate change is a key sustainable development challenge. Additionally, as subsistence agriculture and fishing are particularly important for people living below and close to the poverty line, the impacts of climate hazards on agriculture and fishing can have significant consequences for these households and easily push them below or further below the poverty line. Currently classed as an upper middle income country by the Organisation for Economic Co-operation and Development (OECD), Fiji received over USD 190 million in Official Development Assistance (ODA) in 2020.[5]

This review of the climate hazards to which the fishing communities are exposed is a key precursor to the success of an adaptation initiative. The Intergovernmental Panel on Climate Change (IPCC) Working Group II Fifth Assessment report[6] identified lack of awareness and understanding of climate change as one of the key barriers to community engagement and effective climate adaptation planning, with researchers specifically identifying Fiji as a location where this is a problem exacerbated by spiritual beliefs and traditional governance mechanisms.[7]

In this context, it is important to fully understand how climate hazards impact these communities for prioritisation of climate hazards to be addressed as part of this project, and successful engagement with the target communities.

[5] Trading Economics, https://tradingeconomics.com/fiji/net-official-development-assistance-received-us-dollar-wb-data.html#:~:text=Net%20official%20development%20assistance%20received%20(current%20US%24)%20in%20Fiji,compiled%20from%20officially%20recognized%20sources. (accessed 2 August 2022)

[6] IPCC. Climate Change 2014: *Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* (2014) Available at: https://www.ipcc.ch/report/ar5/wg2/

[7] Natasha Kuruppu, "Adapting water resources to climate change in Kiribati: the importance of cultural values and meanings". *Environmental Science & Policy*, 12.7 (2009) and Shalini Lata and Patrick Nunn, "Misperceptions Of Climate-Change Risk As Barriers To Climate-Change Adaptation: A Case Study From The Rewa Delta, Fiji", Climatic Change, 110.1-2 (2011), cited in IPCC 2018 WGII AR5

Flooding

Flooding is one of the main causes of economic damage in Fiji, with fluvial (relating to the overflow of a river, lake or stream) and pluvial (relating to extreme rainfall independent of an overflowing water body) floods[8] costing on average 2.6% and 1.6% of GDP per year, respectively.[9] It is a regular occurrence during the rainy season of November to April, with the most severe floods often occurring alongside tropical storms and cyclones. During La Niña (negative ENSO) years, flooding can be particularly severe.

Rainfall projections in Fiji are inconsistent across climate models; however, in the long term, rainfall is expected to increase due to climate change during the November to April rainy season with intensification of the rainfall band of SPCZ, and with dry season rainfall from May to October projected to decrease.[10] Extreme rainfall events with more than 50 mm of rain are projected to increase, with this being felt within the next twenty years, and especially in the coastal regions of Viti Levu during the wet season (this would therefore include one of our target areas, Tavua).[11]

At present, fluvial flooding occurs almost every wet season, with the relatively small rivers and streams in Fiji and the dramatic drops in elevation from mountainous terrain to the coast leading to rapid overflows following high intensity rainfall.

Landslide is also a major threat due to high precipitation and steep slopes. Worldwide, 25% of annual deaths from natural hazards are caused by landslide[12], making this an important hazard. In Fiji, for example, the rainfall associated with Cyclone Wally, with 900 mm of rainfall recorded in 24 hours, triggered multiple landslides in Viti Levu in 1981[13], resulting in the relocation of 21 villages.

[8] Fluvial floods occur when excess rainfall causes a river bank to overflow. Pluvial flooding is caused by heavy rainfall independent of a river overflowing and can therefore occur in areas not located near a body of water. Coastal flooding mainly occurs due to extreme tides/storm surge from tropical storms and cyclones and we therefore consider it as part of tropical cyclone risk.

[9] World Bank Climate Change Knowledge Portal, https://climateknowledgeportal.worldbank.org/country/fiji/vulnerability (accessed 29 July 2022)

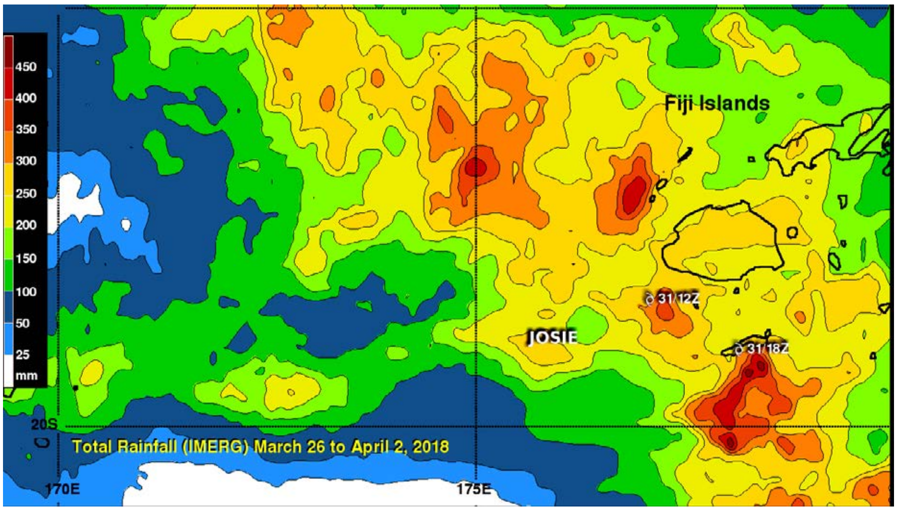
And, in 2012, intense rainfall and a landslide completely destroyed a community in Tukuraki in Viti Levu, and they were displaced for almost five years before being relocated to a new village site in 2017.[14]

With climate change, it is likely that tropical cyclones will become wetter, thus making cyclone-associated flood and landslide risk higher.

On the ground recent daily rainfall data is publicly available from the Fiji Meteorological Service. More detailed rainfall data is likely to be available by request.

Satellite 30-minute rainfall data is available from NASA's Global Precipitation Measurement on an approximately 10x10km grid. This includes cyclone-associated rainfall, with NASA having produced estimations of total rainfall accumulation from past tropical cyclones such as Ana (2021) and Josie (2018). Other satellite-based rainfall estimates are also available at lower temporal and/or spatial resolution. Hourly model-based rainfall data is also available from the ECMWF's ERA5, on a 25x25km grid.

Figure 2: Total rainfall accumulation from Tropical Cyclone Josie, NASA[15]



[10] IFRC and RCRC Climate Centre, *Climate Change Impacts on Health and Livelihoods: Fiji Assessment* (2021)

[11] IFRC and RCRC Climate Centre

[12] Marina C. Drazba, Alice Yan-Richards and Suzanne Wilkinson, "Landslide Hazards In Fiji, Managing The Risk And Not The Disaster, A Literature Review", Procedia Engineering, 212 (2018)

[13] Drazba, Yan-Richards and Wilkinson

[14] UN OHCHR, *Climate Displacement and Non-economic loss in Fiji: A Briefing* https://www.ohchr.org/sites/default/files/Documents/Issues/CulturalRights/Call_ClimateChange/Makereta-waqavonovono.pdf (accessed 8 July 2022)

[15] NASA, https://gpm.nasa.gov/extreme-weather/tropical-cyclone-josies-deadly-flooding-rainfall-examined-imerg (accessed 11 July 2022)

Drought

Drought is a frequent occurrence in Fiji and is usually linked to El Niño (positive ENSO) years, with the Interdecadal Pacific Oscillation and the Pacific Decadal Oscillation driving the multidecadal trends.[16] Currently, Fiji is mainly hit by shorter, seasonal drought, and has been spared multi-year drought events; however, droughts can affect a large proportion of the country at once.[17] Additionally, a severe drought occurred in 1997-98, affecting most of the population of Fiji and requiring the government to provide food and water to households as well as instituting a crop rehabilitation programme. This drought had a significant impact on the Fijian economy as a whole.

Lese at al.[18] note, however, that objective documentation of droughts in the Pacific Islands is limited, with little understanding of the causes and impacts of drought and reliable, long-term information on historical droughts. It is unclear how climate change is influencing and will influence rainfall variability especially in the dry season, and therefore any drought frequency projections are made with low confidence. The Red Cross Red Crescent Climate Centre notes that some projections suggest drought risk may decrease slightly in the long term[19] but climate models do differ in their projections because of insufficient data. Regardless of future trends, the existing drought risk level is already significant, and communities affected by drought are likely to be less resilient to other climate hazards.

Traditional agriculture and fisheries are more resilient to climate hazards such as drought but a shift to monoculture farming and loss of productive farming land in coastal regions has rendered this sector more vulnerable, threatening rural livelihoods and subsistence food production in Fiji.[20] The government have identified drought as an important problem to address, and are in the process of developing a Drought Management Plan. This is of relevance not only for farmers but also for outer islands which are at risk of lack of drinking water in the event of a drought.

The various datasets cited above for rainfall are also relevant for drought monitoring and evaluation, particularly when converted to an index designed to capture drought. Additionally, other optical and microwave satellite-based sensors are used to generate other drought monitoring products such as Standardised Precipitation Index (SPI), Normalised Difference Vegetation Index (NDVI) / Enhanced Vegetation Index (EVI)[21] and Evapotranspiration (ET).[22]

The Fiji Met Office calculates the 3-, 6- and 12-month SPI as an indicator of drought as part of their early warning system, listing expected impacts under each:

Table 1: Expected impacts under different SPI periods, Fiji Met Office[23]

SPI	Expected Drought Impact
3 months	Rainwater tanks, small streams, hand-dug wells, shallow bores, young sugarcane, traditional vegetables (e.g., bele), cabbage, tomatoes, beans, eggplant, okra, tomatoes, watermelon, rice, yam, taro, cassava, pastures
6 months	Small rivers, bores, streams, mature sugarcane, kumala, uvi, hybrid dalo, corn, pineapple, pawpaw, dalo, tapi, kumala
12 months	Deep bores/large aquifer system, reservoirs, dams, rivers, tapi, coconuts, breadfruit, mango, kava, banana, vudi, fruit trees

[16] Viliamu Lese and others, "Historical And Future Drought Impacts In The Pacific Islands And Atolls", Climatic Change, 166.1-2 (2021)
[17] GFDRR Fiji report
[18] Lese and others
[19] TNC 2020, cited in in IFRC and RCRC Climate Centre
[20] IFRC and RCRC Climate Centre
[21] https://climatedataguide.ucar.edu/climate-data/ndvi-and-evi-vegetation-indices-modis
[22] e.g., NASA MODIS MOD16A2 operational product
[23] Fiji Met Office Early Action Rainfall Watch, https://www.met.gov.fj/index.php?page=climateOutlooks#July%202022ear2022.07.12%20 16.31.34.pdf. (2022)

Disease

Vector-borne diseases are highly sensitive to changing climatic conditions. Dengue fever is the main vector-borne disease posing a threat in Fiji, with eight major outbreaks in Fiji in the past 50 years, seven of which have occurred during La Niña years, characterised by wet conditions. With climate change, risk of dengue fever may increase. Water stress can increase the risk of mosquito-borne diseases such as dengue due to people storing water in containers. A study undertaken by the Government of Fiji in 2005 found that 43% of Viti Levu was at low risk of a dengue outbreak in 1990, but in a worst-case, high-emissions scenario, 45% of Viti Levu's population was projected to be at high to extreme risk of an outbreak by 2100.[24]

Waterborne diseases also pose a risk. For example, there is a high incidence of diarrhoea in Fiji, and this contributes to existing high rates of malnutrition. Diarrhoeal transmission is heavily affected by temperature and rainfall. A study by Singh et al. found that for every 1°C increase in temperature, there was a 3% increase in diarrhoea cases.[25] Outbreaks of typhoid fever have also been linked to floods, as well as cyclones, and leptospirosis risk may also increase after floods, with outbreaks documented following floods in January and March 2012.[26] After Cyclone Winston, there was an outbreak of typhoid fever through NE Viti Levu.

Communicable disease such as the recent COVID-19 pandemic, although not a climate risk, also poses a significant threat, and with increasing biodiversity loss and ecosystem degradation, pandemics such as these may become more frequent.[27] With tourism comprising around 38% of Fiji's GDP on average,[28] any reduction in tourism has severe consequences across the economy. Livelihoods can be threatened by a reduction in fish sales – due both to reduced local sales and reduced tourism – and this can leave fishers vulnerable both to the crisis itself as well as other climate hazards and shocks. One study[29] in Fiji found that 73.8% of small-scale fishers reported a reduction in sales of fish during the COVID-19 pandemic. Additionally, many women in the small-scale fisheries sector in the Pacific are engaged in seafood processing and other low-income jobs that increase their exposure to communicable disease. Boat owners reported difficulties in paying off loans on their boats during the lockdown. When fishers were asked what other work they did to bring in income when they were unable to fish, 63.3% stated that they had no other source of income.

[24] Government of Fiji cited in UNDRR, Disaster Risk Reduction in the Republic of Fiji: Status Report 2019 (Bangkok: 2019)

[25] Singh et al, 2001 cited in IFRC and RCRC Climate Centre

[26] Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery. Fiji 2017: Climate Vulnerability Assessment – Making Fiji Climate Resilient (Washington, D.C.: 2017)

[27] Odette K Lawler and others, "The COVID-19 Pandemic Is Intricately Linked To Biodiversity Loss And Ecosystem Health", The Lancet Planetary Health, 5.11 (2021).

[28] International Finance Corporation. Fiji COVID-19 Business Survey: Tourism Focus (2020)

[29] Sangeeta Mangubhai and others, "Politics Of Vulnerability: Impacts Of COVID-19 And Cyclone Harold On Indo-Fijians Engaged In Small-Scale Fisheries", Environmental Science & Policy, 120 (2021)

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Rising Sea Levels

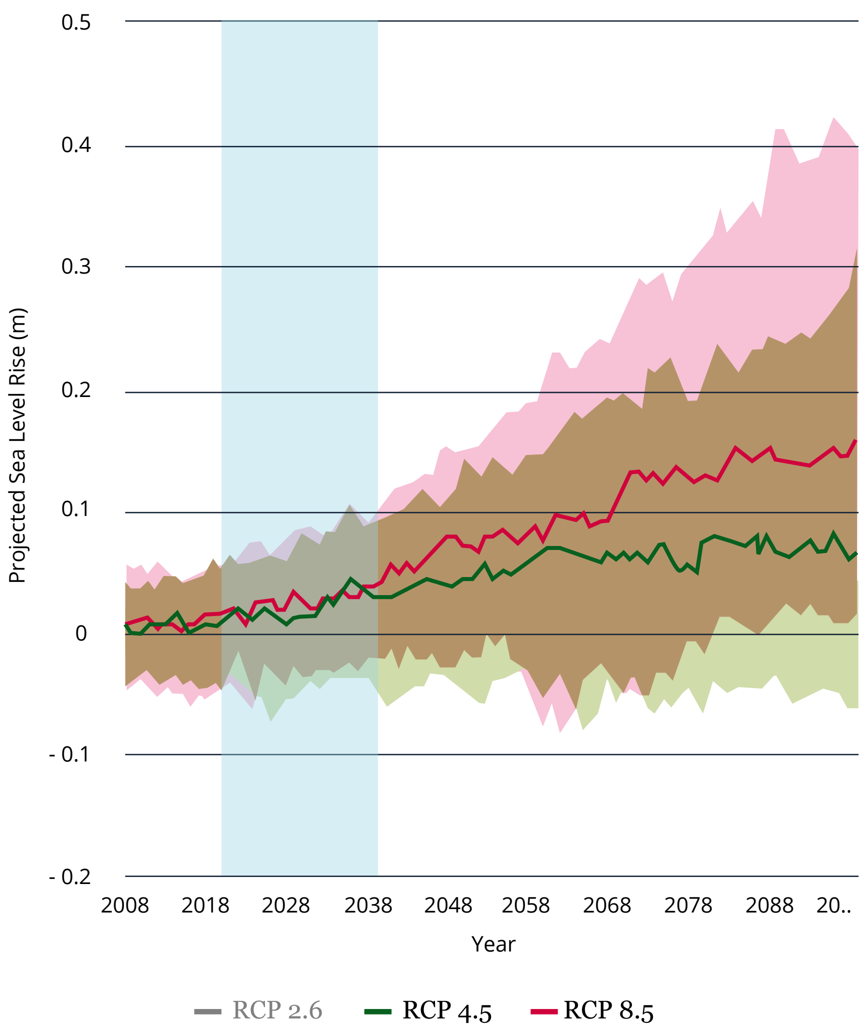
Between 1992 and 2009, the sea level in Fiji has increased by 5.5 mm per year, which is twice the rate of the global average.[30]

In 2012, the village of Vunidogoloa became the first village in Fiji to relocate due to sea level rise and associated flood risk. According to the Fijian Green Growth Framework[31], many more will follow, with 676 communities identified as being at risk of coastal land loss and 42 identified for potential relocation. The effects of climate change on Fiji's coasts are already manifesting themselves, with an additional 7 cm rise from 2008 levels projected by 2050 by the World Bank under an RCP 8.5 emissions scenario, and 4 cm in an RCP 4.5 scenario.[32]

Increases in sea level rise will amplify the impacts of storm surge and this is already being felt today. For example, a study by Strauss et al.[33] found that sea level rise had caused an additional USD 8 billion of damage (out of a total of USD 60 billion in reported economic damage) in the case of Hurricane Sandy in the US East Coast in 2012, and impacted an additional 71,000 people.

Sea level data is available from the Australian Bureau of Meteorology as part of the Pacific Sea Level Monitoring Project, both historical since 1992 and in real time. The two gauges in Fiji are in Lautoka and Suva, both in Viti Levu.

Figure 3: Projected sea level rise of coastal Fiji relative to 1980-2005 average under RCP 4.5 and RCP 8.5 emissions, World Bank[34]



[30] Wairiu et al 2021, cited in UNDRR

[31] Government of Fiji, *A Green Growth Framework for Fiji, 2014*, accessed at https://cop23.com.fj/wp-content/uploads/2018/01/GREEN-GROWTH-FRAMEWORK-Fiji.pdf (accessed 8 July 2022)

[32] World Bank Climate Change Knowledge Portal, https://climateknowledgeportal.worldbank.org/country/fiji/impacts-sea-level-rise (accessed 8 July 2022)

[33] Benjamin H. Strauss and others, "Economic Damages From Hurricane Sandy Attributable To Sea Level Rise Caused By Anthropogenic Climate Change", *Nature Communications*, 12.1 (2021).

[34] World Bank Climate Change Knowledge Portal

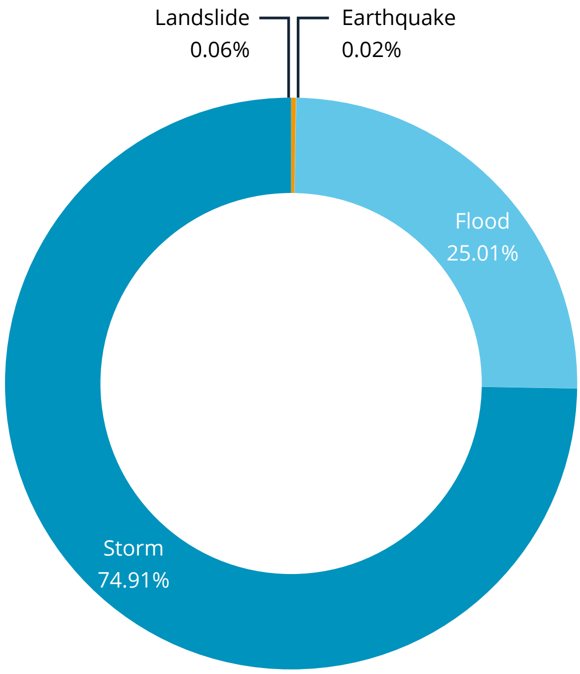
Tropical Cyclones

Fiji has significant exposure to tropical cyclones. An average of 28 cyclones per decade entered Fiji's EEZ between 1969 and 2011. Climate change projections show a decrease in the frequency of tropical cyclones; however, the proportion of severe tropical cyclones is expected to increase.[35] As a result, the average wind speed of tropical cyclones is expected to increase, as well as cyclone-associated rainfall.[36] This means that the impact on Fiji from tropical cyclones will increase, with one study finding that by 2100, losses from a 1 in 50 year tropical cyclone in Fiji could increase by as much as 27.3% in the worst case climate change scenario.[37]

Storm surge constitutes Fiji's highest displacement risk, according to the Internal Displacement Monitoring Centre, which finds that there is a 56% probability that in the next 20 years 35,000 people will be displaced as a result of storm surge in Fiji.[38] The Centre looked at disaster-related displacements in Fiji between 2008 and 2019, finding that almost three quarters of displacements were caused by a storm. Storm surge risk is particularly high on the main island of Viti Levu.

Radio broadcasts are commonly used to communicate cyclone and flood alerts; however, one study found that almost one third of respondents stated that these were unreliable, and only 22% had trust and confidence in them.[39]

Figure 4: Cause of disaster-related displacements in Fiji between 2008-2019, Internal Displacement Monitoring Centre[40]



Tropical cyclones can damage key coastal ecosystems that support fish habitats such as mangroves and coral reefs, contributing to a decline in fisheries stock as well as making access difficult for fishers. The Wildlife Conservation Society (WCS) conducted rapid in-water surveys in March 2016 following Cyclone Winston and documented significant damage to coral reefs up to 20-30 m below the surface.[41] One study[42] of mud crab fishers in Vanua Levu found that two to three months after Cyclone Winston, 52% of fishers interviewed had stopped collecting mud crabs – one third because of difficulty accessing the mangroves, 15% due to bad weather, 7% due to a temporary no-take zone (tabu) as well as other reasons such as village repairs or damage to the mud crab habitat. Of the fishers that did continue to catch mud crabs, they did note that they caught higher numbers of mud crabs before the cyclone than after and 43% said the size of the mud crabs they caught was smaller after the cyclone.

[35] Government of the Republic of Fiji, *Republic of Fiji National Adaptation Plan* (Suva: 2018)

[36] IFRC and RCRC Climate Centre

[37] Pacific Catastrophe Risk Assessment and F*inancing Initiative, Current and Future Tropical Cyclone Risk in the South Pacific,* (2013) https://www.terranova.org.au/repository/paccsap-collection/current-and-future-tropical-cyclone-risk-in-the-south-pacific-south-pacific-regional-risk-assessment/current-and-future-tropical-cyclone-risk-in-the.pdf (accessed 8 July 2022)

[38] Internal Displacement Monitoring Centre, 'Sudden-onset Hazards and the Risk of Future Displacement in Fiji' (2020) https://www.internal-displacement.org/features/pacific-displacement-fiji (accessed 8 July 2022)

[39] Anshuka Anshuka and others, "Vulnerabilities Shape Risk Perception And Influence Adaptive Strategies To Hydro-Meteorological Hazards: A Case Study Of Indo-Fijian Farming Communities", *International Journal Of Disaster Risk Reduction*, 62 (2021).

[40] Internal Displacement Monitoring Centre

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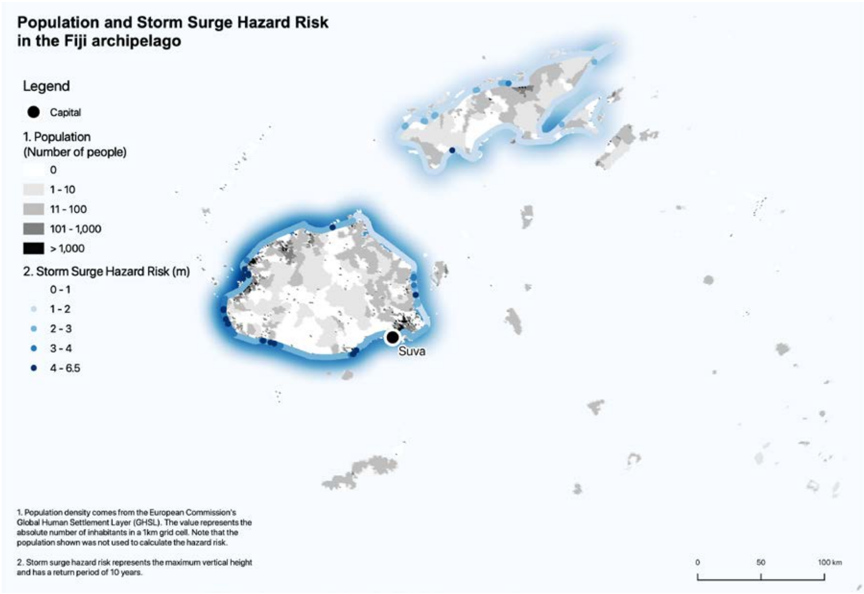
They also noted a price increase in mud crabs after the cyclone. 91% of the fishers reported that the cyclone had damaged their fishing/harvesting gear in some way. The majority of fishers reported their household had suffered from fishing losses, in terms of less seafood consumed and loss of income. 87% of fishers recognised that mangroves provided some sort of protection for their village. Reduced access to markets was noted as a barrier for some mud crab fishers. A separate study found that 35% of villages across Viti Levu and Vanua Levu stated their access to markets to sell fish was affected by Cyclone Winston.[43]

The same study also found that most villages made no changes to their management practices after the cyclone. In some cases, however, some villages opened their tabu (no-take) areas, and in other villages respondents said management practices were being ignored. Many villages did not answer questions around qoliqoli management after a cyclone.[44]

Tropical cyclones also cause property damage. In a survey following Tropical Cyclone Harold, over a quarter of fishers reported damage to fishing boats, 5% to engines, and almost 7% to homes.[45] Insurance companies in Fiji do not offer any cover for the small fishing boats, engines and gear used by small-scale fishers.[46] Two of the fishers sustained significant damage to their boats and were unable to fish for 1-2 months because they did not have the funds available to repair their boats.

[41] Wildlife Conservation Society, *Impact of Tropical Cyclone Winston on Fisheries-Dependent Communities in Fiji* (Suva: 2016)
[42] Alyssa S. Thomas and others, "Impact Of Tropical Cyclone Winston On Women Mud Crab Fishers In Fiji", Climate And Development, 11.8 (2018).
[43] Wildlife Conservation Society
[44] Wildlife Conservation Society
[45] Mangubhai and others
[46] Mangubhai and others

Figure 5: Storm surge hazard risk across Fiji, Internal Displacement Monitoring Centre[47]



The impact of tropical cyclones on Fiji's economy has been significant. The government's fiscal deficit increased from 3.8% in 2015 to 5.5% in 2016, following Cyclone Winston, which also reduced the economic growth of the country. The biggest losses from Winston came from damage to houses, but in a country where only 12% of the adult population had some form of insurance, most households had to bear the cost of rebuilding themselves.[48] This was a challenge for many, and initiatives that were put in place such as the Fiji National Pension Fund allowing members to withdraw a proportion of their pension savings early would not cover the most vulnerable parts of the population.

Tropical cyclone data is readily available. Aggregated historical storm tracks are available from IBTrACS going back to 1897, and can also be visualised on NOAA's Historical Hurricane Tracks tool. Live tropical cyclones can be monitored via the Fiji Meteorological Service.

Rising Sea Temperatures/ Ocean Acidification

As CO2 is released by burning hydrocarbons, and the lower atmosphere warms due to the greenhouse effect, the ocean absorbs both CO2 and heat. This is leading to ocean acidification slowly increasing to a concerning level, with global Sea Surface Temperature (SST) having increased by 1.09°C from 1850-1900 to 2011-2020.[49] As ocean acidification and SST continue to increase, damage to coral reefs and ecosystem disruption will result in loss of fish habitat and changes in the migration of fish species, thus reducing the availability of fish stock. There is high confidence that ocean warming will reduce the global maximum catch potential, and some areas such as the Pacific will experience three times the decrease in catch potential than the global average by 2100 under an RCP 8.5 scenario,[50] with serious consequences for fisheries-based livelihoods.

Increased frequency of marine heatwaves in the Pacific region has already been observed, although trends in terms of intensity are less evident, likely due to the start of the 21st century being marked by a substantial negative Interdecadal Pacific Oscillation causing cooler SSTs across much of the Pacific. Between 1982 and 2019, a total of 82 marine heatwave events have occurred in Fiji, with a typical duration of 5 to 40 days. The longest was 61 days in May/June/ July of 2011. One marine heatwave in 2016 had serious impacts for Fiji and caused the deaths of hundreds of fish and invertebrates, which were washed ashore on beaches in Viti Levu, and similar fish death events were observed in other Pacific islands such as Vanuatu at the same time. This 2016 event was also associated with coral bleaching along Fiji's Coral Coast of Viti Levu.[51] As climate change increases the occurrence of coral bleaching, coral reefs may be unable to recover, with ensuing consequences on fish availability, with studies conducted in Kiribati documenting declines in reef fish populations by 50% associated with heat stress and coral mortality during the 2015-16 El Niño coral bleaching event.[52] Marine heatwaves can also promote Harmful Algal Blooms, which themselves can harm fish as well as producing toxins which make fish unsafe for consumption.

[47] Internal Displacement Monitoring Centre

[48] WTO, accessed at https://www.wto.org/english/tratop_e/devel_e/study_1_pacific_country_annex_18_april_draft_final.pdf (accessed 5 July 2022)

[49] IPCC. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Inter-governmental Panel on Climate Change (2021) Available at: https://report.ipcc.ch/ar6/wg1/IPCC_AR6_WGI_FullReport.pdf

[50] IPCC 2019, cited in Neil J. Holbrook and others, "Impacts Of Marine Heatwaves On Tropical Western And Central Pacific Island Nations And Their Communities", Global And Planetary Change, 208 (2022).

[51] Holbrook and others

[52] Magel, Jennifer M. T., Sean A. Dimoff, and Julia K. Baum. "Direct and Indirect Effects of Climate Change-Amplified Pulse Heat Stress Events on Coral Reef Fish Communities," Ecological Applications: A Publication of the Ecological Society of America, 30:6 (2020).

In Fiji, reported incidences of ciguatera fish poisoning increased by 207% between 2008 and 2017.[53] These figures are likely under-reported.

A study[54] by the South Pacific Regional Environment Programme (SPREP) finds that the production of demersal fish specifically, which make up 50 to 60 percent of coastal fisheries production is likely to decrease as a result of ocean acidification due to reef habitat degradation, while the production of tuna may increase in the medium term, such that small-scale fishers are particularly affected by the effects of ocean acidification. Combined together, thermal stress and ocean acidification more negatively affect coral calcification, as high temperatures compromise corals' ability to cope with ocean acidification by elevating pH and aragonite saturation state.[55] Within Fijian maritime boundaries, aragonite saturation has already declined from about 4.5 in the late 18th century to around 3.9 by 2000.[56] With an aragonite saturation state above 4 being optimal for coral growth, this will result in slower coral growth and compromised reef structures. A negative feedback loop also exists, and research conducted in Fijian coral reefs showed that dispersing juvenile corals and reef fish were repelled by the seaweeds that colonise degraded reefs, such that a degraded reef becomes even less likely to recover.[57]

Apart from damaging habitats, research also suggests that ocean acidification alters fish behaviour, and changes the pH of the fish's blood in a condition called acidosis, which leads to changes in the fish's metabolism[58]. More research is needed to understand exactly how ocean acidification impacts fish, but research to date indicates that ocean acidification could pose a direct threat to fish survival and therefore to fish stocks.

Other ecosystems such as seagrass meadows and mangroves are actually expected to benefit from increased CO_2 and are therefore not vulnerable to ocean acidification.[59]

There is a lack of ocean acidification monitoring data in the region, however, with only three ocean acidification monitoring buoys established as of 2019 – in Palau, Federated States of Micronesia and Samoa—by the Pacific Island Countries Ocean Acidification Observation and Response Network, although more are planned, including in Fiji. Forecasts of ocean pH under different climate scenarios are reliable, however, due to high levels of understanding of the chemistry of how CO_2 affects ocean pH.

Sea temperature data is more readily accessible. The same gauges in Suva and Lautoka from which sea level information can be obtained also measure water temperature, and there are a number of other sources such as NOAA's Coral Reef Watch, NOAA's daily OISST and NASA's GISTEMP.


© Juergen Freund / WWF Pacific

[53] Holbrook and others

[54] Johanna Johnson, Johann Bell and Alex Sen Gupta. *Pacific islands ocean acidification vulnerability assessment*. (Samoa:2016)

[55] Maxence Guillermic and others, "Thermal Stress Reduces Pocilloporid Coral Resilience To Ocean Acidification By Impairing Control Over Calcifying Fluid Chemistry", *Science Advances,* 7.2 (2021).

[56] Pacific Climate Change Science (2013) https://www.pacificclimatechangescience.org/wp-content/uploads/2013/09/Fiji.pdf (accessed 15 July 2022)

[57] Danielle L. Dixson, David Abrego and Mark E. Hay, "Chemically Mediated Behavior Of Recruiting Corals And Fishes: A Tipping Point That May Limit Reef Recovery", Science, 345.6199 (2014).

[58] Smithsonian Institution, "Ocean Acidification", https://ocean.si.edu/ocean-life/invertebrates/ocean-acidification#:~:text=While%20fish%20don't%20have,blood%2C%20a%20condition%20called%20acidosis (accessed 15 July 2022)

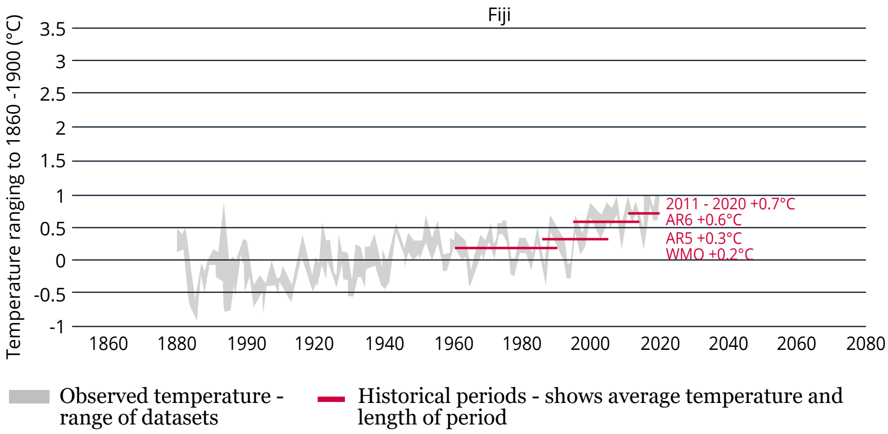
[59] Johnson, Bell and Sen Gupta

Temperature Changes

The air temperature in Fiji has been rising in recent decades, although it has been doing so at a rate less than the global average, and warming for the Pacific Islands is actually projected to be lower than the global average, with Fiji projected to be 1.2 to 1.9°C warmer in a 2°C warmer world.[60] The effects of this temperature increase will still be significant, however.

Hot days occur primarily during the wet season, and a trend of increased frequency is already observable. In the next twenty years, hot days (defined as being over 35°C) will become twice as frequent. Under a high emissions scenario, by 2100, there will be 199 more hot days per year, with warm spells potentially lasting up to 301 days, so almost an entire year.[61]

Figure 6: Average annual temperature of Fiji relative to 1850-1900, compared to four different baselines (WMO 1961-1990, AR5 1986-2005, AR6 1995-2014, and recent 2011-2020 ten-year period), Fiji Meteorological Service[62]



Non-Climate-Related Hazards

Although this project focuses on hazards that are related to climate change, it is worth also briefly mentioning Fiji's exposure to earthquakes and tsunamis, due to its location in the Pacific Ring of Fire. It is classified as a high risk country for earthquakes with an over 20% chance of a potentially damaging event taking places in the next 50 years,[63] although compared to surrounding countries, Fiji is in a relatively quieter seismic area.[64] Fiji has also experienced eleven historically recorded tsunamis.

The impacts of these geophysical hazards may be worsened by sea-level rise, which increases the proportion of the population exposed to them.[65]

NOAA has recorded five tsunamis that caused runup (pushing of water onto the shore) in Fiji – most notably, runup exceeding 1m in height following the 1953 Suva earthquake, as well as four other less significant events in 1881, 1884, 1979 and 2017.[67]

Coral reefs provide important protection to Fiji, dissipating wave energy from tsunamis.

[62] CSIRO and SPREP

[63] UNDRR

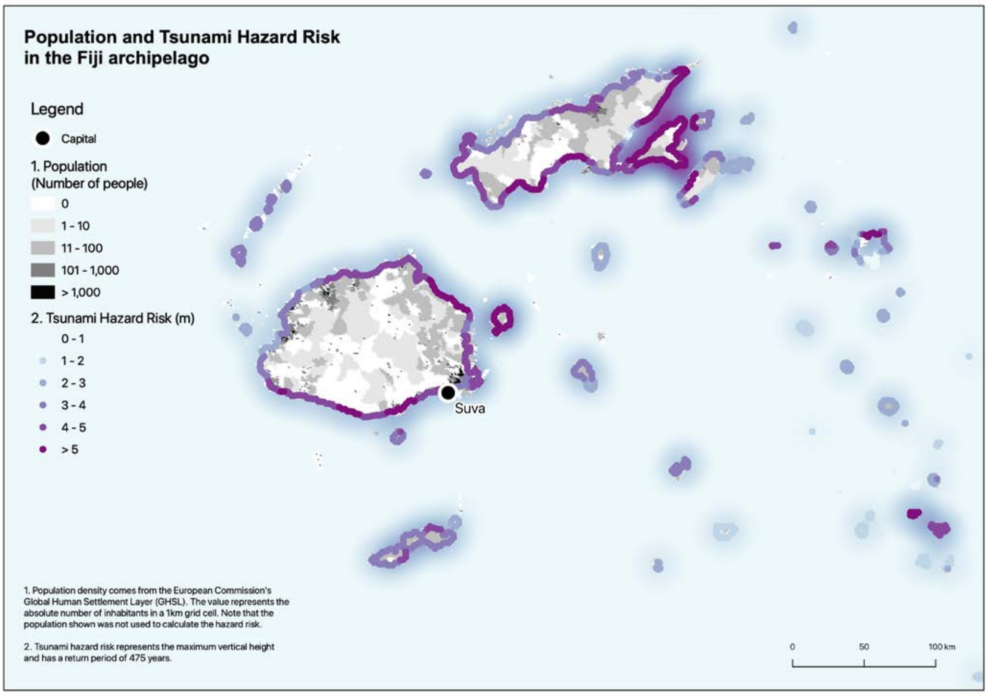
[64] WTO

[65] Internal Displacement Monitoring Centre, 'Sudden-onset Hazards and the Risk of Future Displacement in Fiji' https://www.internal-displacement.org/features/pacific-displacement-fiji (accessed 12 July 2022)

[66] Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery.

[67] Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery.

Figure 7: Tsunami Hazard Risk for Fiji, Internal Displacement Monitoring Centre[68]



Overview of Historic Events and Impacts

In this section, we look at available statistics, particularly in terms of population affected, of historical climate-related disasters. This information does not include chronic climate impacts we have highlighted in the previous section, such as ocean acidification, and we also note that historical impacts, particularly of a short and incomplete record, are not necessarily a good indicator of future impacts, particularly when climate change is taken into account. During this project, we will gather further information for hazards selected for analysis.

Tropical cyclone, manifesting through multiple hazards, is the climate-related phenomenon that impacted the most people in Fiji between 1970 and 2016, followed by drought and then flood. The most severe tropical cyclone to have affected Fiji was Cyclone Winston, which made landfall in Fiji as a Category 5 storm on 20 February 2016. Other significant cyclones include TC Kina (1993,) TC Ami (2003), TC Evan (2012) and TC Harold (2020). The Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) catastrophe risk model, which includes loss and damage from wind, rain, and coastal hazards, estimates that tropical cyclones cause an Average Annual Loss of F$152 million (equivalent to around 70 million USD). This estimate includes losses to buildings, infrastructure and the agricultural sector. On top of this, PCRAFI also estimate 17.6 million USD of emergency costs.[70]

Major floods were experienced in 2009 (Tropical Depression 04F), 2012 (2 floods linked to tropical depressions and TC Evan) and 2016 (linked to TC Winston). The 2009 and 2012 events caused the loss of 15 lives and directly impacted more than 160,000 people, with the 2012 floods causing an estimated F$71 million (equivalent to around 32 million USD) of damage.[71] Estimates based on the SSBN Global Flood Hazard Model estimate an Average Annual Loss for flooding of F$400 million (equivalent to around 183 million USD).[72] A significant proportion of this number is derived from high-frequency, low-severity flooding.

[68] Internal Displacement Monitoring Centre
[69] Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery.
[70] Pacific Catastrophe Risk Assessment and Financing Initiative, 'Country Risk Profile: Fiji', https://pcric.org/wp-content/uploads/2022/03/Fiji.pdf
[71] Pacific Catastrophe Risk Assessment and Financing Initiative.
[72] Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery.

Figure 8: Impacts of major disasters in Fiji from 1970-2016, Government of Fiji

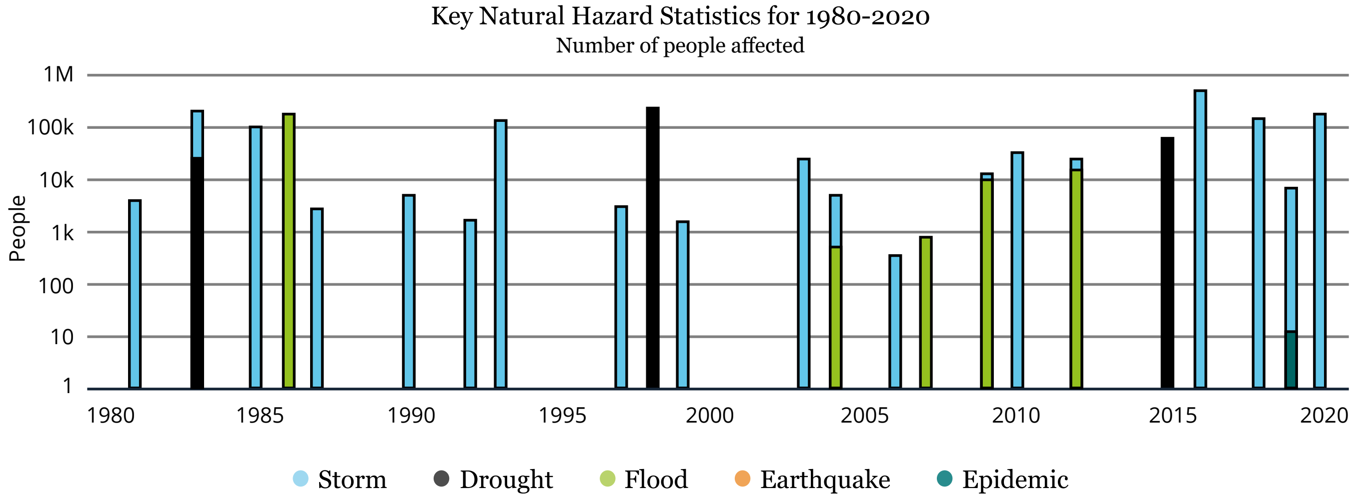
Direct impact of major disasters, 1970-2016

Disaster	Number of events[a]	Number of people affected[b]	Number of people killed
Drought	6	840,860	0
Tropical cyclone	66	1,888,490	355
Flood	44	563,310	103
Severe local storm	2	8,370	17
Earthquake	10	0	5
Tsunami	2	0	0
Total	**130**	**3,299,030**	**480**

Sources Lai Singh, and Holland (2009) using figures compiled EM-DAT, Glide, the Fiji Meteorology Service, and the National Disaster Management Office, and updated to include January 2009, January 2012, and March 2012 flood events. Tropical cyclone data are as reported bt eh Government of Fiji and include TC Tomas (2010), TC Evans (2012), and TC Winston (2016).

[a] Number includes major events only.
[b] Numbers are rounded to nearest 10

Figure 9: Number of people affected by natural hazards between 1980-2020, World Bank[73]



[73] World Bank Climate Change Knowledge Portal.

Figure 10: Historical displacement events in Fiji 2008-2019, Internal Displacement Monitoring Centre

Year	Event Name	Hazard Type	New Displacements
2009		Flood	9,400
2009	Cyclone Mick	Storm	3,845
2009	Cyclone 'Tomas'	Storm	18,000
2012		Flood	3,646
2012		Flood	15,000
2012		Storm	8,416
2014	Tropical depression	Storm	800
2016	Tropical Cyclone Zena	Storm	12,000
2016	Tropical Depression – Fuji	Storm	2,072
2016	Tropical Cyclone Winston	Storm	62,000
2017	Fiji: Magnitude – 6.9 earthquake – Fiji – 04/01/2017	Earthquake	30
2017	Fiji: Tropical Cyclone Ella – Country wide – 09/05/2017	Storm	155
2017	Fiji: Viti Levu Flood –08/02/2017	Flood	189
2018	Tropical Cyclone Keni – 09/04/2018	Flood	10,000
2018	Tropical Cyclone Josie –31/03/2018	Storm	2,313
2019	Cyclone Pola – 23/02/2019	Storm	15
2019	Tropical Cyclone Mona – 02/01/2019	Storm	2,327
2019	Landslide – Novosa – February 2019	Landslide	80
2019	Tropical Cyclon Sarai – 12/12/2019	Storm	2,490
2019	Flooding – Central Division – 22/04/2019	Storm	57
2019	Storm – Viti Levu (Veriaisi) – 07/10/2019	Storm	20
2019	Landslide – Cakaudrove (Northern Divison) – 24/04/2019	Landslide	10

These historical events highlight the importance of cyclones, floods and droughts to the Fijian population. Cyclone Winston (2016) affected 62% of the country's total population and 80% of the population lost power.[74]

[74] Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery.

Exposure

Formal analysis of the exposure and vulnerability of Pacific Islands is currently lacking, with limited data availability, approaches that are too broad, or data that is misleading. One recent study uses a mixture of census data and global datasets SEDAC-CIESIN GPWv4 and the Oak Ridge National Laboratory LandScan to estimate that, of Fiji's total population, 91% live within 10km of the coast, and 27% within 1km of the coast.[75] The fact that the majority of Fiji's population lives close to the coast is key in understanding their exposure to climate hazards and ocean-related threats. Relative to its income level, housing quality is relatively high in Fiji, with 40% of houses made out of concrete/masonry.[76]

Figure 11: Summary of Exposure in Fiji as of 2010, PCRAFI[77]

General Information:	
Total population	847,000
GDP per Capita (USD)	3,550
Total GDP (million USD)	3,009.4
Asset Counts:	
Residential Buildings	240,958
Public Buildings	8,204
Commercial, Industrial, and other buildings	16,974
All buildings	266,140
Hectares of major crops:	169,733
Cost of replacing assets (Million USD):	
Buildings	18,865
Infrastructure	3,094
Crops	216
Total	**22,175**
Government revenue and expenditure:	
Total Government Revenue	
Million USD	652.5
(% GDP)	21.7%
Total Government Expenditure	
(Million USD)	2,734.5
(% GDP)	24.4%

The above table lays out key information relevant to understanding the exposure of people and assets in Fiji. On top of these, it is also important to consider natural assets, which are often left out of countries' balance sheets but are also crucial to the economy. Key natural assets for Fiji include over 6,700km^2 of coral reefs and 385km^2 of mangroves[78], with a 2014 study by MACBIO estimating that Fiji receives F$ 2.5 billion (equivalent to USD 1.13 billion) in marine ecosystem services per year.[79] Marine tourism accounts for almost half of this figure. Coral reefs and mangroves also provide important coastal protection services, avoiding damages annually worth FJ$ 12.7 – 21.2 million (equivalent to USD 6.4 – 10.6 million) across Viti Levu and Vanua Levu, as well as forming a key source of livelihood and food security. Degradation of these natural assets due to climate change, anthropogenic factors and climate hazards could have a large impact on the economy through a reduction in tourism, fisheries provision and coastal protection (upon which both local communities and tourist infrastructure depend). Tourist activities in Fiji are largely marine-based, so declines in marine ecosystems could reduce the attractiveness of Fiji to tourists.

[75] Neil L. Andrew and others "Coastal proximity of populations in 22 Pacific Island countries and Territories," PLOS ONE, 14.9 (2019).
[76] Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery
[77] Pacific Catastrophe Risk Assessment and Financing Initiative.
[78] Gonzalez, Ricardo and others. 'National marine ecosystem service valuation: Fiji. MACBIO' (GIZ/IUCN/SPREP, 2015)
[79] Gonzalez, Ricardo and others.

Figure 12: Value of tourism in Fiji by resource, Ricardo Gonzalez and others[80]

Ecosystem	Arca	Unit value		Total value (million)	
		FJS/ha/yr	US$/ha/yr	FJS/year	US$/year
Coral reefs and lagoon	6,704 km²	1,367.3	684.52	916.66	458.9
Mangroves	38,500 ha	5,952.3	2,979.89	229.2	114.7
Coast	1,130 km	202,800.8[a]	101,527.3[a]	[b]	[b]
Coastal land	1,130 km²	2,028.0	1,015	[b]	[b]
Fiji land area	18,274 km²	627.02	313.90	[b]	[b]
Total tourism				1,145.8	573.6

[a] In $ per km per year
[b] Totals for coral reefs and lagoon and for mangroves encompass the values ascribed to coasts and coastal lands.

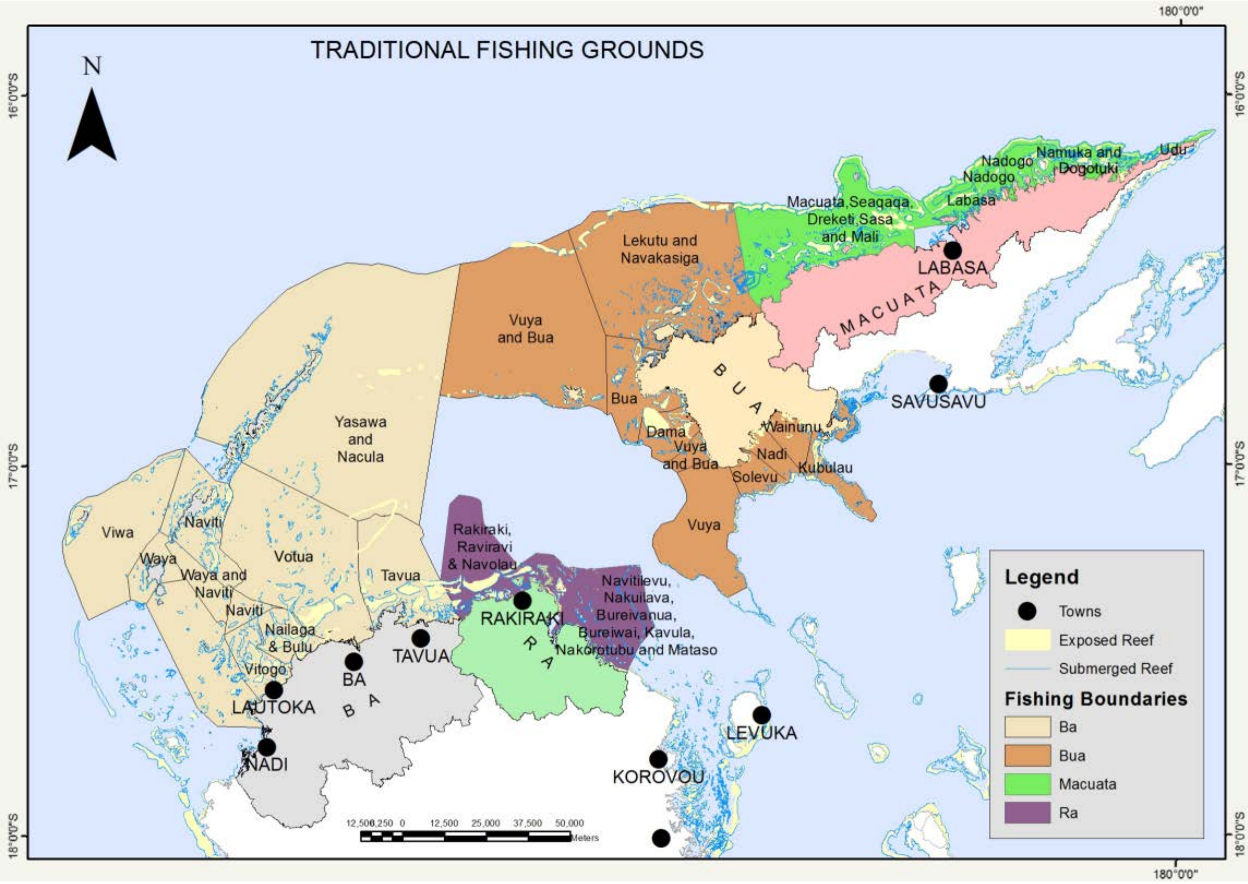
Fisheries

With an Exclusive Economic Zone of 1,290,000 km², the fishing industry in Fiji is the third largest natural resource sector in the economy, after sugar and subsistence agriculture. The annual marine catch in Fiji was estimated at 40,000 tonnes in 2015, of which 34% was tuna and other large pelagic species. The tuna industry and aquaculture remain relatively underdeveloped and uncompetitive in Fiji, but there is significant pressure on inshore fisheries. Rural communities in Fiji derive 52% of their fish consumption from subsistence fishing, underlying the importance of fishing to food security. Women and children mainly collect invertebrates such as sea cucumbers, crabs and molluscs. Based on estimates of sustainable annual production from the coral reef area, however, it will not be possible in the future for Fiji to meet forecasted fish needs for food security. Ironically, marine tourism development may actually contribute to fisheries depletion despite leading to a decline in fishery participation by providing alternative employment: to meet tourist demand for reef fish during their stay, it has been shown in Pacific SIDS that fishing efforts may actually intensify[82].

Although the Department of Fisheries has general oversight of marine resources in Fiji, it conducts little monitoring into subsistence fishing due to the qoliqoli system, which enshrines the rights of indigenous Fijians to inshore fisheries. These customary rights are held solely by indigenous Fijians, with communities following their own set of agreed rules which can include no-take areas or seasonal bans. Due to increased coastal threats and pressure on resources in recent years, a complementary system of Locally Managed Marine Areas (LMMAs) which builds on this traditional system with the aim of ensuring sustainable use of resources has also been created in the past 25 years. Fish wardens monitor fishing grounds for illegal fishing, and are sourced from within villages themselves, but sometimes have limited capacity due to a lack of resources including compensation for fuel. Tavua's LMMA is the second oldest in Fiji and prohibits the use of destructive fishing techniques such as dynamite fishing. In the Korolevu-i-wai LMMA, which includes a tourist resort, agreements have been put in place including tabu areas where no fishing is permitted, and agreements for low-impact tourism activities to take place on the reef in return for financial and technical assistance for the community such as school materials.[83] The qoliqoli system is supported by a ban of foreign fishing vessels within 12 nautical miles of qoliqolis.

[80] Gonzalez, Ricardo and others.
[81] Bell, Johann D, Mecki Kronen, Aliti Vunisea, Warwick J Nash, Gregory Keeble, Andreas Demmke, and others, "Planning the Use of Fish for Food Security in the Pacific," Marine Policy, 33 (2009), 64–76
[82] Wabnitz, Colette CC, Andrés M Cisneros-Montemayor, Quentin Hanich and Yoshitaka Ota, "Ecotourism, Climate Change and Reef Fish Consumption in Palau: Benefits, Trade-Offs and Adaptation Strategies," Marine Policy, 88 (2018), 323–32
[83] United Nations Development Programme. "Fiji Locally-Managed Marine Area Network, Fiji. Equator Initiative Case Study Series." (2012)

Figure 13: Map of traditional fishing grounds of the Great Sea Reef, WWF[84]



Country-Level Vulnerability Profile

In the disaster risk community, vulnerability is often defined as a "set of conditions and processes resulting from physical, social and economic factors, which increase the susceptibility of a community to the impact of the hazard".[85]

The vulnerability of Fijian coastal communities to climate hazards is high. The IFRC Climate Centre estimates that up to 4% of the population may be pushed into poverty each year by 2050 due to climate-related disasters.[86] This vulnerability is particularly high in the rural population, which depends on subsistence agriculture and fishing, and informal work. These livelihood options are often also impacted in the aftermath of an event, with productive assets damaged and natural resource availability reduced. Additionally, the natural capital on which these livelihoods depend is

[84] Andradi-Brown D.A., Veverka L., Free B., Ralifo A., Areki F. "Status and trends of coral reefs and associated coastal habitats in Fiji's Great Sea Reef." World Wildlife Fund US, WWF-Pacific Programme, and Ministry of Fisheries Fiji. (2022)

increasingly depleted and at risk of further depletion due to climate change. Practices such as overfishing, poor waste management and use of agrochemicals stress ecosystems which additionally also suffer from climate impacts such as ocean warming. Subsistence agriculture and thus food security will increasingly be impacted by climate change, with the medium-term impact of climate change on taro, sweet potato, yams and rice, as well as poultry, estimated to be moderate to high in Fiji.[87] Despite the fragility of these livelihoods, especially in the face of climate change, other livelihood options that may be able to provide diversification and mitigate the impacts of climate hazards are limited. Certain initiatives, however, such as Rise Beyond the Reef (which has a programme to generate income through handicrafts), are helping provide sustainable livelihood opportunities for women.

The below table summarises the status of commonly-used socioeconomic indicators through which the vulnerability of Fijians can be framed.

Table 2: Socio-economic vulnerability indicators, World Bank Open Data complemented by country-specific and disaggregated data based on availability

Indicator	Score
Human Development Index	0.741
% of population below national poverty line	24.1
GINI index	30.7
Gender Inequality Index (GII)	0.370
Global Gender Gap index	0.67
Household size	6.07
Unemployment rate	5.2%
Under five child mortality	27 per 1,000
Under five prevalence of stunting	7.5%
Proportion of seats held by women in national parliament	21.6%
Girls married under age of 18	9%

[85] Zhou, Y., Li, N., Wu, W., Wu, J. and Shi, P., 2014. Local spatial and temporal factors influencing population and societal vulnerability to natural disasters. Risk analysis, 34(4), pp.614-639.

[86] IFRC and RCRC Climate Centre

[87] Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery.

Racial dynamics are a key part of Fiji's history. There is a clear distinction between indigenous and non-indigenous groups, creating a hierarchy that dictates access to social capital and assets.[88] Fijians of Indian descent comprise the largest minority group in Fiji, and there have been tensions between them and indigenous (iTaukei) Fijians resulting in political unrest and periodic military coups. Indo-Fijians often have limited access to land, fishing grounds (which are managed by iTaukei leaders) and social security. The population is comprised of 56% indigenous (iTaukei) Fijians, 38% Fijians of Indian descent, 1.2% Rotuman, 1.8% other Pacific Islanders, and 3% other ethnicities.

There are three types of land arrangements in Fiji. Crown land is land owned by the government, native land is land owned by indigenous Fijians, and freehold land is land available for private tenure/ownership. It is common for farmers to occupy land (especially crown land) through informal arrangements, and often these comprise the lowest socioeconomic groups.[89] This can make it difficult for them to undertake adaptive actions. Relocation may not be an option due to financial constraints, and the government may not prioritise state-funded relocation of informal settlements, leaving these groups at the mercy of flooding, sea level rise, coastal erosion and saltwater intrusion. With 96,510 people living in informal settlements in 2015, 63% of the total population growth (29,720 people) in Fiji from 2007 to 2015 occurred in informal settlements.[90] In these informal settlements, households often do not have access to potable water or electricity, and can be evicted at any time. Additionally, 90% of these houses are made out of timber frame and tin/iron, and are therefore more vulnerable to climate hazards.

Gender-Specific Impacts

Many studies have shown that gender is a key determinant in how people are affected by climate hazards. In Fiji, where gender norms are still strong and enforced by societal systems, this may be even more important. Cultural norms mean that women's autonomy and ability to participate in decision-making remain limited.

Increases in violence against women and children in emergency settings is well-documented worldwide.[91] In Fiji, gender-based violence is already amongst the highest in the world,[92] and this is only exacerbated by disaster/emergency settings.

In the aftermath of cyclones in 2012, women in relief centres reported sexual coercion and lack of privacy, and in the aftermath of Cyclone Winston, women reported experiencing violence at evacuation sites.[93] Following the 2012 floods in Fiji, financial precarity forced some children out of school with some forced to earn money through sex work.[94]

Additionally, women face different challenges in relation to financial resilience. Due to hierarchies and cultural and social norms, only 46% of Fijian women are employed or looking for work. This makes them dependent on male members of the family for coping with natural hazards. For example, women faced challenges accessing loans in the aftermath of Cyclone Winston[95] and after an extreme weather event, women do not have as many opportunities to transition out of their fisheries livelihoods as men, who have more options such as migration or alternative livelihoods due to having more education or skills.[96] Perhaps due to this lack of access to financial coping mechanisms, women are more likely to ask friends and family for assistance. Additionally, aid and assistance provided after an event may be distributed to men, with women not necessarily receiving access to this assistance.[97] This was the case, for example, after Cyclone Winston (2016), when replacement fishing gear was given to male leaders on the assumption they would distribute it fairly.[98]

88 Anshuka and others
89 Anshuka and others
90 Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery.
91 Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery.
92 UNCDF, Economic Impacts of Natural Hazards on Vulnerable Populations in Fiji (2020)
93 Sivertsen, 2016 cited in UNDRR
94 UN Women, The 2012 Fiji Floods: Gender Sensitivity in Disaster Management https://www.unisdr.org/preventionweb/files/52742_fjif-lunwomen2012gendersensitivity.pdf (accessed 29 July 2022)
95 Thomas and others
96 Thomas and others
97 United Nations University Institute for Environment and Human Security, '5 Facts on gender equality and access to disaster risk finance in Fiji' https://ehs.unu.edu/news/news/5-facts-on-gender-equality-and-access-to-disaster-risk-finance-in-fiji.html (accessed 29 July 2022)
98 Wabnitz, Colette C.C. and others, "Gender Dimensions of *Ocean Risk and Resilience in SIDS and Coastal LDCs", Ocean Risk and Resilience Action Alliance Report* (2021)

Women are key to the resilience of communities, however, often holding much traditional knowledge and offering crucial contributions to the sustainable management of natural resources such as mangroves.[99] In one study[100] of indigenous communities in Ba Province, it was noted that women hold more information about plants, freshwater and marine life and the nutritional or medicinal value of natural resources. This knowledge can enhance ecological resilience if women are able to participate in resource management. Additionally, human and social capital form key pillars of resilience in the Pacific,[101] in a context where culture and community are so important, and it is often women who have the most social capital as well as recognising the importance of resilience to be able to support their family. An interviewee in the Ba Province study stated: “Only a woman can understand the stress and tension that comes after the natural disaster. Even our husbands do not understand the economic pressure upon us and find it easy to yell at us when things are not functioning properly.” [102]

Despite women’s efforts to contribute to financial resilience by diversifying income and engaging in income-generating activities such as selling seafood or farming, the same study found that the men’s focus group expressed views that women should not be working as this formed a distraction from their domestic duties, and with men as dominant decision-makers, this can limit women’s ability to undertake these activities. With the help of the Fijian Micro and Small Business Grant Scheme, however, two women in the village were operating a small bakery and a grocery shop.

To not consider the role of women is therefore to overlook a key component of sustainable resource management, livelihood and resilience to climate impacts. Women are often the first to predict and respond to a crisis, yet they are excluded from planning and response. In the 2012 floods, women in Nadi were the first to raise the alarm of rising waters as they were the first of the household to get up in the morning.[103]

[99] Jasmine Pearson, Karen E. McNamara and Patrick D. Nunn, “Gender-Specific Perspectives Of Mangrove Ecosystem Services: Case Study From Bua Province, Fiji Islands”, Ecosystem Services, 38 (2019).

[100] Priyatma Singh, Tammy Tabe and Tess Martin, “The Role Of Women In Community Resilience To Climate Change: A Case Study Of An Indigenous Fijian Community”, Women’s Studies International Forum, 90 (2022).

[101] Warrick et al 2017 cited in Singh, Tabe and Martin

[102] Singh, Tabe and Martin

[103] UN Women

Section 2

What existing mechanisms are there to respond to and address climate and disaster risk, both at sovereign level and community level?

Existing Government-Level Response and Financing Mechanisms

At an administrative level, Fiji is divided in Northern, Eastern, Central and Western divisions, which include 14 provinces supported by Provincial Councils. The Ministry of iTaukei Affairs is in charge of governance of iTaukei villages.

The Fiji National Disaster Management Plan outlines the roles and responsibilities of government agencies involved in disaster management. A National Disaster Risk Reduction Policy for 2018-2030 has also been adopted to mainstream risk reduction at every level, and is aligned with the Sendai Framework as well as Fiji's Natural Disaster Management Act of 1998, which governs disaster risk reduction in Fiji and established the National Disaster Management Office (NDMO).

Of relevance also, the Fiji National Climate Change Policy (2018-2030) provides a comprehensive strategy for addressing climate change in Fiji, including measures to adapt to the impacts of climate change, reduce greenhouse gas emissions, secure financing, strengthen governance and coordination, and monitor and evaluate progress towards achieving climate change goals. The plan was followed by the promulgation of the Climate Change Act Fiji, a legal framework that was passed by the Fijian Parliament in 2021. The purpose of the Act is to provide a legal basis for the development and implementation of policies and strategies to address climate change in Fiji.

The National Disaster Risk Reduction Policy introduces the Disaster Management Plan, which provides guidance on how to manage disasters in Fiji. It covers the following key areas:

- Hazard Analysis: The plan provides a hazard analysis of Fiji, including information on the types of hazards that may occur, their likelihood, and their potential impact on communities.
- Preparedness and Response: The plan outlines procedures for preparing for and responding to disasters, including the activation of emergency operations centres, the mobilization of resources and personnel, and the establishment of evacuation centres

- Recovery and Reconstruction: The plan provides guidance on recovery and reconstruction efforts following a disaster, including assessing damage and losses, developing recovery plans, and supporting affected communities.
- Risk Reduction: The plan emphasizes the importance of risk reduction efforts, such as improving building codes and land use planning, strengthening infrastructure, and enhancing community preparedness.
- Communication and Coordination: The plan emphasizes the importance of communication and coordination among stakeholders, including government agencies, NGOs, and communities, to ensure effective disaster management.
- Monitoring and Evaluation: The plan includes a framework for monitoring and evaluating the effectiveness of disaster management efforts.

Noting limited coping capacity to natural hazards in Fiji, the Policy aims to increase the resilience of communities to disasters in an inclusive manner, and acknowledges that the participation of women is critical in the management of climate and disaster risk and that it is important to overcome the increased vulnerability of women and girls through the explicit consideration of gender in in disaster risk reduction. There is also a Cyclone Support Plan which details procedures for preparedness and response to a cyclone. This is the only hazard in Fiji for which there is an operational plan.[104]

The NDMO conducts disaster preparedness and management trainings, as well as community-level awareness work and disaster risk mitigation measures such as seawalls. When there is an event, they manage the disaster response and are responsible for setting up the National Emergency Operations Centre. Disaster risk governance responsibility primarily falls to the national government, although local government and communities are expected to contribute and supplement. In the immediate aftermath of an event, response can be challenging due to difficulties accessing many of the more remote communities, especially those living on small islands. Access to fresh water was a serious concern for many affected communities following Cyclone Winston (2016).

Despite these plans, there is currently no financing framework to support this. [105] Government budget reallocation and dependence on donors and borrowing are normally needed after a severe event. This limits Fiji's ability to operationalise its disaster risk management plans, and this challenge is acknowledged in the National Disaster Risk Reduction policy.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[104] Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery.
[105] Insuresilience Global Partnership, 'A Strategic Approach to Layered Climate and Disaster Risk Financing Solutions in Fiji,' https://annualreport.insuresilience.org/government-of-fiji/ (accessed 15 February 2023)

Figure 14: Roles of organisations in disaster risk governance under the Fiji National DDR Policy

Disaster Risk Governance			Organisation		
			National Gov.	Local Gov.	Commu-nity
Framework	Legal Framework	Consolidating legal systems and instruments			
Framework	Policy and Plan	Mainstream DRR intro stragetic planning and development plans	◎	○	
Institutional Arrangement	Risk Communication	Strengthening institutional capacities for risk communication including information sharing and dissemination	◎		
Institutional Arrangement	Coordination and Collaboration	Strengthening institutional capacities for information sharing among departments and egional alliances	◎	◎	◎
Institutional Arrangement	Coordination and Collaboration	Strengthening collaboration mechanisms among the regional alliances and relevant departments	◎	○	
Institutional Arrangement	Risk Evaluation and assessment	Strengthening monitoring and evaluating system for hazzards and disaster risks	◎	○	
Institutional Arrangement	Risk Evaluation and assessment	Strengthening Disaster Loss and Damage Assessment (DLDA) and Post Disaster Needs Assessment (PDNA)	◎	○	○
Institutional Arrangement	Risk Evaluation and assessment	Strengthening Evironmental Impact Assessment (EIA) and Land Use Regulation	◎	○	○
Institutional Arrangement	Capacity Development	Integrating national resources, institiutional capacities and technical expertise	◎	◎	
Institutional Arrangement	Capacity Development	Strengthening capacity building for government staff and stakeholders to manage DRR	◎	○	○
Management of DRR Measures	Financing and Investing	Strengthening institutional mechansims for finacing and investing in effective DRR measures and its compliance	◎	○	
Management of DRR Measures	Integration of DRR Measures	Strengthening integrated arrangements for reducing the underlying risk factors in various sectors for the advancement of sustainable development	◎	○	○
Management of DRR Measures	Management of DRR Measures (Preparedness)	Strengthening institutional mechansims for disaster preparedness for effective response including structural and non-structural measures	◎	◎	○
Management of DRR Measures	Management of DRR Measures (Emergency Response)	Strengthening institutional mechansims for emergency/consequence management	◎	◎	◎
Management of DRR Measures	Management of DRR Measures (Recovery and Reconstruction)	Strengthening institutional mechansims for recovery and reconstruction management to respond to post-disaster situation	◎	◎	○

(random order)

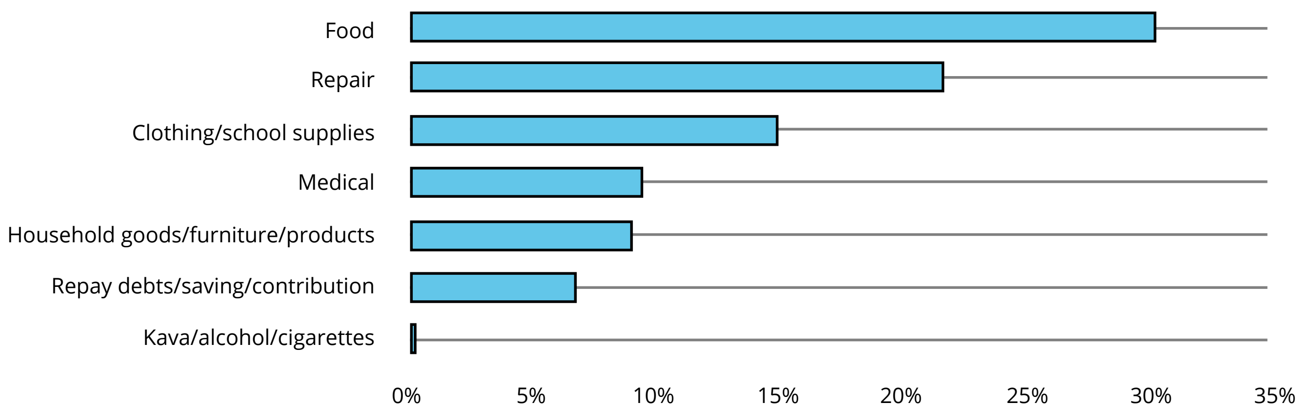
(Legend symbol) ◎ **major role**
○ **secondary role**

Funding is available from the Government Fund, the Prime Minister Relief Fund/National Disaster Relief and Rehabilitation Fund (of F$1 million (equivalent to USD 450,000) for immediate humanitarian response after a disaster, in contrast to F$ 32 million of humanitarian assistance required after Cyclone Winston (2016), the Contingency Fund (of F$5 million (equivalent to USD 2.26 million) for recovery after a disaster, in contrast to F$216.3 million needed for the recovery programme after Cyclone Winston[106]), the Operational Fund and the Fiji National Provident Fund. Social funds being provided to communities to enhance community assets are under consideration under the National DRR Policy for 2018-2030, as are other programmes such as a disaster recovery and reconstruction subsidy programme, a disaster relief programme at the post-disaster stage to assist people disproportionately affected and reduce poverty, a collective relocation subsidy programme for residents in hazardous areas, a funding loan programme to support disaster victims via the central bank, a disaster protection programme to support livelihoods and productive assets, a disaster moratorium programme for repayment of loans and taxes, a disaster insurance programme, and strengthening of the existing Contingency Fund and Prime Minister Relief Fund.

In 2012 and 2013, having exhausted the dedicated disaster risk funding mechanisms (the National Disaster Relief and Rehabilitation Fund and the Rehabilitation Fund, which only currently amount to F$3 million[107] and which there is a 57% chance that Fiji would exceed in any given year[108]), the government had to reallocate F$ 24 million (equivalent to USD 12.8 million) from the national budget to finance disaster response for Tropical Cyclone Evan which hit Fiji in December 2012.

The government has been working to strengthen resilience and the social protection system has been a priority to reach vulnerable populations through the Poverty Benefit Scheme, the Care and Protection Allowance, and the Social Pension Scheme (which all include a food voucher programme), as well as investments into making infrastructure more resilient. These schemes can be scaled up after a shock event, as was the case with Cyclone Winston in 2016, when in collaboration with World Food Programme (WFP), the food voucher scheme was topped up, and the Department of Social Welfare provided housing vouchers to assist low-income families in rebuilding. Existing beneficiaries of the programmes mentioned received top-up payments equivalent to three months of their regular benefits. This was spent as follows:

Figure 15: Spending of top-up assistance after TC Winston, Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery.



[106] Asian Development Bank, "The Enabling Environment for Disaster Risk Financing in Fiji" (2019)

[107] Mansur, Aisha, Jesse Doyle, and Oleksiy Ivaschenko, "Social Protection and Humanitarian Assistance Nexus for Disaster Response: Lessons Learnt from Fiji's Tropical Cyclone Winston" (Washington, D.C., DC: World Bank, 2017)

[108] Pacific Catastrophe Risk Assessment and Financing Initiative.

These social protection schemes cannot currently easily be scaled to include people who are not eligible in normal times but may require extra support after a shock event. Such households would therefore require support from a different channel. Additionally, negative impacts are often compounded by the remoteness of many rural communities as well as the remoteness of Fiji itself from neighbouring countries.

PCRIC

To date, Fiji has not yet purchased an insurance policy from the Pacific Catastrophe Risk Insurance Company (PCRIC). PCRIC, a regionally dedicated insurance company, is owned for the benefit of Pacific Island Countries and Territories (PICTs), through the Pacific Catastrophe Risk Insurance Foundation (PCRIF). PCRIC's key objective is to provide disaster risk finance products, including catastrophe risk insurance for natural and climatic disasters which impact PICTs, with an aim of providing liquidity to enable governments to deliver emergency response requirements as soon as possible after a disaster. Currently, PCRIC offers tropical cyclone and earthquake products and are in the process of developing drought and excess rainfall products. At the time of writing, in April 2023, Fiji and PCRIC continue to engage on the possibility of Fiji purchasing cover in future. This policy operates under a 'modelled loss' approach, whereby when a tropical cyclone impacts a policy member country, the hazard attributes of the tropical cyclone (e.g., wind speeds) are run through a damage and loss model. If the model generates a loss, then the policy holders' terms and conditions (e.g., attachment point and limit) are applied to the loss, and if this is greater than $0, then 23% of this loss is paid to the policy holder as emergency response funding. In theory, this money can be used for anything required to help impacted communities' recovery from the immediate impacts of a tropical cyclone. As such, if Fiji were to take out tropical cyclone cover from PCRIC, during a disaster such funds could be used in the fishery sector if the model generates a pay-out and the government identify the fishing sector as a key priority area (i.e., the ultimate expenditure decision is at the discretion of the government of Fiji).

For example, when tropical cyclone Gita impacted Tonga in 2018, they received an insurance pay out from PCRIC of USD 3,528,744[109]. The acquittal report showed the expenditure of these funds were as follows:

Table 3: A summary of expenditures of a PCRIC pay out by the government of Tonga for Tropical Cyclone Gita in 2018.

Expenditure Item	Expenditure (USD)
Shelter Relief Cash Grants	2,682,402
Food Security and Livelihood (ploughing, seeds, fuel, chicks)	117,334
Fisheries Grants (maintenance of boats)	150,780
Education Cluster (fuel, bus hirage)	4,523
WASH Cluster	16,998

[109] Insurance Payout Acquittal Report to PCRIC CEO by the Kingdom of Tonga (2018).

Existing Community-Level Response and Financing Mechanisms

It is important to understand communities' resilience to climate events and ability to adapt. The impact of and ability to recover from a climate event are influenced by a range of factors including access to finance. In Fiji, however, insurance penetration is low at 15%, which means the majority of the population is uninsured when a climate event happens. For example, it is estimated that insurance claims only covered 7% of losses caused by TC Winston.[110] A survey of households after TC Evan found that most respondents coped by, in order of popularity, seeking help from relatives/friends, using savings, and relying on less preferred food options.[111] Despite national bank account ownership rates of 81%, and recent initiatives to improve financial inclusion such as the creation of a National Financial Inclusion Taskforce in 2010 and the integration of financial education into school curriculums, these rates are much lower in rural communities and amongst women (at 50%[112]), and level of savings too. This means that communities have very little in the way of a financial safety net, and depend on government assistance in the aftermath of an event, especially if friends and relatives have also been impacted. Increasing access to insurance is made difficult by construction and certification requirements that most low-income households are unable to meet. Microfinance access is limited in Fiji, and South Pacific Business Development is the main microfinance institution, having provided 57,000 loans in Fiji between 2010-2021, of which 99% were to women[113]. Microfinance is also available from some banks.

Despite a lack of access to financial instruments, communities do, however, undertake a range of adaptation practices to respond to and prepare for climate hazards. Adaptation practices in Fijian communities are heavily influenced by social and cultural norms.[114] Relocation of communities to new areas can find resistance amongst senior members of the community, who are more attached to their land than younger generations. A study by Neef et al. surveyed various households in Ba Province in Viti Levu, finding that almost half were against relocation due to cultural ties with the land, history and livelihood needs – a Fijian concept tying people to the land known as Vanua.[115] Others said they would consider relocation but could not due to a lack of land, housing and finance.

Another study[116] found that of the 30% of respondents who undertook a structural adaptive strategy, a common response to previous flood experience was for households to elevate houses on poles; however, this also makes the house more exposed to tropical cyclones. Financial constraints have been a persistent barrier to the use of structural adaptive strategies, with building houses to be resistant to floods and cyclones out of reach for most households. Social strategies are also common, particularly in those with insecure land tenure and low socioeconomic status, with the study finding about 50% of those with insecure land tenure employed some kind of social strategy including, for example, stocking up on food in advance of a disaster, sheltering livestock or supplementing household income with another type of job. One community established a community warning system where people living close to the river would keep the rest of the community informed about the water level. Neef et al. found that many households had limited ability to permanently store belongings, food and water, and some expressed a desire to store more things but could not afford it. In some villages, communal water tanks had been provided by the government or external organisations.[117]

[110] Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery.
[111] Government of Fiji, World Bank, and the Global Facility for Disaster Reduction and Recovery.
[112] Reserve Bank of Fiji, 'Fiji National Financial Inclusion Strategy 2022-2030'
[113] Fiji Times, "Institution surpasses $US200m in micro loans", https://www.fijitimes.com/institution-surpasses-us200m-in-micro-loans/ (accessed 17 February 2023)
[114] Climate Adaptation Platform, "Climate Adaptation Practices in Fiji Are Influenced by Social Norms and Cultural Values" (2021), https://climateadaptationplatform.com/climate-adaptation-practices-in-fiji-are-influenced-by-social-norms-and-cultural-values/ (accessed 12 July 2022)
[115] Andreas Neef and others, "Climate Adaptation Strategies In Fiji: The Role Of Social Norms And Cultural Values", *World Development*, 107 (2018).
[116] Anshuka and others
[117] Neef and others

Neef et al.'s study also found that households employed adaptation strategies in fishing practices. For example, some respondents shifted to crab fishing after flooding meant there were no freshwater mussels for 18 months. Their shift to alternative seafood was less profitable but allowed them to get by. Some also reported going further offshore to catch fish as they could not be found in sediment-laden nearshore zones following floods. Similar shifts were also seen in agricultural practices with households changing crop type due to flood risk.

Communal pooling methods mentioned by households in Neef et al.'s study included sharing of two-storey homes for storage and shelter, sharing of food and water, use of community boats for evacuation, and one women's financial cooperative providing microfinance to members. Households also mentioned the organisation of workshops led by external organisations on evacuation drills and preventative strategies, but noted that attendance has been low.

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About GEF

The Global Environment Facility (GEF) is a family of funds dedicated to confronting biodiversity loss, climate change, pollution, and strains on land and ocean health. Its grants, blended financing, and policy support helps developing countries address their biggest environmental priorities and adhere to international environmental conventions. Over the past three decades, the GEF has provided more than $23 billion and mobilized $129 billion in co-financing for more than 5,000 national and regional projects.

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