



Climate Adaptation
and Protected Areas
Initiative

Resilience for People, Nature and Place

CLIMATE VULNERABILITY AND
ADAPTATION PRIORITIES FOR
THE VATU-I-RA SEASCAPE, FIJI



Wildlife
Conservation
Society

The Wildlife Conservation Society (WCS) Fiji sincerely acknowledges the support and collaboration of the Provincial Offices for Bua, Cakaudroke, Ra and Tailevu. We extend our deep appreciation to the leaders and community members from across the Vatu-i-Ra Seascape whose knowledge, time, and participation were invaluable to this work.

This includes communities from:

- Bua District (Koroinasolo, Tacilevu, and Waitabu)
- Dama District (Tavulomo)
- Dawasamu (Nasinu, Nataleira, Delakado, and Natadradave)
- Kubulau (Waisa, Natokalau, Nasasaivua, Kiobo, Navatu, and Nabalabalawa)
- Nadi District (Sawani)
- Namalata (Veinuqa, Naitutu, and Davetalevu)
- Wailevu District (Natuvu, Vatulele, and Urata)
- Wainunu District (Saolo)

Report Contributors (alphabetical order):

WCS Fiji: Joelle Albert, Senimili Baiculacula, Kinisimere Batibasaga, Akanisi Caginitoba, Siriolo Dulunaqio, Apisaki Fuka, Eferemo Kubunavanua, Sesenieli Marama, Waisea Naisilisili, Akisi Nabou, Ingrid Qauqau, Mereia Ravoka, Shirignil Ram, Shudha Singh, Milika Tabua, Tarau Taga and Paul van Nimwegen.

WCS Conservation Science and Planning: Paul Elsen and Kendall Jones

MCC Sustainable Futures: Kate Duggan, Gillian Goby and Hannah Barrowman

Independent Consultant: Antonio Espejo.

This publication has been produced with financial support of the Government of Canada.

© 2026 Wildlife Conservation Society

This publication is licensed under the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) Licence. Reproduction, distribution, and adaptation for educational and other non-commercial purposes are permitted, provided appropriate acknowledgement is given to the copyright holder. Commercial use, including resale, requires prior written permission from the Wildlife Conservation Society.

DOI: doi.org/10.19121/2026.Report.P41077

Recommended citation: WCS (2026) Resilience for People, Nature and Place: Climate Vulnerability and Adaptation Priorities for the Vatu-i-Ra Seascape, Fiji. Wildlife Conservation Society, Fiji.

Front cover photo: Milika Tabua © WCS

Photo Credits: Milika Tabua, Tarau Taga, Sangeeta Mangubhai, Tom Vierus, Stacy Jupiter, Nick Hopgood

Layout by: Kate Hodge



Climate Adaptation and Protected Areas (CAPA) Initiative

The Climate Adaptation and Protected Areas (CAPA) Initiative seeks to promote nature-based solutions (NbS) to strengthen climate resilience and protect biodiversity in and around protected areas and critical ecosystems. The CAPA Initiative, funded by Global Affairs Canada, will work with local communities, traditionally underrepresented groups, women's groups, and national and local authorities in Belize, Fiji, the Greater Virunga Landscape, and the Kavango–Zambezi Landscape to implement site-specific activities that respond to the risks, vulnerabilities, needs, and priorities of local communities and ecosystems, as identified through comprehensive assessments of the climate, gender, biodiversity, and conflict contexts. The CAPA Initiative is led by the International Institute for Sustainable Development (IISD), the Wildlife Conservation Society (WCS), and the World Wide Fund for Nature (WWF).

Project partners



Funded by



Food and Agriculture Organization

The Food and Agriculture Organization (FAO) is a specialized agency of the United Nations that leads international efforts to defeat hunger. Our goal is to achieve food security for all and make sure that people have regular access to enough high-quality food to lead active, healthy lives. With 194 members - 193 countries and the European Union, FAO works in over 130 countries worldwide.

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Contents

Executive summary.....	viii
1. Introduction	1
1.1 Background	1
1.2 Purpose and scope	3
2. Country Context	5
2.1 Climate Change in Fiji	6
2.2 Fiji's natural resources	10
2.3 Nature-based Solutions	13
3. Methods	14
3.1 Approach	15
3.2 Data analysis.....	18
4. Climate Risk and Resilience Assessment – Findings.....	20
4.1 Kubulau.....	21
4.1.1 Risk (exposure and sensitivity)	22
4.1.2 Resilience and Adaptive Capacity	22
4.2 Namalata	25
4.2.1 Risk (exposure and sensitivity)	26
4.2.2 Resilience and Adaptive Capacity	26
4.3 Nakorotubu District	29
4.3.1 Risk (exposure and sensitivity)	30
4.3.2 Resilience and Adaptive Capacity	30
4.4 Dawasamu District	33
4.4.1 Risk (exposure and sensitivity)	34
4.4.2 Resilience and Adaptive Capacity	34
4.5 Dama District – Tavulomo Village	37
4.5.1 Risk (exposure and sensitivity)	37
4.5.2 Adaptive capacity/Resilience	37
4.6 Bua District - Koroinasolo, Tacilevu & Waitabu	39
4.6.1 Risk (exposure and sensitivity)	39
4.6.2 Resilience and Adaptive Capacity	39

4.7 Wainunu District – Saolo Village	41
4.7.1 Risk (exposure and sensitivity)	41
4.7.2 Resilience and Adaptive Capacity	41
4.8 Nadi District – Sawani Village	43
4.8.1 Risk (exposure and sensitivity)	43
4.8.2 Resilience and Adaptive Capacity	43
4.9 Wailevu District – Natuvu, Vatuele & Urata	45
4.9.1 Risk (exposure and sensitivity)	45
4.9.2 Resilience and Adaptive Capacity	45
5. Vulnerability Assessment of the Vatu-i-Ra Seascape	47
5.1 National Climate Vulnerability Context	48
5.2 Vulnerability across the Seascape	53
5.3 Variation within the Seascape	60
5.4 Importance of marine and coastal ecosystems	63
6. Climate Adaptation across Vatu-i-Ra Seascape	65
6.1 Community identified adaptation actions	66
6.2 Recommended adaptation responses	69
6.3 Adaptation across the Seascape	73
7. Conclusion	75
References	77
Annex A Community CRVA methods & indicators	80
Annex B Community climate risk and vulnerability assessment	88
Annex C Community fisheries risk and vulnerability assessments	96
Annex D Focal district vulnerability and adaptive capacity	104

Figures

Figure 1.1. Vatu-i-Ra Seascape Boundary (Source WCS Fiji 2025).....	4
Figure 1.2. Vatu-i-Ra Seascape Districts with Assessment sites (Source WCS Fiji 2025)	4
Figure 2.1. High integrity, climate-resilient reefs identified across Fiji.	11
Figure 3.1. Weighted mean composite scores for 19 communities in the Vatu-i-Ra Seascape (communities numbered 1-19 on the x axis)	19
Figure 4.1. Community risk and adaptive capacity within Kubulau District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)	23
Figure 4.2. Community risk and adaptive capacity within Namalata District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail).....	27
Figure 4.3. Community risk and adaptive capacity within Nakorotubu District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)	31
Figure 4.4. Community risk and adaptive capacity within Dawasamu District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)	35
Figure 4.5. Community risk and adaptive capacity within Dama District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)	38
Figure 4.6. Community risk and adaptive capacity within Bua District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)	40
Figure 4.7. Community risk and adaptive capacity within Wainunu District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail).....	42
Figure 4.8. Community risk and adaptive capacity within Nadi District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)	44
Figure 4.9. Community risk and adaptive capacity within Wailevu District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail).....	46
Figure 5.1. National distribution of climate vulnerability across Fiji's 182 administrative districts.	48
Figure 5.2. National distribution of composite climate exposure across Fiji's 182 administrative districts. ...	49
Figure 5.3. National distribution of composite adaptive capacity across Fiji's 182 administrative districts. ..	50
Figure 5.4. Climate exposure, adaptive capacity, and climate vulnerability scores for a subset of districts.....	51
Figure 5.5. Probabilistic coastal inundation maps for selected communities corresponding to the 100-year return period under a +0.75 m sea-level rise scenario, including existing mangrove coverage.....	57
Figure 5.6. Maps of the contribution of mangrove ecosystems to coastal inundation reduction for selected communities.....	58
Figure D.1 Summarised risk and adaptive capacity indicators used in pictorial diagrams (Figure 4.1 to Figure 4.7)	105

Tables

Table 4.1.	Risk and resilience summary for Kubulau	24
Table 4.2.	Risk and resilience summary for Namalata	28
Table 4.3.	Risks and resilience summary for Nakorotubu.....	32
Table 4.4.	Risks and resilience summary for Dawasamu	36
Table 5.1.	Climate vulnerability indices and national ranking for Vatu-i-Ra Seascape districts.	52
Table 5.2.	Drivers of Vulnerability across the Seascape.....	59
Table 5.3.	Vulnerability across the Seascape Districts	62
Table 6.1.	Existing and proposed adaptation response across the Seascape.	67
Table 6.2.	Comparison of community adaptation actions with this Seascape assessment, categorised broken down by district.....	70

Executive summary

This report presents the first seascape-wide Climate Vulnerability Assessment (CVA) for Fiji's Vatu-i-Ra Seascape. It integrates multiple lines of evidence to provide a comprehensive understanding of climate risks, vulnerabilities, and resilience and is designed to support decision-making that strengthens community resilience, safeguards livelihoods and sustains ecosystem integrity.

The assessment draws on three primary information sources: (i) community-level vulnerability assessments across 20 communities through the Climate Adaptation and Protected Areas (CAPA) project; (ii) fisheries-focused assessments in 10 Bua Province fishing communities supported by FAO; and (iii) spatial analysis of current and projected climate hazards. A socio-ecological framework is applied to examine how climate hazards interact with exposure, sensitivity (e.g. settlement patterns and livelihood dependence) and adaptive capacity (e.g. ecosystem health, governance, infrastructure, and access to services and finance).



Fiji faces escalating climate risks, particularly from cyclones, flooding, and drought, with increasing severity of extreme events expected to amplify existing vulnerabilities. Across the Vatu-i-Ra Seascape, community vulnerability exists along a continuum shaped by the interaction of environmental exposure, ecosystem condition, livelihood dependence, and adaptive capacity. Resilience is strongest where healthy ecosystems, diversified livelihoods, effective governance, social cohesion, and access to services converge. In contrast, the most vulnerable communities experience overlapping pressures, including ecosystem degradation, economic dependence on climate-sensitive resources, and limited capacity to adapt.

Ecosystem condition emerges as a critical determinant of resilience across the Seascape. Coral reefs, mangroves, seagrass and coastal forests play a pivotal role in reducing wave energy, limiting coastal erosion and buffering flood impacts, while also sustaining fisheries and other ecosystem services. Degradation of these systems significantly increases vulnerability. Within this context, Fiji's climate-resilient reefs – those projected to maintain ecological function under thermal stress – are especially critical for ongoing coastal protection, food security, and recovery from shocks.

Nature-based Solutions (NbS) are therefore central to effective adaptation across the Vatu-i-Ra Seascape. Safeguarding climate-resilient reefs, alongside mangroves, seagrass systems and coastal forests strengthens natural defence systems while sustaining livelihoods and cultural practices.

Combined with strengthened governance, improved infrastructure and targeted capacity building, these measures provide a clear pathway for integrated, place-based adaptation at community, district, and seascape scales, supporting long-term resilience in the face of a changing climate.



Key findings

Climate risk is already high and expected to intensify

All districts face escalating exposure to sea-level rise, coastal erosion, storm surge, inundation, flooding, cyclones, drought, rainfall variability and rising temperatures. These risks threaten ecosystems, infrastructure, food security and livelihoods across the Seascape.

Vulnerability is widespread but uneven and shaped by interacting factors

All communities face climate risks, but vulnerability is shaped by the interaction of hazards with settlement location (coastal vs inland), dependence on climate-sensitive livelihoods (fishing, coastal harvesting and subsistence farming), ecosystem condition, water security and adaptive capacity (infrastructure, services, governance and financial buffers).

Coastal and inland communities face distinct but significant risks

Coastal settlements are most vulnerable as they face the combined exposure to coastal hazards (erosion, inundation and storm surge) and rely heavily on reefs, mangroves and coastal resources for food security and income, often compounded by limited resilient infrastructure and water insecurity. While less exposed to coastal hazards, inland communities face growing risk from drought, rainfall variability and flooding, heat stress and freshwater shortages that undermine agricultural productivity, food systems and household water security.

Ecosystem condition is a key determinant of resilience

Healthy coral reefs, mangroves, seagrass beds, and forests significantly reduce exposure by buffering wave energy, stabilising shorelines, and supporting fisheries and livelihoods. Where ecosystems are degraded, vulnerability increases sharply.

Non-climate pressures are compounding climate impacts

Sedimentation from catchment disturbance (logging and gravel extraction), land-use change, poor planning and unsustainable fishing are compounding climate impacts and accelerating ecosystem decline in several locations. Integrated ridge-to-reef management is particularly important in districts where upstream land-use pressures are degrading downstream marine ecosystems

Nature-based Solutions (NbS) are central to adaptation

Effective adaptation is less about isolated and costly infrastructure construction and more about strengthening ecosystems, livelihoods and local governance. Protecting and restoring ecosystems offers one of the most effective adaptation measures for simultaneously reducing climate vulnerability and reinforcing local livelihoods and cultural values. Future adaptation needs to focus on reducing exposure where possible by strengthening ecosystem buffers and building adaptive capacity by expanding livelihood and institutional resilience.

Adaptive capacity is strengthened by social cohesion

Customary governance, community organisation and traditional ecological knowledge (TEK) support adaptive capacity, particularly where strong local institutions enable collective action (e.g., tabu areas and locally managed marine areas).

Access to services and resilient infrastructure influence recovery capacity

Investing in resilient infrastructure and preparedness systems, particularly in remote and highly exposed communities is important. Limited access to markets, infrastructure, and emergency services increases recovery times and reduces income stability, particularly in more remote districts. Low household incomes restrict the ability to invest in climate-resilient housing, water systems, and livelihood diversification, reinforcing vulnerability.

1. Introduction

1.1 Background

The Wildlife Conservation Society (WCS) is an international non-government organisation that works to conserve biodiversity and strengthen the community resilience and ecosystem integrity in priority seascapes. As part of this commitment, WCS has undertaken the first CVA for Fiji's Vatu-i-Ra Seascape. Previous assessments have examined climate vulnerability at local scales (Dumaru et al., 2020), sub-regional scales (ICEM, 2023), or have considered aspects of socio-economic resilience (World Bank, 2017; 2018). However, this assessment is the first to evaluate climate vulnerability at the level of a seascape, providing a comprehensive understanding of climate risks, vulnerability and resilience across interconnected coastal and marine social-ecological systems.



The Vatu-i-Ra Seascape is a globally significant marine and coastal conservation area located between Fiji's two largest islands, Viti Levu and Vanua Levu. Covering approximately 27,000 km², the seascape encompasses coral reefs, lagoons, deep ocean passages, coastal forests and important fisheries habitats across the provinces of Bua, Lomaiviti, Ra and Tailevu. The area is internationally recognised for its exceptional biodiversity, supporting more than 300 coral species, over 1,000 fish species, migratory whales and dolphins, sea turtles, seabirds, and a range of culturally and ecologically important marine ecosystems (WCS, 2000).

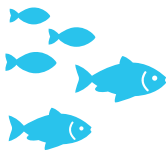
The Seascape is also of considerable social and economic importance. It provides food, livelihoods, fisheries resources and tourism opportunities for more than 116,000 people living within and adjacent to the area. Communities maintain strong cultural and customary connections to the Seascape through traditional fishing grounds (*qoliqoli*) and locally managed resource governance systems, including tabu areas (permanent or temporary fishing closures). These social, cultural and ecological connections make the resilience of communities and ecosystems closely interdependent.

Given the increasing impacts of climate change on coastal communities, marine ecosystems and natural resources, a seascape-scale assessment is critical for understanding patterns of vulnerability and resilience across the region. The assessment provides an evidence base for adaptation planning by identifying the key drivers of climate vulnerability, the factors that support resilience, and opportunities for adaptation actions, including NbS and hybrid approaches. In doing so, it supports WCS's ongoing efforts to strengthen community resilience while safeguarding the globally significant biodiversity of the Vatu-i-Ra Seascape (Figure 1.2).



1.2 Purpose and scope

This Vatu-i-Ra Seascape CVA report provides an evidence base to support climate adaptation planning and strengthen community resilience across the Vatu-i-Ra Seascape. This report presents a synthesis of three complementary CVAs undertaken to examine vulnerability at community, sectoral and landscape scales and produce a clear and accessible assessment of climate vulnerability and likely effective adaptation actions to guide decision-making on conservation and adaptation planning across the Vatu-i-Ra Seascape. It supports the identification and design of effective adaptation responses, including NbS and hybrid approaches that strengthen ecosystem health while reducing climate risks and enhancing the resilience of communities and livelihoods.



Fisheries Risk and Vulnerability Assessments

Participatory assessments were conducted with 10 fishing communities in Bua Province to identify climate-related risks to fisheries resources, livelihoods and food security, and to understand local drivers of vulnerability and resilience. This was undertaken through the FAO funded “*Development of a fisheries-specific Risk and Vulnerability Assessment methodology*,” project.



Community Risk and Vulnerability Assessments

To examine community exposure, sensitivity and adaptive capacity in relation to climate change and natural hazards, participatory assessments were undertaken in 20 communities across Bua, Ra and Tailevu Provinces as part of the Climate Adaptation and Protected Areas (CAPA) Initiative. The CAPA Initiative seeks to promote NbS to strengthen climate resilience and protect biodiversity in and around protected areas and critical ecosystems, including within Vatu-i-Ra Seascape. The initiative is funded by Global Affairs Canada and implemented through a partnership led by the International Institute for Sustainable Development (IISD).



Spatial Climate Hazard and Vulnerability Analysis

WCS Global Conservation Planning team conducted a spatial analysis of current and projected climate hazards under different climate scenarios using available geospatial datasets. The analysis provides insights into patterns of climate risk and vulnerability at both community (CAPA sites) and district scales across the Seascape.

Together, these assessments provide a multi-scale evidence base for understanding climate vulnerability across the Vatu-i-Ra Seascape and for identifying adaptation priorities, including NbS and hybrid approaches that strengthen community resilience and biodiversity conservation.

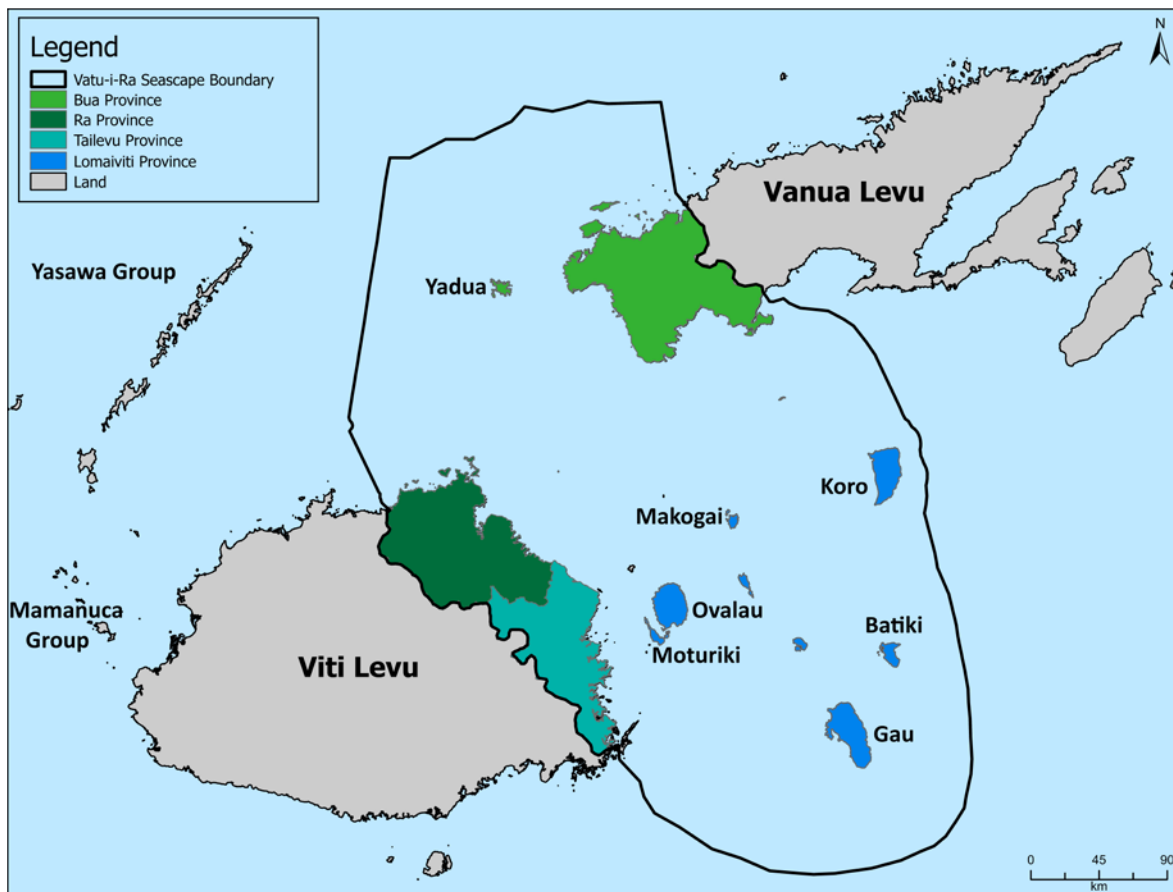


Figure 1.1. Vatu-i-Ra Seascape boundary (Source WCS Fiji 2025)

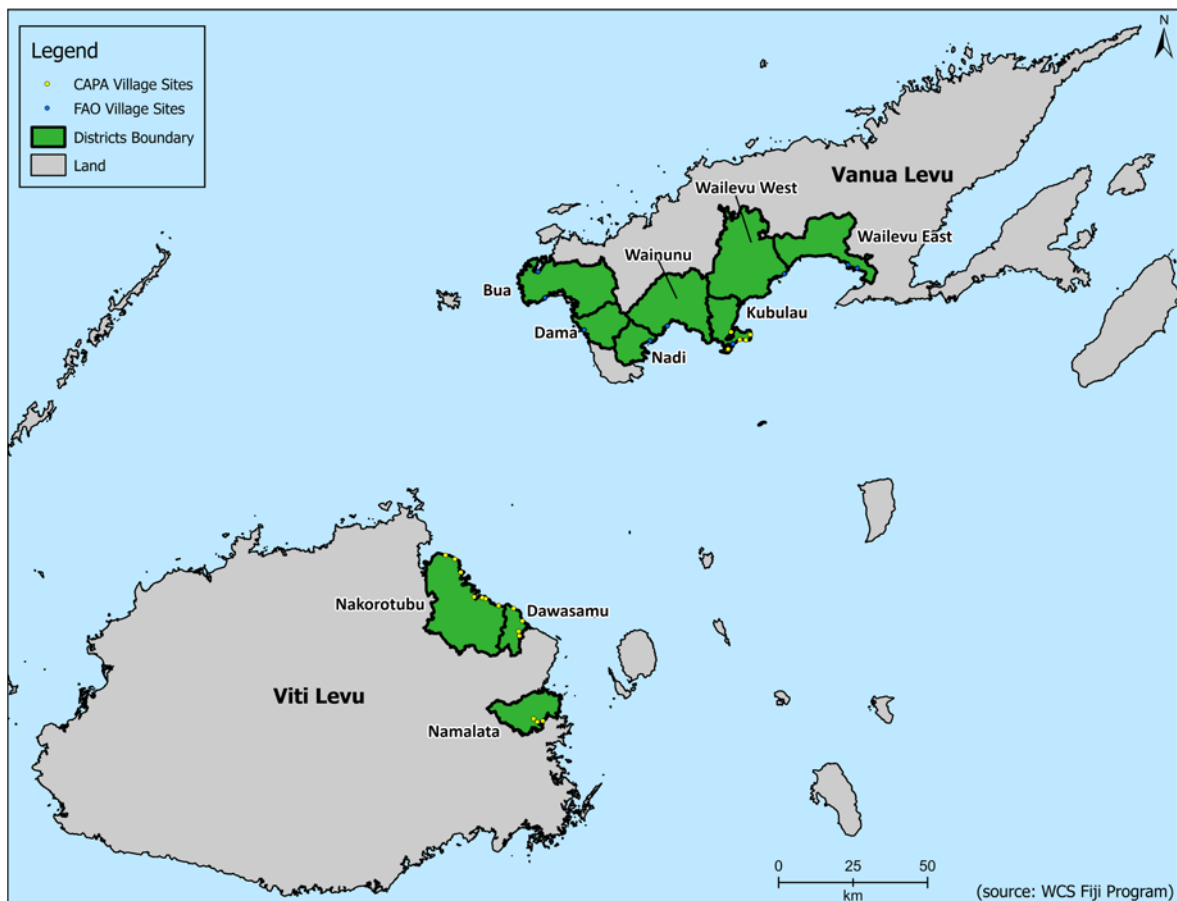
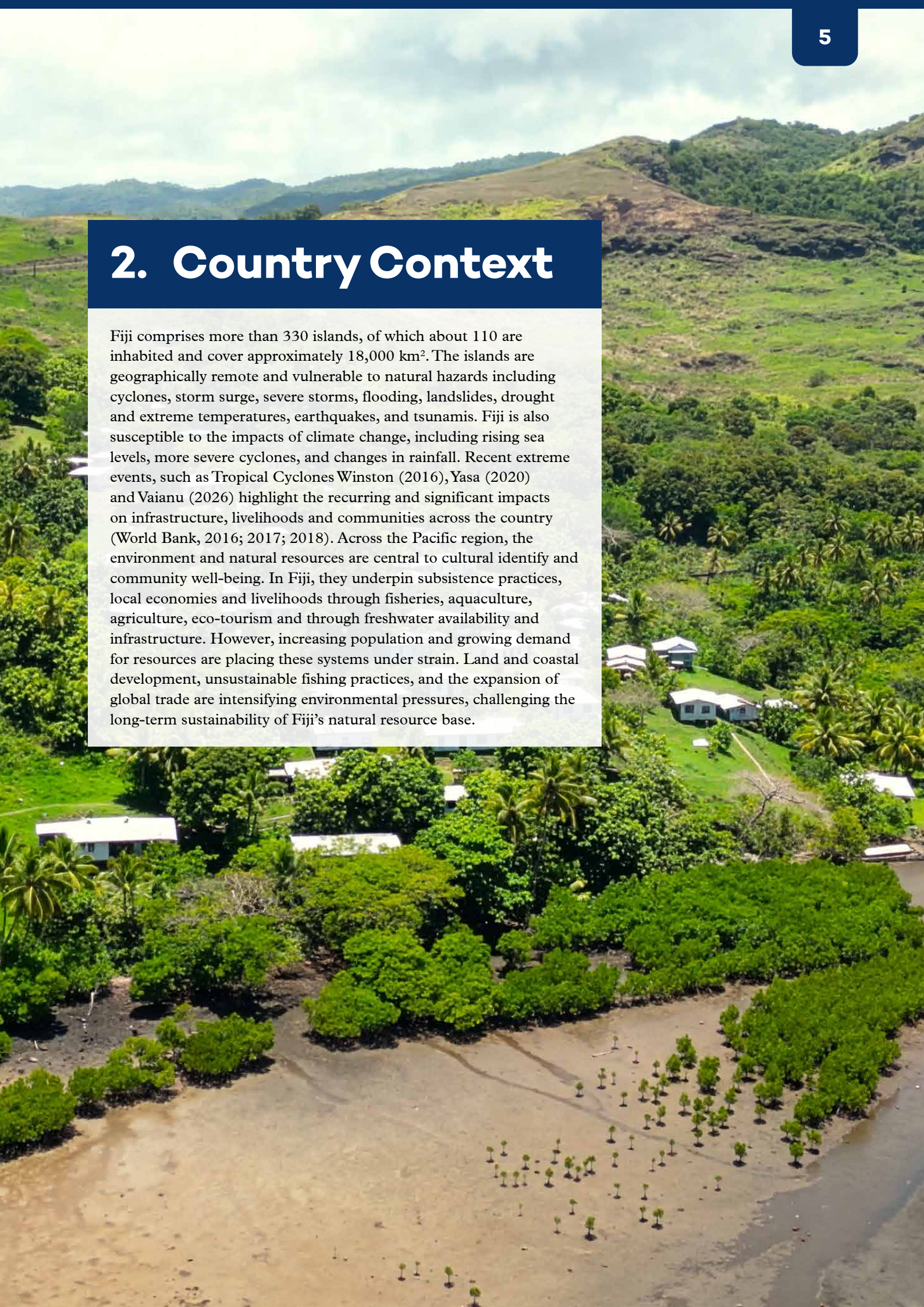


Figure 1.2. Vatu-i-Ra Seascape Districts with assessment sites (Source WCS Fiji 2025)

2. Country Context

Fiji comprises more than 330 islands, of which about 110 are inhabited and cover approximately 18,000 km². The islands are geographically remote and vulnerable to natural hazards including cyclones, storm surge, severe storms, flooding, landslides, drought and extreme temperatures, earthquakes, and tsunamis. Fiji is also susceptible to the impacts of climate change, including rising sea levels, more severe cyclones, and changes in rainfall. Recent extreme events, such as Tropical Cyclones Winston (2016), Yasa (2020) and Vaianu (2026) highlight the recurring and significant impacts on infrastructure, livelihoods and communities across the country (World Bank, 2016; 2017; 2018). Across the Pacific region, the environment and natural resources are central to cultural identity and community well-being. In Fiji, they underpin subsistence practices, local economies and livelihoods through fisheries, aquaculture, agriculture, eco-tourism and through freshwater availability and infrastructure. However, increasing population and growing demand for resources are placing these systems under strain. Land and coastal development, unsustainable fishing practices, and the expansion of global trade are intensifying environmental pressures, challenging the long-term sustainability of Fiji's natural resource base.



CVAs are widely used to evaluate susceptibility of systems (e.g. community, ecosystem, industry) to the impacts of climate change. In Fiji, such assessments have been conducted at local, sub-regional level and national scales (World Bank, 2017; 2018; Dumaru et al., 2020; ICEM, 2023). For example, Dumaru et al. (2020) provided critical data to inform discussions on the relocation of communities and assets at risk from potential coastal hazards on Koro Island in Lomaiviti Province. At a broader scale, using the Northern Division as a case study, ICEM (2023) highlighted growing threats and pressures on Fijian biodiversity, emphasising the significant implications for community livelihoods and wellbeing given the essential values and services these systems provide. At a national level, the Government of the Republic of Fiji (2017) assessed the impacts of climate change on Fiji's economy, livelihoods, poverty, health and food security. The assessment also examined potential impacts of sea level rise on coastal areas and low-lying islands, underscoring the need for increased investment in coastal planning and protection, and the sustainable management of coastal resources.

Within this broader context, this report presents the first CVA undertaken on a seascape basis in Fiji. Consistent with national and regional approaches, it focuses on the key hazards and drivers of vulnerability, while providing particular emphasis on coastal communities and the natural resources and ecosystems that underpin their resilience and livelihoods.

2.1 Climate Change in Fiji

Climate change presents an increasing and pervasive threat to Fiji's ecosystems, biodiversity, livelihoods and economic sectors (IPCC, 2019; SPC, 2025). Fiji is highly exposed to climate-related hazards, particularly tropical cyclones, flooding and drought. For example, Tropical Cyclone Winston caused an estimated FJ\$1.99 billion in damages and losses in 2016 (Chaston et al., 2016). Climate change is expected to increase the severity of extreme events such as cyclones and further exacerbate community vulnerability.

In addition to extreme events, slow-onset changes such as sea-level rise and ocean acidification are beginning to affect socio-ecological systems. Rising air and sea temperatures, changing rainfall patterns, ocean stratification and declining dissolved oxygen levels are also projected. Together, these changes are expected to significantly affect marine and terrestrial ecosystems and the services they provide, with cascading impacts across both natural and human systems (IPCC, 2022; Johnson and Wabnitz, 2025).

Climate change is already altering the structure and function of coastal, offshore and freshwater ecosystems, with consequential impacts on fisheries and the communities that depend on them (Perry et al., 2019; Johnson and Wabnitz, 2025). Beyond fisheries, these changes threaten freshwater quality and reliability, climate-sensitive agriculture and other coastal livelihoods, with implications for food and water security, household incomes and public revenues (Basil et al., 2020).

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report identified five major climate-related risks for Small Island Developing States (SIDS) (IPCC, 2022):

- Loss of terrestrial, marine and coastal biodiversity and ecosystem services.
- Loss of life and assets, food insecurity and economic disruption resulting from damage to settlements and infrastructure.
- Economic decline and livelihood losses in fisheries, agriculture and tourism, as well as from biodiversity loss in traditional agroecosystems.
- Reduced habitability of reef and non-reef islands, leading to population displacement.
- Increasing risks to water security across most small islands.

Assessment of these risks remains constrained by limited availability of adequately downscaled climate projections, the diversity of climatic and socioeconomic conditions across the Pacific, and the relatively small number of impact and risk studies available for different warming scenarios.

Sea-Level Rise

Sea level is projected to continue to rise throughout the century. Recent Coupled Model Intercomparison Project (CMIP6) climate modelling (2015–2021) suggests that future sea-level rise may be greater than previously estimated. Fiji is located within the western tropical Pacific, a region already experiencing above-average rates of sea-level rise due to ocean circulation patterns.

By 2100, CMIP6 and IPCC-aligned projections indicate sea-level rise of approximately 0.7–1.0 m under a high-emissions scenario, with higher-end outcomes exceeding 1 m possible if ice-sheet loss accelerates. Local impacts will vary according to topography and coastal morphology, but these projections indicate substantially increased risks of coastal inundation, erosion and storm surge for many coastal communities. Consequently, both engineered and nature-based coastal protection measures will become increasingly important.



Heat

Air temperatures in Fiji are projected to increase under all emissions scenarios. Mean surface temperatures are expected to rise by approximately 0.44–0.52°C by 2030 and 0.82–1.34°C by 2050 (World Bank, 2025). Warming is projected across the country and is likely to be most pronounced during the warm season (December–February).

Sea surface temperatures are projected to increase by 0.6–1.1°C under a medium-emissions scenario (SSP2-4.5) and by 0.8–1.5°C under a high-emissions scenario (SSP5-8.5) by 2050. Heat extremes are also expected to become more frequent, including increases in hot days (above 30°C), warm nights (above 26°C) and extended periods of elevated temperatures.

Marine heatwaves are projected to increase substantially. Under a high-emissions scenario, moderate-intensity marine heatwave conditions could increase from an historical average of 10–50 days per year (1995–2014) to approximately 200 days per year by 2050 (Webb et al., 2025).

Rainfall

Future rainfall patterns remain uncertain. Climate models do not indicate a consistent national trend, and projections vary considerably among scenarios. However, increased rainfall during the wet season (November–April) appears more likely, with the largest increases projected for northeastern Fiji (World Bank, 2025).



Extreme Weather

Climate projections indicate that while the total number of tropical cyclones may decline, the proportion of severe cyclones is likely to increase, resulting in stronger winds and heavier rainfall (Webb et al., 2025). Fiji has experienced several major cyclones in recent decades, including Tropical Cyclone Winston (Category 5, 2016), Tropical Cyclone Evan (Category 4, 2012), Tropical Cyclone Ami (Category 3, 2003) and Tropical Cyclone Kina (Category 4, 1993). Cyclones Kina and Ami caused extensive flooding, landslides and damage to infrastructure, agriculture and livestock (World Bank, 2017). Cyclone Winston caused significant, albeit spatially variable damage to coral reef and mangrove forests (Cameron et al, 2021; Ford et al, 2025).

Studies of extreme water levels at Suva and Lautoka indicate that significant coastal flooding can result from relatively small storm surges occurring simultaneously with high astronomical tides (Haigh et al., 2017). Under present climatic conditions, the estimated 1-in-100-year total water level is approximately 2.2 m above mean sea level in Suva and 3.2 m in Lautoka (Mendez et al., 2017). These findings highlight the vulnerability of north-western Viti Levu and parts of Vanua Levu to storm surge impacts, particularly due to the shallow offshore bathymetry in these areas.

Flooding represents a major natural hazard across Fiji. Large portions of the population and critical infrastructure are located on river floodplains, in flash flood-prone catchments and in low-lying coastal areas. Because all major rivers discharge to the ocean, elevated sea levels, storm surges and high tides can exacerbate riverine flooding. Fiji experiences flooding more than once per year on average, with particularly severe events recorded in 2004, 2009, 2012 and 2014 (World Bank, 2017).

Implications for Coastal Communities

CMIP6 projections indicate that Fiji could experience warming of 3°C or more by 2100 under a high-emissions scenario. Such warming would have significant implications for coastal communities through impacts on coral reefs, fisheries, cyclone intensity, storm surge frequency and magnitude, coastal flooding and erosion.

Fiji is also expected to experience increased variability and intensity of the El Niño–Southern Oscillation (ENSO), contributing to more severe floods, droughts, periods of aridity and cyclone activity. As these climate impacts intensify, the exposure and vulnerability of coastal communities across the Seascapes are expected to increase substantially, placing greater pressure on ecosystems, livelihoods, infrastructure and community wellbeing.

National climate change policy

The Government of Fiji recognises the risk of climate change and the importance of adapting and coordinating climate change related adaptation policies, strategies, plans and activities to reduce the vulnerability and enhance the resilience of Fiji communities and sectors. Fiji has put in place several national policies and plans to manage this, including the National Climate Change Policy (2018–2030) and National Adaptation Plan (Government of Fiji, 2021), and has prepared a CVA (update pending in 2026).

Fiji aims to accelerate growth towards high-income status by 2050, with the vision under the National Development Plan 2025–29 outlining an ambition of a four-fold increase in per capita income by 2050 and the elimination of poverty (Government of Fiji, 2024). Fiji also articulates ambition to increase community and economic resilience to climate change in the National Adaptation Plan (2018), and National Climate Change Policy (2018). Climate change may risk progress towards these targets and impose economic and social shocks. Climate change could furthermore reduce investment and labour productivity and stall the tourism sector that underpins 40% of Fiji's GDP (MCTA, 2024). Investments and reforms to strengthen resilience and to decarbonise will help Fiji to stay on track and may include removing barriers to adaptation the trade/export, energy and infrastructure, workforce, and governance sectors.



2.2 Fiji's natural resources

Fiji's coastal ecosystems, including coral reefs, seagrass, mangroves and coastal vegetation, play a critical role in buffering the impacts of climate change, particularly by reducing wave energy, storm surge, and coastal erosion associated with more intense storms. At the same time, these ecosystems underpin subsistence living and livelihoods through fisheries and aquaculture. Healthy coral reefs, near shore habitats, seagrass beds, and mangrove ecosystems support an economically important fisheries sector in Fiji, through subsistence, inshore artisanal, aquaculture, and offshore fisheries (Gillet, 2009).

Fiji's coral reefs cover 6,704 km², including the third largest continuous barrier reef in the world, the Great Sea Reef, encapsulating over 1,200km² of reef systems. These coral reefs harbor 42% of all known coral species, over 1,000 marine fish and 342 species of scleractinian corals which are native to Fiji (ICEM, 2024). Coral reefs with high coral cover, species diversity, and fish biomass have the potential to resist and recover from some climatic related impacts and have been referred to as high integrity climate-resilient coral reef (HICOR) (Bowden-Kerby, 2025; Ford et al., 2025; WCS, 2025). Global analyses have identified coral reefs in Fiji that have higher resistance to thermal stress (McClanahan et al, 2020) and are among a portfolio of coral reefs that have lower exposure to climate change stress, higher connectivity and have greater chance of surviving projected climate changes (Beyer et al., 2018). The '50 Reefs Analysis' identified coral reef locations globally (including in Fiji) that, in the absence of other impacts, are likely to have a heightened chance of surviving projected climate changes (Beyer et al., 2018). In Fiji the analysis highlighted two climate refuge reef areas: i) Northern Viti Levu, Southern Vanua Levu and Somosomo Strait and ii) Northern Vanua Levu and Vanua Balavu. Building on the 50 Reef framework, recent advances in modelling and improved data availability have enabled a finer resolution analysis identifying climate-resilient reef areas in Fiji that have favourable conditions for long-term persistence under climate change (Zawada et al. 2026).



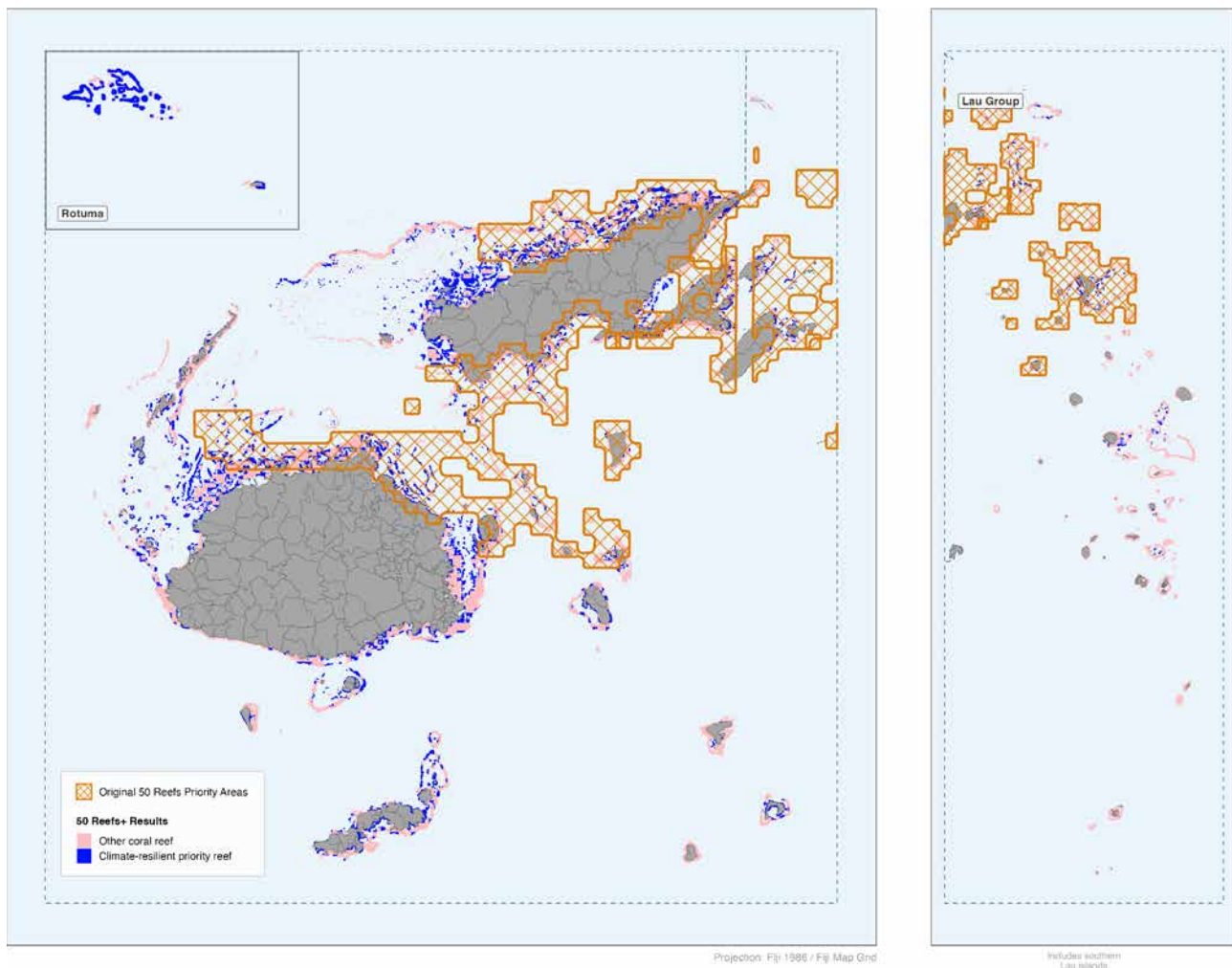


Figure 2.1. High integrity, climate-resilient reefs identified across Fiji.

Seagrass meadows cover 59.19 km² of Fiji's shallow water habitats typically within sheltered bays (e.g., Laucala Bay, Viti Levu), on fringing reef habitats (e.g., Kubulau, Vanua Levu and Coral Coast and Mamanuca Islands, Viti Levu; Lau Group) or within shallow lagoons bordered by barrier reefs such as Great Astrolabe Reef, Kadavu (Shiiba et al., 2023).

In Fiji, mangrove habitat covers approximately 652 km², with the largest stands in the deltaic areas of the Rewa, Ba, and Nadi Rivers on Viti Levu and the Labasa River on Vanua Levu (ICEM, 2024). Mangroves are highly productive ecosystems, supporting a complex food web through nutrient generation feeding many species and providing natural capital for communities. Mangroves also buffer against storms, preventing coastal erosion, and saline intrusion and filtering runoff of sediment and pollutants from the land to the sea. Mangroves can absorb and store up to four times as much carbon in their root systems as mature tropical rainforests. For these reasons protecting, regenerating and planting mangroves and other 'blue carbon' ecosystems such as seagrasses and tidal marshes are essential in building resilience to climate change and offer NbS discussed below.



Coral reefs, seagrass and mangroves are livelihood support systems for coastal communities across the Vatu-i-Ra Seascape



2.3 Nature-based Solutions

Nature-based Solutions are increasingly recognised as an important approach for addressing the impacts of climate change while simultaneously supporting biodiversity conservation and human wellbeing. The International Union for Conservation of Nature (IUCN) defines NbS as “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits” (IUCN Members’ Assembly, 2016, p. 1). The United Nations Environment Assembly (UNEA) subsequently expanded this definition to include actions that protect, conserve, restore, sustainably use and manage terrestrial, freshwater, coastal and marine ecosystems, while delivering benefits for human wellbeing, ecosystem services, resilience and biodiversity (UNEA, 2022).

The IUCN definition and its associated principles informed the development of the IUCN Global Standard for Nature-based Solutions™, which provides an operational framework for designing, implementing and evaluating NbS and is widely regarded as the leading framework for applying the UNEA definition in practice (IUCN, 2020; IUCN, 2026; Cohen-Shacham et al., 2024).

NbS use the protection, restoration and sustainable management of ecosystems to address societal challenges such as climate change, coastal erosion, biodiversity loss and disaster risk. By maintaining and enhancing ecosystem functions, NbS can reduce vulnerability to climate hazards, strengthen resilience and support sustainable livelihoods, particularly in coastal communities (SPREP, 2025). Examples include the restoration of mangroves and coastal forests to reduce erosion and storm impacts, the protection of coral reefs and seagrass habitats that support fisheries and coastal protection, and the sustainable management of watersheds to improve water security.

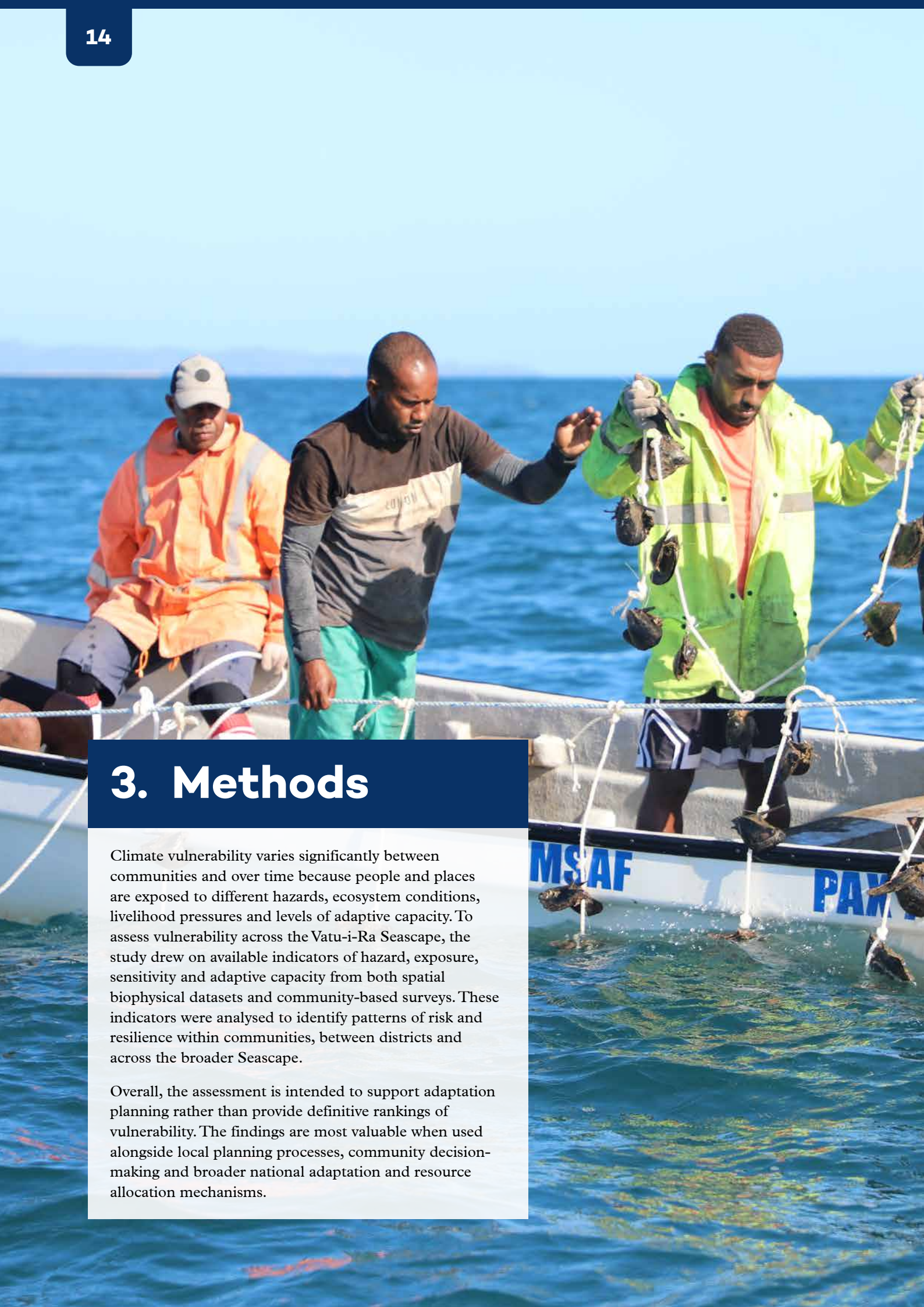
NbS can also be implemented as hybrid approaches that combine ecosystem-based measures with engineered infrastructure. For example, mangrove restoration may be combined with seawalls or other coastal protection structures to provide greater protection than either approach alone. A notable example in Fiji is the hybrid NbS seawall developed to protect Viro Village in Levuka, Ovalau (Government of Fiji, 2020). Across the Pacific, both ecosystem-based and hybrid approaches are increasingly being incorporated into climate adaptation, disaster risk reduction and coastal management strategies.

In the Vatu-i-Ra Seascape, the effectiveness of NbS is closely linked to the social and institutional context in which they are implemented. Customary governance systems, land and marine tenure arrangements, *qoliqoli*, and locally managed practices such as tabu areas play a central role in shaping decision-making, resource management and benefit sharing. These governance arrangements can provide important foundations for the successful design and long-term stewardship of NbS.

A ridge-to-reef perspective is also critical in a seascape approach. Land-based activities and catchment condition influence downstream rivers, estuaries, seagrass meadows, coral reefs and coastal fisheries. Consequently, effective NbS often require integrated management across connected terrestrial, freshwater and marine ecosystems rather than focusing on individual sites or habitats in isolation.

The success of NbS is also influenced by broader social, economic and institutional factors that shape adaptive capacity. These include the strength of governance and leadership, access to infrastructure and services, livelihood security, technical knowledge, financial resources and community capacity (IPCC, 2022; Berkes and Ross, 2013). In Pacific Island communities, TEK, social cohesion and local stewardship systems are important contributors to adaptation and sustainable resource management (Ensor et al., 2016; Barnett and Waters, 2016). Conversely, remoteness, limited infrastructure, constrained access to services and unequal access to resources can reduce adaptive capacity and limit the long-term implementation and maintenance of NbS (IPCC, 2022; Perry et al., 2019).

NbS should therefore be understood not simply as environmental interventions, but as part of broader social-ecological systems. When designed and implemented effectively, they can simultaneously reduce climate risks, strengthen ecosystem health, support livelihoods and enhance the resilience of communities facing increasing climate change impacts.

A photograph showing three men on a small boat in the ocean. The man on the right, wearing a bright yellow-green jacket, is holding up a string of harvested oysters. The man in the middle, wearing a grey and black shirt and green shorts, is looking down at the oysters. The man on the left, wearing an orange jacket and a cap, is also looking down. The boat has 'MSAF' and 'PAM' written on its side. The background is a clear blue sky and the ocean.

3. Methods

Climate vulnerability varies significantly between communities and over time because people and places are exposed to different hazards, ecosystem conditions, livelihood pressures and levels of adaptive capacity. To assess vulnerability across the Vatu-i-Ra Seascape, the study drew on available indicators of hazard, exposure, sensitivity and adaptive capacity from both spatial biophysical datasets and community-based surveys. These indicators were analysed to identify patterns of risk and resilience within communities, between districts and across the broader Seascape.

Overall, the assessment is intended to support adaptation planning rather than provide definitive rankings of vulnerability. The findings are most valuable when used alongside local planning processes, community decision-making and broader national adaptation and resource allocation mechanisms.

3.1 Approach

The assessment applied a socio-ecological approach to understanding climate vulnerability across the Vatu-i-Ra Seascape, drawing together information from multiple climate vulnerability and risk assessments previously undertaken by WCS and partners across the region. It represents the first CVA conducted at a seascape scale in Fiji and complements existing national and sub-national vulnerability assessments, including Fiji's National Climate Vulnerability Assessment and National Adaptation Plan processes.

The assessment synthesised information from three primary evidence sources:

- participatory community vulnerability assessments;
- fisheries-focused vulnerability and risk assessments conducted in fishing communities in Bua Province; and
- spatial analysis of contemporary and projected climate hazards and ecosystem conditions across the Seascape.

These datasets were collected using different methodologies, scales and forms of evidence. Rather than attempting to directly compare or aggregate all data into a single quantitative index, the assessment took a synthesis approach that analyses the strengths and findings of each dataset separately before integrating findings to identify patterns of exposure, adaptive capacity and vulnerability across districts and communities.

Summaries of these data sets are provided in Annex A, B and C.

The assessment adopts definitions drawn from the IPCC and WCS frameworks.

- **Adaptive capacity** refers to the ability of human or natural systems to cope with or adjust to change.
- **Adaptation** is the process of adjustment to actual or expected climate impacts to reduce harm or take advantage of opportunities.
- **Exposure** describes the extent to which people, livelihoods, ecosystems, infrastructure and assets experience climate hazards.
- **Hazards** are natural or human-induced events or trends that may cause harm to people, ecosystems or infrastructure.
- **Resilience** refers to the ability of systems to maintain essential functions and adapt or transform in response to change.
- **Sensitivity** describes the predisposition of people, ecosystems or assets to be adversely affected.
- **Vulnerability** reflects the overall propensity to be harmed, incorporating exposure and adaptive capacity. It is often expressed as a function of propensity to be harmed, incorporating exposure and adaptive capacity.

The assessment recognises that vulnerability differs between communities and changes over time. CVAs therefore commonly combine indicators of hazard, exposure, sensitivity and adaptive capacity to generate composite measures of vulnerability. These approaches are useful for understanding complex interactions within socio-ecological systems, identifying common patterns and highlighting important differences between places and communities that can guide adaptation planning and investment.

The assessment used composite approaches to vulnerability analysis, where indicators of exposure and sensitivity were considered alongside measures of adaptive capacity to understand how environmental, social and economic factors interact within socio-ecological systems. Weighted mean scores and comparative analysis were used to identify common patterns, key drivers of vulnerability and important local differences relevant to adaptation planning.

The assessment was developed through a staged process that combined a desktop review of climate vulnerability literature, synthesis of three WCS datasets and vulnerability assessments, integration of spatial hazard analysis with community-level exposure, sensitivity, adaptive capacity and resilience data, and assessment of vulnerability at district and Seascape scales. This approach enabled identification of key risks to fisheries, ecosystems and coastal livelihoods, as well as potential NbS.

The methodology combines biophysical spatial analysis with community-based social survey data. Together, these datasets provide complementary perspectives on vulnerability. The spatial data primarily indicate patterns of physical exposure and environmental sensitivity, while the community survey data provide insight into how communities themselves perceive climate risks, what they feel most vulnerable to, and the factors they identify as strengthening or constraining resilience. This combination provides a richer and more comprehensive understanding of vulnerability than either dataset could provide independently.



Spatial Climate Hazard and Vulnerability Assessment

The spatial assessment included indicators of both climate exposure and adaptive capacity across 19 of the 20 communities. Exposure indicators included hazards such as cyclones, flooding, extreme heat, drought, thermal stress, changing rainfall patterns and coastal inundation, as well as indicators of ecological sensitivity including coral reef bleaching, tidal flat loss, erosion, landslide risk and sediment yields. Indicators of adaptive capacity reflected the condition and extent of ecosystems and natural resources that contribute to resilience, including coral reefs, mangroves, seagrass systems, tree cover, freshwater availability and agricultural land potential (Annex A).

These spatial datasets provide important insight into how geography, ecosystem condition, settlement patterns and legacies of land and resource use influence climate exposure and resilience across the Seascope. They are particularly useful for identifying broad patterns, hotspots of vulnerability and relationships between ecosystems, hazards and livelihoods at district and seascope scales. Mean scores for exposure and adaptive capacity indicators were analysed within and across districts to identify common trends, key sources of vulnerability and important exceptions.

Community Vulnerability Assessments

The community-based assessment data provide a different but complementary perspective. Focus group discussions (FGDs) and household surveys captured local perceptions of climate risks, exposure, resilience and adaptive capacity (Annex B & C). Communities identified which hazards they experienced most frequently and which aspects of their livelihoods, infrastructure, environment or wellbeing they considered most vulnerable. This provided detailed insight into local sensitivities, including concerns relating to water insecurity, fisheries decline, flooding, erosion, governance, livelihoods and disaster impacts.

FGDs also explored dimensions of adaptive capacity and resilience using a “five capitals” framing, including physical, natural, human, financial and social capital. Household survey data were aggregated to identify community-level patterns relating to livelihoods, savings capacity, trust in leadership, resource access and social organisation. Together, these data help explain why some communities are more resilient than others despite experiencing similar levels of physical exposure.

Combined Assessment

The combined assessment therefore provides a more nuanced understanding of vulnerability across the Vatu-i-Ra Seascope. The spatial data indicate where communities and ecosystems are physically exposed to climate hazards and environmental change, while the community data explain how people experience vulnerability, which risks they prioritise, and the social, cultural and economic factors influencing adaptive capacity. When synthesised together, the datasets reveal important relationships between ecosystem condition, livelihoods, governance systems, infrastructure and resilience.

A key strength of the methodology is therefore its ability to integrate ecological, climatic and social dimensions of vulnerability across multiple scales. The assessment is particularly valuable in highlighting interactions between marine and coastal ecosystem condition, climate exposure, customary governance and livelihood dependence across the Seascope. It also identifies recurring drivers of vulnerability, as well as important differences between districts and communities, providing a strong foundation for locally tailored adaptation planning and NbS.

At the same time, the assessment acknowledges several important limitations and challenges associated with the available datasets. Data quality and depth vary between communities and districts, with some locations containing richer descriptive and spatial information than others. Detailed spatial exposure data were available for the community risk and vulnerability assessment but were limited for some fisheries risk and vulnerability assessment communities, making direct comparisons challenging.

In addition, some indicators are based on qualitative or semi-quantitative information rather than consistent measured datasets, limiting the ability to objectively rank or compare vulnerability between locations. The assessment also provides primarily a snapshot of current vulnerability conditions and contains limited information on long-term environmental or socio-economic trends, including changes in ecosystem condition, livelihood diversification or governance effectiveness over time.

Despite these limitations, the synthesis of complementary spatial and community-based datasets provides one of the most comprehensive assessments of climate vulnerability undertaken in Fiji at the seascape scale. The methodology offers a valuable framework for integrating environmental and social evidence to support adaptation planning, conservation management and resilience-building across complex coastal and marine socio-ecological systems.

3.2 Data analysis

Data and information from the spatial and social surveys were summarised and assessed to highlight key characteristics of risk and adaptive capacity for communities across the Seascape. Given the widely divergent methods for collecting data and organising between the spatial and social survey sets, and challenges with the inherent replicability of the latter, the assessment adopted the approach of initially analysing the raw data sets separately to determine what they could tell us about vulnerability in the sample of communities, in the districts and across the Seascape. The analysis adopted the indicators for which data were available, including the sets of exposure and adaptive capacity indicators, and the five capitals considered under the social survey. This information was assessed to determine the characteristics of the locations which influenced vulnerability (spatial data) and the perceptions of community members about factors that affect their climate risk and resilience (adaptive capacity).

Data from the various sources were analysed in the following steps:

1. **Analyse exposure and adaptive capacity data**

Spatial datasets were analysed within communities, between districts and across the Seascape to identify common patterns, key sources of vulnerability and notable exceptions. Weighted mean scores for exposure and adaptive capacity indicators were calculated and compared across communities and districts to identify primary climate risks, sources of resilience and broader patterns of vulnerability relevant to adaptation planning.

2. **Analyse community perceptions of exposure and sensitivity**

FGDs were used to assess how communities perceived climate exposure and sensitivity. Communities ranked the frequency and severity of climate impacts, with the analysis focusing on hazards identified by both men and women as high exposure issues. Information relating to these impacts — such as environmental condition, nature of hazards and affected livelihoods — was used to develop a more detailed understanding of local exposure and unique community sensitivities.

3. **Assess adaptive capacity through community resilience indicators**

FGDs also examined dimensions of adaptive capacity, including physical, natural and human capital. Analysis focused on resilience attributes ranked highly by both men and women. Information relating to strongly rated resilience factors was incorporated into the assessment, while medium and low rankings were considered qualitatively to help explain differences between communities.

4. Aggregate and analyse household survey data

Household survey data were aggregated to the community level to enable comparison across communities and districts. Responses to ranked questions were averaged to identify patterns relating to livelihoods, financial capacity, leadership trust, savings capacity and other indicators of adaptive capacity and social resilience.

5. Synthesise spatial and social datasets

Findings from the spatial analysis and community surveys were then synthesised to assess vulnerability at community, district and seascape scales. This combined analysis integrated information on physical exposure, ecosystem condition and environmental risk with community perceptions of vulnerability, resilience and adaptation options to develop a comprehensive understanding of climate vulnerability across the Seascape.

Analyses of the composite spatial indices for exposure and adaptive capacity for the 19 CAPA communities enabled comparisons and patterns to be assessed, as well as geographic differences to be examined (Figure 3.1).

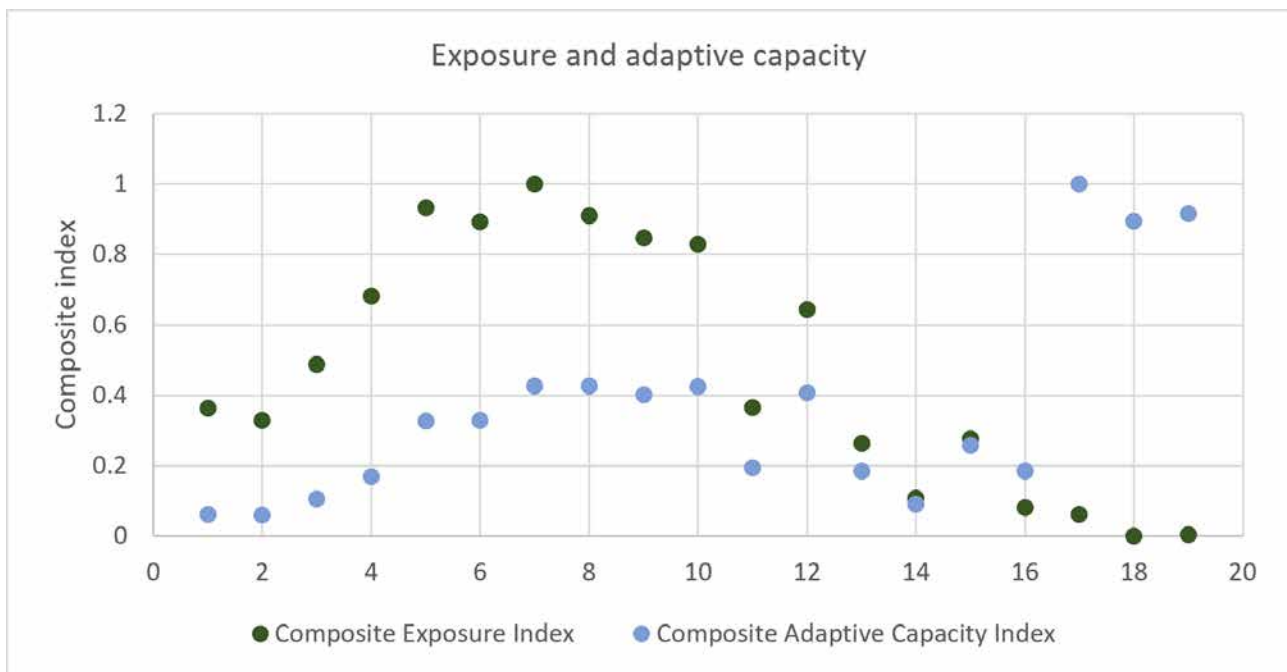


Figure 3.1. Weighted mean composite scores for 19 communities in the Vatu-i-Ra Seascape (communities numbered 1-19 on the x axis)

4. Climate Risk and Resilience Assessment – Findings





4.1 Kubulau

Kubulau is in the southeast of Bua Province, around 80 km from Nabouwalu Jetty. It includes 10 villages and one settlement, with six sites included as part of the community vulnerability assessment: Waisa, Natokalaus, Nasasaivua, Kiobo, Navatu, and Nabalabalawa settlement. Most communities are coastal, while a few are inland.

Study communities within the district have a combined population of 529, with an even gender balance. Livelihoods are mainly subsistence-based, combining farming and marine resource use. Agricultural produce is either consumed locally or sold in nearby markets in Savusavu town, the closest to the district. Fishing and collection of crabs and seaweed support both food security and income. Compared with other districts, Kubulau has relatively intact and healthy ecosystems and limited major development pressures.

Community organisation is active, with men's, women's, and youth groups operating across villages, although participation varies depending on availability and interest. Governance of natural resources is coordinated through the Kubulau Resource Management Committee, which includes traditional leaders from all communities and works with WCS Fiji for technical support. This structure has supported significant conservation initiatives, including the Namena Marine Reserve and the Kilaka Forest Conservation Area, which protects high biodiversity forest and endangered native species.

Despite its strong conservation record, the district faces external environmental threats, particularly the potential reopening of the Mount Kasi gold mine in a neighbouring district, which could affect both terrestrial and marine ecosystems.

4.1.1 Risk (exposure and sensitivity)

Kubulau's communities experience a complex mix of climate-related risks, influenced by their coastal setting, reliance on natural resources, and limited infrastructure. Coastal villages are highly exposed to sea-level rise, storm surge, coastal erosion, and coral reef degradation, with projections showing substantial increases in extreme heat days across the district. Inland communities face heat stress, shifting rainfall patterns, and occasional flooding, which affect food production and water availability. Sensitivity is heightened by the district's strong dependence on fishing, coastal resource harvesting, and subsistence agriculture, combined with low agricultural land potential in most villages and widespread reliance on rainwater for drinking, which becomes unreliable during prolonged dry periods. While Kubulau benefits from extensive coral reef and mangrove cover and relatively intact ecosystems, exposure remains high due to the location of most settlements along the coast, the predicted future instability of natural resources that underpin livelihoods, and the limited public infrastructure available to buffer communities from climate and disaster impacts.

4.1.2 Resilience and Adaptive Capacity

Adaptive capacity in Kubulau is shaped by a combination of strong community organisation, deep ecological knowledge, and a long history of resource stewardship. Social structures are active across the district, with men's, women's and youth groups contributing to labour mobilisation, information sharing and community preparedness. Traditional leadership remains central to decision-making, and the Kubulau Resource Management Committee provides a coordinated platform for managing natural resources. Men, women and young people hold substantial TEK, particularly in relation to harvesting practices, species identification and seasonal patterns, which strengthens the district's ability to anticipate and respond to environmental change.

Natural capital is a major source of resilience. Extensive mangrove systems, the Namena Marine Reserve and the Kilaka Forest Conservation Area provide ecological buffers, maintaining biodiversity and supporting fisheries productivity. These ecosystems underpin food security and livelihoods, and their health contributes directly to the district's capacity to absorb climate-related shocks. Financial resilience is also notable: most communities can access government and civil-society support, and many households receive remittances or earn income through small informal businesses, reducing immediate vulnerability after climate hazards.

Physical and human capital show mixed patterns. The district has a sizeable working-age population with practical skills in carpentry and agriculture, and many households have begun upgrading homes to cyclone-resilient standards. Communities are also undertaking proactive adaptation measures such as afforestation of degraded areas, establishing nurseries for post-cyclone replanting, and shifting towards more climate-tolerant crops including *uto* (breadfruit), *vudi* (plantain) and *tivoli* (wild yam). However, resilience is uneven. Some villages have minimal public infrastructure, only two have dedicated evacuation centers, and water security remains a persistent challenge due to reliance on rainwater and unstable springs during droughts. Trust in leadership varies between communities, influencing how effectively adaptation initiatives are implemented.

Overall, Kubulau's adaptive capacity is strengthened by its governance systems, ecological assets and active community networks, but constrained by limited infrastructure, water insecurity and external pressures such as the potential reopening of the Mount Kasi mine.

A detailed breakdown of exposure, sensitivity and adaptive capacity indicators for Kubulau is provided in Table 4.1.

Kubulau District

Assessment Villages: Waisa, Natokalau, Nasasaivua, Kiobo, Navatu, and Nabalabalawa



Overall vulnerability
HIGH

Community locations



Coastal



Inland

Primary livelihoods



Fisheries



Agriculture

Risk (exposure & sensitivity)



Cyclone, floods and inundation
HIGH



Agriculture production impacts
HIGH



Impacts on community livelihoods
LOW



Marine ecosystem impacts
MODERATE

Resilience & adaptive capacity



Coastal protection
MODERATE



Freshwater availability
LOW



Land-based livelihoods
LOW



Social mobility & infrastructure
MODERATE



Marine livelihoods
MODERATE



Social & human capital
HIGH



Forest cover
HIGH



Financial capital
HIGH

Figure 4.1. Community risk and adaptive capacity within Kubulau District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)

Table 4.1. Risk and resilience summary for Kubulau

Risk		Resilience & Adaptive Capacity	
Exposure	Sensitivity	Infrastructure	Capital
Highly exposed coastal villages Cyclone exposure on northern coastline High exposure to coastal inundation, erosion Storm surge & coral bleaching Wind damage and saltwater intrusion into gardens Low-lying shorelines with flooding and erosion during storm surges Rapid increase in extreme heat days Inland areas exposed to heat stress and rainfall variability	Fishing and coastal resource dependence Low agricultural land potential in most villages Widespread reliance on rainwater for drinking, with some communities requiring trucked water; springs unreliable during droughts. Predicted reef degradation will reduce food and income security	Minimal public infrastructure in several villages (Waisa, Kiobo, Natokalau); only Kiobo and Navatu have evacuation centres Distance to markets limits access to services	Physical & Natural Capital: Healthy ecosystems that buffer climate impacts and support livelihoods High mangrove cover and significant conservation areas (Namena Reserve, Kilaka Forest) Human & Social Capital: Strong community organisation through active social groups and traditional leadership; men, women and youth hold substantial TEK; TEK is widely used The district has a sizeable working age population, with many individuals skilled in carpentry High gender equality in decision-making; variable but generally functional trust in leadership Financial Capital: Access to government and NGO support, remittances and small business income



4.2 Namalata

Namalata is in the northeastern part of Tailevu Province on Viti Levu, along the Kings Road, about 8 km from Korovou Town. It includes 11 villages most of which are located inland. Three inland villages: Veinuqa, Naitutu, and Davetalevu, were included as part of the community-vulnerability assessment.

The district is primarily terrestrial, with forest and freshwater ecosystems and no designated protected areas. Livelihoods are mixed, with farming as the main activity supported by formal employment, small businesses, and government social welfare. Minor income sources include fishing, pensions, and remittances. Agriculture is diverse, producing crops such as cassava, dalo, yaqona, plantains, cabbage, and leafy greens, with additional planting along riverbanks and within villages. Women also contribute through pandanus and flower cultivation. Freshwater resources such as prawns, fish, and mussels are also used. Climate-resilient crops are being introduced to support adaptation. Produce is mainly sold in Korovou, Nausori, and Suva markets.

Resource access is generally equitable, with variation mainly influenced by livelihood type, land availability and ownership. Study communities within the district have a combined population of 509 people, with a slightly higher proportion of males (52%) than females (48%), and a strong working-age demographic. Some female-headed households and elderly individuals living alone are present.

Community organisation includes natural resource (iYaubula) management committees, development committees (with sub-committees for services such as water and health), as well as women's and youth groups.

4.2.1 Risk (exposure and sensitivity)

Communities in Namalata experience a distinct climate-risk profile influenced by their inland location, terrestrial ecosystems and mixed livelihood base. Overall exposure to heat stress and extreme-heat days is low, with available data indicating minimal current heat-related risk compared with coastal districts. However, Namalata faces high exposure to drought and future drought, making water security a central concern. Rain-related indicators show mixed patterns: exposure to rainfall seasonality is low, but exposure to changes in total rainfall and aridity varies across communities, creating uncertainty for agricultural planning. Flood risk is generally low, although some villages experience elevated exposure due to localised drainage and catchment characteristics.

As most communities in Namalata are located inland, exposure to coastal hazards such as storm surge, sea-level rise and coastal inundation is negligible. However, the district experiences high cyclone exposure and impacted by wind damage, crop loss and prolonged recovery periods remain significant. Land-based hazards, including fire risk, are generally low but variable. Sensitivity is shaped by the district's reliance on agriculture as the primary livelihood, supported by freshwater harvesting and small-scale resource use. While agricultural systems are diverse, they remain vulnerable to drought, rainfall variability and prolonged dry periods, which can reduce yields and affect food security. Communities with limited livelihood diversification or reduced access to freshwater are more sensitive to climate shocks.

4.2.2 Resilience and Adaptive Capacity

Adaptive capacity in Namalata is comparatively strong across several indicators, reflecting the district's inland geography, access to resources and well-established community structures. Agricultural potential is high, with productive land, diverse crop systems and opportunities for further cultivation. Freshwater availability is generally reliable, supported by streams, springs and piped water systems, which enhances resilience to drought despite high projected exposure. Communities benefit from good access to public infrastructure, including health clinics, schools, electricity, phone service and public transport, which improves mobility, information flow and access to emergency support.

Social and institutional systems are well developed. Namalata communities maintain active iYaubula committees, development committees and sub-committees for water and health, alongside strong women's and youth groups. These structures support coordinated decision-making, labour mobilisation and community preparedness. The district has a strong working-age population, including many skilled carpenters, which contributes to rapid recovery after storms and supports ongoing adaptation measures such as cyclone-proofing houses, tree and vetiver planting, and erosion-control initiatives.

Financial resilience is strengthened by diverse income sources, including farming, small businesses, formal employment and government social welfare. A significant proportion of households receive remittances, which provide an important buffer during climate shocks and reduce dependence on external aid. While most households earn enough to meet daily needs, savings capacity remains limited, which may constrain long-term adaptation investments. Nevertheless, the combination of productive land, reliable freshwater, strong governance, diversified livelihoods and active community-led adaptation gives Namalata one of the highest adaptive-capacity profiles in the region.

A detailed breakdown of exposure, sensitivity and adaptive capacity indicators for Namalata is provided in Table 4.2. Climate risk & resilience summary.

Namalata District

Assessment Villages: Veinuqa, Naitutu, and Davetalevu



**Overall
vulnerability
LOW**

Community locations



Inland

Primary livelihoods



Agriculture



**Employment /
business**

Risk (exposure & sensitivity)



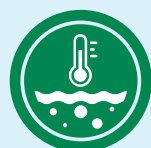
Cyclone, floods and
inundation
HIGH



Agriculture production
impacts
LOW



Impacts on community
livelihoods
LOW



Marine ecosystem impacts
LOW

Resilience & adaptive capacity



Coastal
protection
HIGH



Freshwater
availability
HIGH



Land-based
livelihoods
HIGH



Social mobility &
infrastructure
HIGH



Marine
livelihoods
HIGH



Social & human
capital
HIGH



Forest cover
HIGH



Financial capital
HIGH

Figure 4.2. Community risk and adaptive capacity within Namalata District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)

Table 4.2. Risk and resilience summary for Namalata

Risk		Resilience & Adaptive Capacity	
Exposure	Sensitivity	Infrastructure	Capital
Some areas are highly exposed to the climate risks, like the coastal villages, while others more inland Inland communities show low exposure to heat stress and extreme-heat days, but high exposure to drought and future drought Rainfall-related indicators are mixed: low exposure to rainfall seasonality, but variable exposure to changes in total rainfall and aridity Flood risk is generally low, with isolated high-risk sites Exposure to cyclones is high, and indirect cyclone impacts remain significant. Fire risk is generally low but variable Villages near the Kings Road corridor are exposed to drainage flooding and infrastructure disruption during heavy rainfall events Low-lying coastal settlements face recurrent storm surge, coastal flooding, and sea-level-rise impacts	Strong variation in ecosystem condition; inland drought and agricultural stress; uneven access to services and markets Agricultural dependence on root crops and small household gardens increases vulnerability to heat stress, rainfall variability, and prolonged dry periods Small village economies with limited livelihood diversification have reduced recovery capacity following climate-related shocks and disasters Livelihoods are strongly tied to agriculture, which is vulnerable to drought, rainfall variability and prolonged dry periods While agricultural systems are diverse, they remain sensitive to water stress Communities with limited livelihood diversification or reduced freshwater access show higher sensitivity	Public infrastructure access is generally strong, with most communities having access to health clinics, electricity, phone service, piped water, schools and public transport, which supports mobility, service access and emergency response Housing quality is improving, with many households upgrading to cyclone-resilient construction standards, reducing structural vulnerability during severe weather Road and transport networks provide reliable access to Korovou and other service centers, although some areas remain sensitive to localised flooding and erosion Water infrastructure is generally reliable due to piped systems and freshwater sources, but drought conditions can still place pressure on supply. Community facilities such as village halls and committee buildings support coordination, preparedness and recovery activities	Physical & Natural Capital: High agricultural potential, productive land and reliable freshwater availability strengthen resilience. Communities have good access to public infrastructure (health clinics, schools, electricity, phone service, transport) Human & Social Capital: Strong working-age population with carpentry and agricultural skills; active iYaubula committees, development committees, and women's and youth groups support coordinated decision-making Financial Capital: Livelihoods are diversified across farming, small businesses, formal employment and social welfare. High levels of remittances provide an important buffer during climate shocks. Natural Capital: Terrestrial ecosystems and freshwater systems support food production and reduce drought impacts



4.3 Nakorotubu District

Nakorotubu District is an amalgamation of seven sub-districts: Bureivanua, Bureiwai, Nakoilava, Mataso, Nakorotubu, Kavula, and Navitilevu. The present study was undertaken along the coastal areas of the district, focusing on the communities of Nadologoa, Nayavutoka, Nabuladra, Saioko, Nayavaira, and Nasau. Although most villages are located along the coast, land boundaries extend inland where farming and limited livestock grazing occur.

The district is largely dependent on subsistence livelihoods, mainly farming and fishing, with small-scale business and limited formal employment also contributing. Agricultural production is constrained by poor “talasiga” soils and rugged terrain, resulting in limited arable land. Women commonly sell produce in nearby towns such as Rakiraki and Korovou, while fish catches are sometimes sold through middlemen. Government social welfare support is significant, indicating a notable elderly population and some vulnerable households. Remoteness also supports small canteen-based businesses.

Natural resources are generally accessed equitably, with variation mainly driven by livelihood type, land ownership, and availability. The communities share similar environmental and socioeconomic risks, meaning vulnerability patterns are largely consistent across villages.

The total population of the seven villages is 662, with a higher proportion of males (58%) than females (42%). There is a strong working-age population (18–60 years), alongside some female-headed households and elderly people living alone. Community governance structures are present, including seven formal working groups (youth, women, environment, health, water, school, and church). While these groups exist across all villages, many require further capacity building and resources to function effectively.

4.3.1 Risk (exposure and sensitivity)

Communities in Nakorotubu face a broad and complex climate-risk profile shaped by their coastal location, rugged terrain and dependence on mixed farming and fishing. Although only a small proportion of the population is directly exposed to coastal inundation and wave damage from cyclones is very low, the district experiences high exposure to heat stress, very high projected drought by mid-century, and moderate increases in extreme heat and extreme rainfall days. Inland areas are exposed to landslides, river flooding and intense rainfall, with sediment loads increasing during heavy rain. Exposure to indirect cyclone impacts (associated with impacts on marine areas) is very high, even though direct cyclone-wave exposure is low.

Sensitivity is heightened by the district's reliance on subsistence farming and coastal fisheries, both of which are vulnerable to drought, rainfall variability and pest and disease outbreaks already being observed in crops. Agricultural production is constrained by poor talasiga soils, limited arable land and rugged terrain, reducing the ability of households to buffer climate shocks. Water contamination during high-rainfall periods further increases sensitivity. Remoteness, limited road access and the isolation of some settlements during extreme events amplify the district's overall vulnerability.

4.3.2 Resilience and Adaptive Capacity

Adaptive capacity in Nakorotubu is mixed, with several strong resilience factors but also structural constraints that limit longterm adaptation. Natural capital is a major strength: the district has high coral reef and seagrass extent, providing strong coastal protection and supporting fisheries-based livelihoods. Tree cover is moderate, and mangrove cover is present but not extensive. Freshwater availability and agricultural productivity potential are highly variable, with some communities having limited cultivable land and low cropland availability.

Social and institutional systems contribute positively to resilience. The district has seven active community working groups (youth, women, environment, health, water, school and church), though many require further capacity building to function effectively. Gender equality is relatively high, and both men and women participate in decision-making. TEK- remains important for hazard awareness and resource use, although there is concern about declining intergenerational transfer.

Human and financial capital are comparatively strong. Nakorotubu has a large working-age population, including skilled carpenters and fishers. Many households maintain disaster preparedness plans, and communities demonstrate high awareness of climate hazards. Trust in leadership is relatively strong, particularly in villages such as Nabukadra. Financial resilience is supported by access to government and civil-society assistance, remittances and, in some communities, the ability to save small but regular amounts of income. However, limited infrastructure, remoteness and constrained agricultural potential continue to restrict adaptive capacity in several villages.

A detailed breakdown of exposure, sensitivity and adaptive capacity indicators for Nakorotubu is provided in Table 4.3.

Nakorotubu District

Assessment Villages: Nadogoloa, Nabukadra, Nayavutoka, Saioko, Veidrala, Nasau, and Nayavuira



Overall vulnerability
MODERATE

Community locations



Coastal

Primary livelihoods



Fisheries



Agriculture



Employment/
business

Risk (exposure & sensitivity)



Cyclone, floods and
inundation
LOW



Agriculture production
impacts
MODERATE



Impacts on community
livelihoods
MODERATE



Marine ecosystem impacts
HIGH

Resilience & adaptive capacity



Coastal
protection
LOW



Freshwater
availability
LOW



Land-based
livelihoods
HIGH



Social mobility &
infrastructure
MODERATE



Marine
livelihoods
HIGH



Social & human
capital
HIGH



Forest cover
HIGH

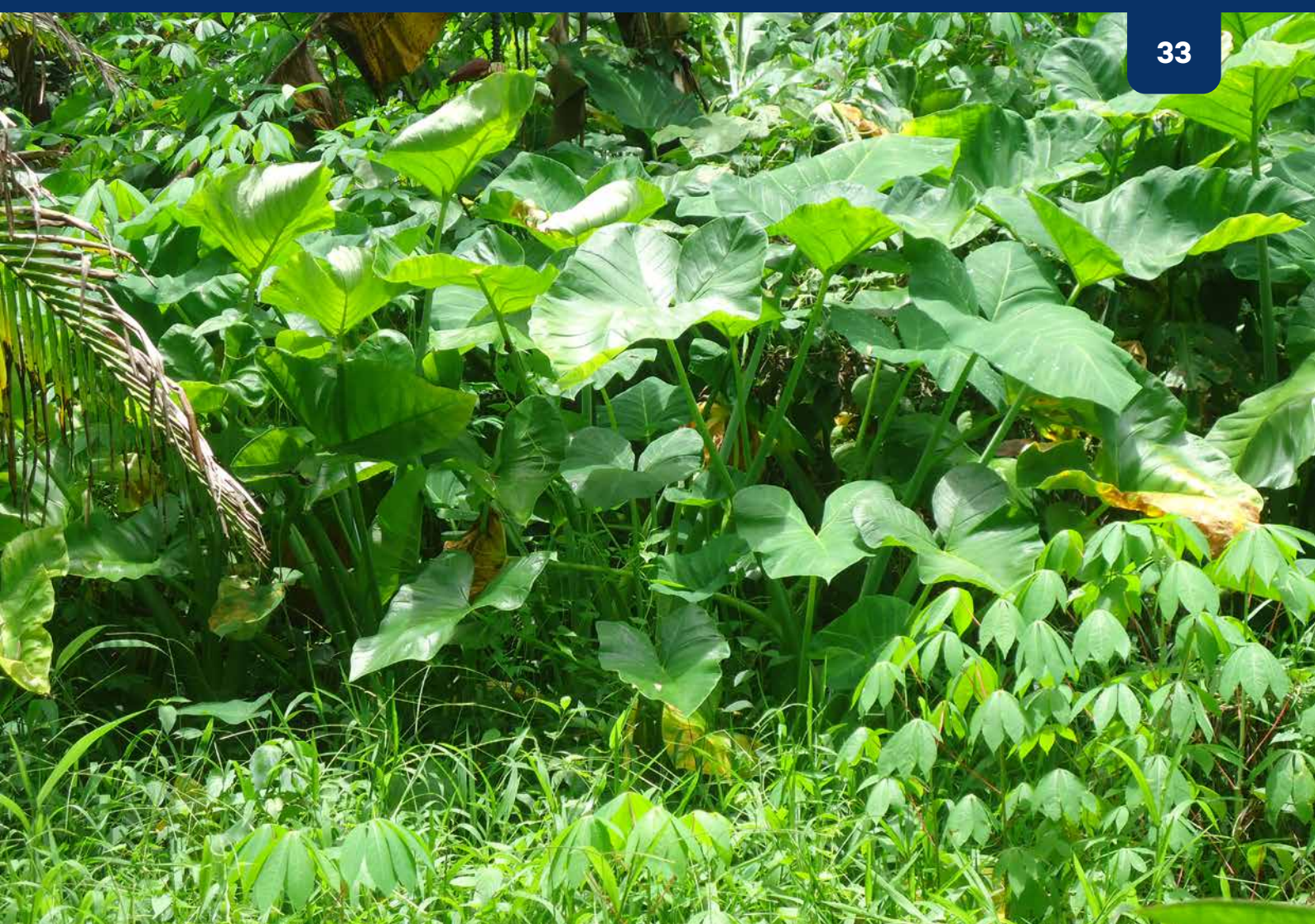


Financial capital
HIGH

Figure 4.3. Community risk and adaptive capacity within Nakorotubu District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)

Table 4.3. *Risks and resilience summary for Nakorotubu*

Risk		Resilience & Adaptive Capacity	
Exposure	Sensitivity	Infrastructure	Capital
Low exposure to coastal inundation and very low cyclone-wave damage High exposure to heat stress Very high projected drought Moderate increases in extreme heat and rainfall days Inland areas face landslides, river flooding, intense rainfall and high sediment loads Exposure to indirect cyclone impacts is very high	Strong dependence on mixed farming and fishing Agricultural production constrained by poor talasiga soils, limited arable land and rugged terrain Water contamination during heavy rainfall increases sensitivity Remoteness and limited road access heighten isolation during extreme events	Infrastructure constrained by remoteness, limited road access and terrain-driven isolation, which can restrict movement during heavy rain, landslides or flooding Water systems are vulnerable to contamination during high-rainfall events, when sediment enters supply lines Many community working groups require additional capacity and resourcing to function effectively Housing quality varies, though many households maintain disaster preparedness plans and undertake structural strengthening before cyclones	Physical & Natural Capital: High coral reef and seagrass extent provide strong coastal protection; mangrove cover present but limited Moderate tree cover Freshwater and agricultural potential are variable Human & Social Capital: Strong working-age population with carpentry and fishing skills; each community has multiple committees (youth, women, environment, health, water, school, church) High climate-hazard awareness; TEK still used but declining among youth; relatively high trust in leadership Financial Capital: Access to government and NGO support, remittances and small business income Some communities able to save regularly



4.4 Dawasamu District

Dawasamu is located on the northeast coast of Viti Levu in Tailevu Province and includes nine villages, four of which were involved in the community vulnerability assessment: Nasinu, Nataleira, Delakado, and Natadradave.

The district contains a mix of ecosystems, including grasslands, forests, mangroves, and freshwater systems. While communities are mostly coastal, livelihoods are strongly based on subsistence farming, with fishing as a secondary source. Farming includes both food crops (cassava, plantain, *duruka* (*Saccharum edule*)) and cash crops (such as *yaqona* (kava) and *dalo* (Taro)), alongside limited livestock grazing. Women also contribute through small-scale planting along riverbanks. Income is supplemented by small businesses, formal employment, and government social welfare, the latter indicating a significant elderly population. Produce is mainly consumed locally or sold in nearby towns such as Korovou, Nausori, and Suva, often through markets or middlemen. Remoteness and limited access to markets support small canteen-style businesses.

Environmental pressures are a key concern, particularly river gravel extraction in the Delakado River, which has increased sedimentation, reduced water quality, and negatively affected marine ecosystems and resources. Climate change is also making resource access more difficult. Despite this, resource use is generally shared across communities, with differences mainly linked to livelihood type, availability, and land access.

The population of the four villages is 554, with a slightly higher proportion of males (54%) than females (46%), and a strong working-age group. Some female-headed households and elderly people living alone are present. Community organisation includes men's, women's, and youth groups, as well as a iYaubula Management Committee and a development committee.

4.4.1 Risk (exposure and sensitivity)

Dawasamu communities face a diverse set of climate and environmental risks shaped by their coastal location, mixed ecosystems and dependence on farming and fisheries. Exposure to wave damage from cyclones ranges from very low to high, reflecting differences in coastal orientation and local geomorphology. Communities experience moderate to high increases in extreme-heat days, and drought exposure is projected to be high by mid-century, placing pressure on freshwater systems and crop production. Flood exposure varies widely, with some villages facing high flood risk from coastal flooding, particularly those near river mouths or low-lying coastal areas. Inland and coastal settlements are also exposed to erosion, storm surge, landslides and sedimentation, the latter intensified by river gravel extraction in the Delakado River.

Sensitivity is heightened by strong reliance on subsistence farming and coastal fisheries, both of which are vulnerable to drought, rainfall variability and saltwater intrusion. Farming systems depend on crops such as cassava, plantain, *duru* (*Saccharum edule*), yaqona (kava) and dalo (Taro), all sensitive to prolonged dry periods and soil degradation. Water contamination during heavy rainfall further increases sensitivity, while limited coral reef and seagrass extent reduces natural coastal protection. Remoteness and limited access to markets increase economic vulnerability, and many households rely on government social welfare, indicating the presence of elderly and vulnerable populations.

4.4.2 Resilience and Adaptive Capacity

Adaptive capacity in Dawasamu is moderate, supported by diversified livelihoods and active community governance, but constrained by infrastructure gaps and limited extent of and declining marine ecosystem health. The district benefits from moderate agricultural potential, high tree cover, which support food security and reduce drought impacts. Mangrove cover is moderate to high in some areas, providing partial coastal protection, although coral reef and seagrass extent are low, limiting offshore buffering capacity.

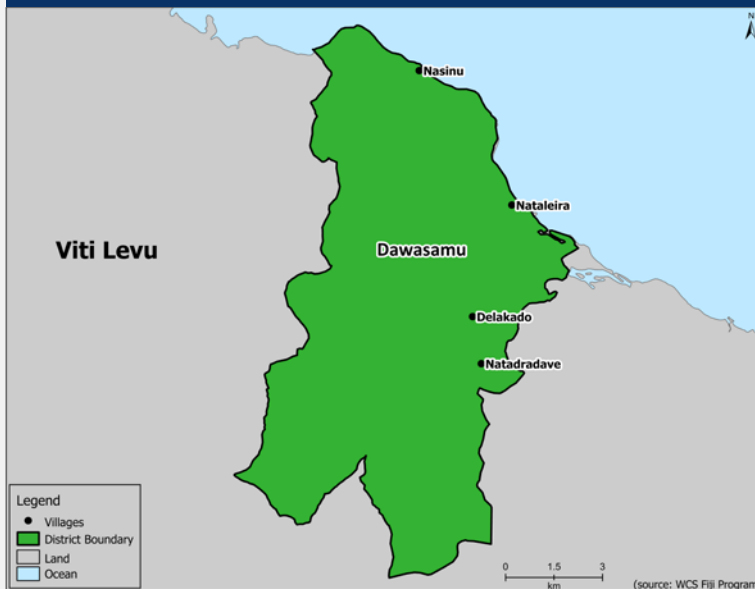
Social and institutional systems contribute positively to resilience. Communities maintain men's, women's and youth groups, as well as a iYaubula Committee and a development committee. TEK remains widely used for hazard awareness and resource management, though concerns exist about declining intergenerational transfer. Many households have disaster preparedness plans, and communities such as Nataleira and Natadradave show strong awareness of climate risks.

Human and financial capital are relatively strong. Dawasamu has a large working-age population, including skilled farmers and fishers. Livelihoods are diversified through small businesses, formal employment and market sales, and remittances provide an additional buffer. However, adaptive capacity is limited by infrastructure gaps, including the fact that only one village (Natadradave) has an evacuation center and many homes are not built to cyclone-resilient standards. Environmental pressures such as gravel extraction and sedimentation also undermine ecosystem-based resilience. Overall, Dawasamu's adaptive capacity is strengthened by its natural resources and community organisation but constrained by infrastructure limitations and declining coastal ecosystem health.

A detailed breakdown of exposure, sensitivity and adaptive capacity indicators for Dawasamu is provided in Table 4.4.

Dawasamu District

Assessment Villages: Nasinu, Nataleira, Delakado, and Natadrade



Overall vulnerability
MODERATE

Community locations



Coastal



Inland

Primary livelihoods



Fisheries



Agriculture



Employment/
business

Risk (exposure & sensitivity)



Cyclone, floods and
inundation
LOW



Agriculture production
impacts
LOW



Impacts on community
livelihoods
MODERATE



Marine ecosystem impacts
HIGH

Resilience & adaptive capacity



Coastal
protection
HIGH



Freshwater
availability
LOW



Land-based
livelihoods
MODERATE



Social mobility &
infrastructure
MODERATE



Marine
livelihoods
LOW



Social & human
capital
HIGH



Forest cover
MODERATE



Financial capital
HIGH

Figure 4.4. Community risk and adaptive capacity within Dawasamu District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)

Table 4.4. Risks and resilience summary for Darvasamu

Risk		Resilience & Adaptive Capacity	
Exposure	Sensitivity	Infrastructure	Capital
Exposure to wave damage from cyclones ranges from very low to high Moderate–high increases in extreme-heat days High projected drought by mid-century Flood exposure varies from low to high depending on proximity to river mouths and low-lying areas Communities face erosion, storm surge, landslides and sedimentation, with gravel extraction increasing river and marine sediment loads	Strong dependence on farming and fishing Crops sensitive to drought and rainfall variability Water contamination during heavy rain Low coral reef and seagrass extent reduces natural coastal protection Remoteness and limited market access increase economic vulnerability	Access to electricity, phone service, public transport and health facilities is generally good Only one village (Natadradave) has an evacuation centre Many homes are not cyclone-resilient, and public buildings are only beginning to be climate-proofed Water systems are vulnerable to sedimentation and contamination during heavy rainfall Road access is limited in some areas, increasing isolation during extreme events	Physical & Natural capital: High agricultural potential and freshwater availability Moderate–high tree cover Moderate–high mangrove cover but low coral reef and seagrass extent Human & Social Capital: Active men’s, women’s and youth groups; iYaubula and development committees Strong working-age population; TEK widely used but declining among youth; high hazard awareness in some villages. Financial Capital: Income from farming, small businesses, formal employment and remittances Government social welfare supports vulnerable households

4.5 Dama District – Tavulomo Village

Tavulomo village is located on the southwestern coast of Vanua Levu in Dama district, Bua Province. It is the only village (of seven) in Dama to be included in the fisheries vulnerability assessment. There are 41 households in Tavulomo with the population of 208, which has a slightly higher proportion of males (56%) than females (44%). They are mainly subsistence fishers and farmers.

The community drinking water is sourced from a solar powered bore hole. This bore hole does not work well during heavy rain, when soil run-off covers the water pump and limits its functions. During intense dry weather, the water committee regulates access to the bore. Community members use the Naruwai river, located beside the village, for other household purposes, such as bathing.

Intensive pine tree plantations and logging takes place along Naruwai river and estuary. Logging has led to an increase in landslides along the river and an increase in sedimentation of the river and coastal area.

The community fish within their *qoliqoli*, with fishers noting that there are now fewer and smaller fish than in the past. As a result, fishers have started moving further offshore to obtain their catch.

4.5.1 Risk (exposure and sensitivity)

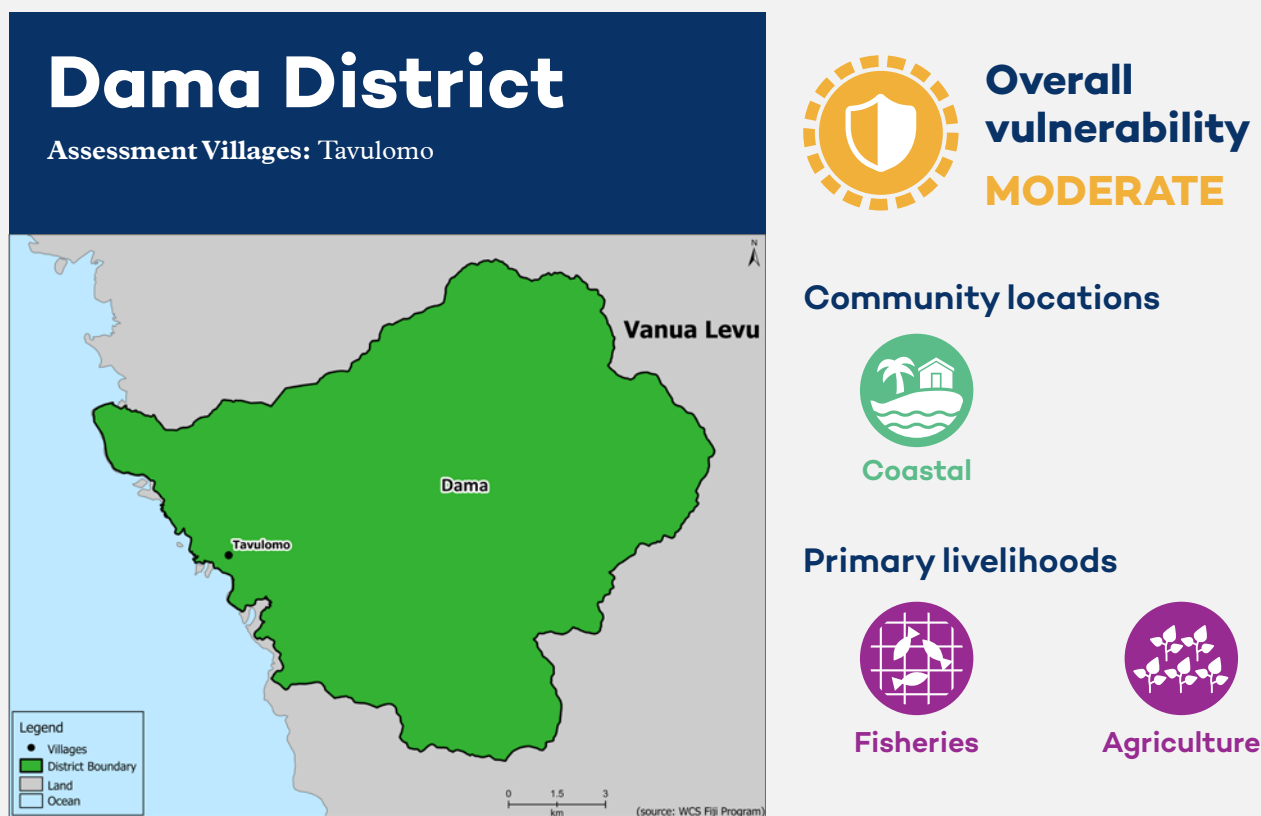
Tavulomo is exposed to cyclones, landslides and drought-related water shortages. The village relies heavily on fishing for income, making it sensitive to declining marine resources and changes in sea conditions. Water security is a persistent challenge: the solar-powered borehole fails during heavy rain when sediment covers the pump, and poor household piping systems limit reliability. During dry periods, the Naruwai River becomes the main water source, even as logging and pine plantations upstream increase landslide risk and cause river sedimentation.

4.5.2 Adaptive capacity/Resilience

Despite these pressures, Tavulomo demonstrates relatively strong adaptive capacity. Governance institutions are trusted, and community leaders are seen as responsive to climate issues. Tabu areas are functioning well, and gender equality in decision-making is high. Traditional knowledge remains active, and households are already adopting practical adaptation strategies such as planting disaster-resilient crops and securing homes before storms. Access to government financial support after disasters is strong, although reliance on civil society and remittances is limited.

Community recommendations for future adaptation actions include:

- Setting up a community disaster preparedness committee to coordinate post-disaster responses and resources from government and civil society.



Risk (exposure & sensitivity)



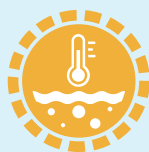
Cyclone, floods and inundation
MODERATE



Agriculture production impacts
LOW



Impacts on community livelihoods
HIGH



Marine ecosystem impacts
MODERATE

Resilience & adaptive capacity



Coastal protection
LOW



Freshwater availability
LOW



Land-based livelihoods
MODERATE



Social mobility & infrastructure
LOW



Marine livelihoods
HIGH



Social & human capital
HIGH



Forest cover
MODERATE



Financial capital
MODERATE

Figure 4.5. Community risk and adaptive capacity within Dama District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)

4.6 Bua District - Koroinasolo, Tacilevu & Waitabu

Bua district is located at the western tip of Bua Province. Three of seven villages in Bua district were included in the fisheries vulnerability assessment include Koroinasolo, Tacilevu and Waitabu. The population of each village is 290, 228 and 208 respectively.

Community members are mainly subsistence farmers and fishers. Koroinasolo relies more on its marine resources for their livelihood and food consumption and, over the years have seen a reduction in fish stock. Some areas near mangroves have deepened due to intensive storm surge or increased king tides. There is a dam that supplies water to the community. Dam water supply is affected during heavy rain as fills with sediment runoff that block the outlet. When there is drought, water supply is significantly affected. During these times, water is supplied by the government to the village.

Tacilevu and Waitabu villages are situated on flat land overlooking the sea, and both are exposed to similar hazards: storm surge, coastal flooding, storms and cyclones. With the intense disaster that occurs, the landscapes are mainly affected. Coastal mangrove forests have been extensively damaged by cyclones and therefore the marine species e.g. edible seaweed are no longer commonly found closer nearshore. The community now fish further offshore. There is also coastal erosion.

The other main problem in Tacilevu and Waitabu is water scarcity. During drought periods, the water source dries up and members of the two communities will often go to nearby settlements for water for drinking and other household activities.

4.6.1 Risk (exposure and sensitivity)

The communities assessed in Bua face rising heat stress and the direct impacts of tropical cyclones. Farmers report increased incidence of pests and diseases affecting crops. With many fishing communities, Bua is exposed to changes in sea temperatures and degradation of coastal ecosystems. Livelihoods depend heavily on farming and fishing, with Koroinasolo and Tacilevu particularly reliant on marine resources. Income diversity is low, and most households struggle to meet current needs, with limited capacity to save. Water systems are fragile: Koroinasolo's dam clogs with sediment during heavy rain and dries during drought, requiring government water deliveries. Tacilevu and Waitabu face coastal flooding, storm surge and erosion, with cyclone-damaged mangroves reducing natural protection and forcing fishers further offshore.

4.6.2 Resilience and Adaptive Capacity

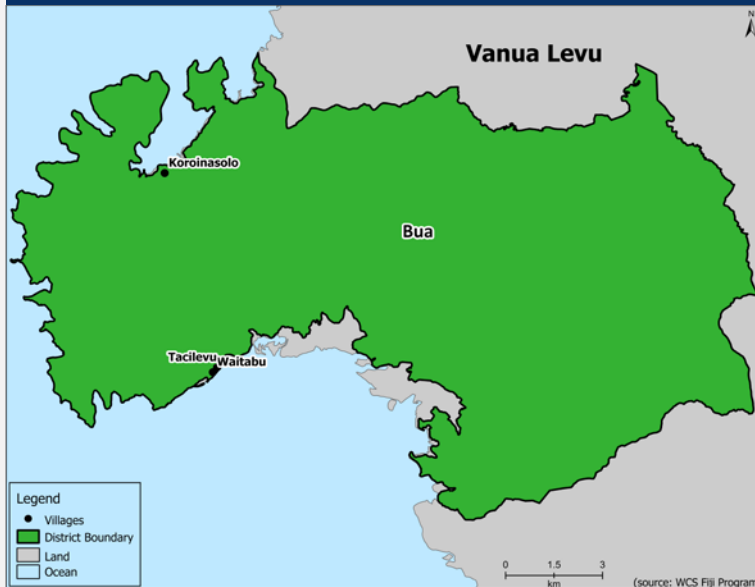
Adaptive capacity is mixed. People have differing views of governance institutions with some concerns that existing governance institutions are not necessarily effective, and limited belief that individuals can influence decisions, although gender equality remains high. TEK remains strong in some villages, especially Waitabu, and communities are already renovating homes, planting resilient crops such as kumala and tivoli, and attempting to budget for future disasters. These efforts show initiative, but limited income and weak institutions constrain longterm resilience.

Community recommendations for future adaptation actions include:

- Establishment of community DRM and climate change plans, mechanisms for disaster preparation, messaging and information.
- Community training on climate change awareness and adaptation action.
- Support for strengthening TEK, including documentation of existing TEK.

Bua District

Assessment Villages: Koroinasolo, Tacilevu and Waitabu



Overall vulnerability
HIGH

Community locations



Coastal

Primary livelihoods



Fisheries



Agriculture

Risk (exposure & sensitivity)



Cyclone, floods and inundation
MODERATE



Agriculture production impacts
HIGH



Impacts on community livelihoods
MODERATE



Marine ecosystem impacts
LOW

Resilience & adaptive capacity



Coastal protection
MODERATE



Land-based livelihoods
LOW



Marine livelihoods
LOW



Forest cover
LOW



Freshwater availability
MODERATE



Social mobility & infrastructure
MODERATE



Social & human capital
MODERATE



Financial capital
LOW

Figure 4.6. Community risk and adaptive capacity within Bua District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)

4.7 Wainunu District – Saolo Village

Wainunu district is located in Bua Province. Saolo village is the only village of seven in the district included in the fisheries vulnerability assessment. There are 30 households in Saolo village with a population of 154 with a higher proportion of females (51%) than males (49%). Communities are mainly subsistence farmers and fishers.

The village sits on a low slope to flat land, overlooking a bay, with houses largely constructed along the sloped land. Landslides and soil runoff are common around village. Tropical cyclones have led to large landslides and significant rates of sedimentation in the past, affecting mangroves and nearshore fisheries resources.

Monocropping is common in inland areas, and this is also affecting the marine environment through increased chemical use and run-off.

4.7.1 Risk (exposure and sensitivity)

Saolo is experiencing increasing crop pests, reduced agricultural yields and cyclone-driven landslides that increase sediment runoff into nearshore environments, damaging mangroves and impacting fisheries. Water supply is unreliable, and financial capital is extremely low — most households cannot meet current needs, and are struggling to save for the future. These factors heighten sensitivity to climate shocks, community risk and adaptive capacity within Wainunu District.

4.7.2 Resilience and Adaptive Capacity

Adaptive capacity is strengthened by relatively robust community infrastructure. The village has an evacuation centre, and key buildings such as the hall, school and church are built to withstand Category 5 cyclones. Many households are upgrading homes to similar standards. Income diversity is moderate, with small businesses and informal activities supplementing farming. Access to government and civil-society financial support after disasters is strong, and trust in leadership institutions is relatively high, although people feel less confident that their voices influence decisions.

Community recommendations for future adaptation actions include:

- Development of climate change adaptation plans, mechanisms for disaster preparation, messaging and information.
- Community training on climate change awareness and adaptation action.

Wainunu District

Assessment Villages: Saolo



Overall vulnerability
HIGH

Community locations



Coastal



Inland

Primary livelihoods



Fisheries



Agriculture

Risk (exposure & sensitivity)



Cyclone, floods and inundation
MODERATE



Agriculture production impacts
MODERATE



Impacts on community livelihoods
HIGH



Marine ecosystem impacts
HIGH

Resilience & adaptive capacity



Coastal protection
HIGH



Land-based livelihoods
MODERATE



Marine livelihoods
MODERATE



Forest cover
HIGH



Freshwater availability
MODERATE



Social mobility & infrastructure
LOW



Social & human capital
MODERATE



Financial capital
HIGH

Figure 4.7. Community risk and adaptive capacity within Wainunu District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)

4.8 Nadi District – Sawani Village

Nadi district is located along the south-western coastline of Bua Province. Sawani village is the only village of the four villages in Nadi to be included in the fisheries vulnerability assessment. There are 50 households in Sawani with a population of 229 individuals.

Deforestation is common in inland areas and is leading to soil erosion and increased sedimentation of local rivers – important freshwater sources when the village dam dries out in dry periods.

It has been observed that corals are dying, fish stocks have declined and fish size reduced. The village has implemented *tabu* areas with the aim to support marine ecosystem recovery.

4.8.1 Risk (exposure and sensitivity)

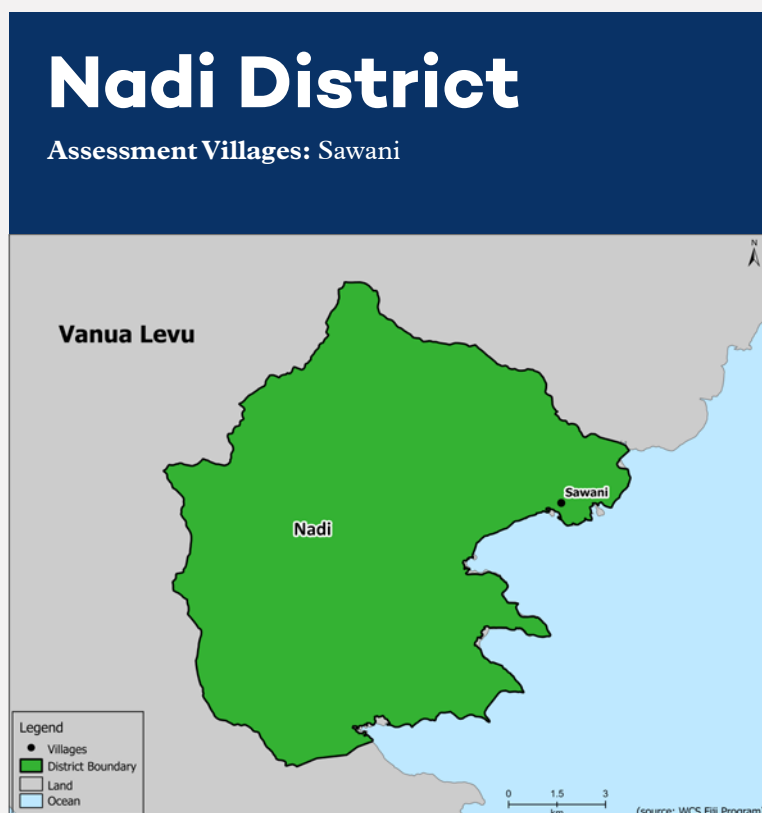
Sawani faces growing pressure from unsustainable fishing practices, declining marine health and limited water supply. When the main dam dries during drought, households rely on rivers that are increasingly affected by sedimentation from inland deforestation. Income diversity is low, with most households depending on farming and fishing. Inequality is emerging, with some households able to save while others cannot meet basic needs — a gap likely to widen under climate stress.

4.8.2 Resilience and Adaptive Capacity

Governance institutions are trusted, yet there is limited evidence to support effectiveness of *tabu* areas or strong resource-management systems. At the same time, Sawani shows relatively high levels of participatory decision-making, with many residents feeling their voices are heard in community discussions on climate issues. This provides a foundation for strengthening local governance and resource management over time.

Community recommendations for future adaptation actions include:

- Maintain and enforce marine and terrestrial protected areas.
- Extend water catchment infrastructure (more water tanks in the village to meet demand during long drought).
- Support to change farming practices, agroforestry, climate-smart agriculture and afforestation. Support gender equality/women's participation in community decision making.
- DRM training and support for preparation, including preparation of local health clinic (need for more medical supplies).



Overall vulnerability
MODERATE

Community locations



Coastal

Primary livelihoods



Fisheries



Agriculture

Risk (exposure & sensitivity)



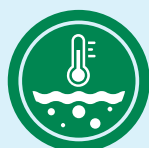
Cyclone, floods and inundation
MODERATE



Agriculture production impacts
HIGH



Impacts on community livelihoods
LOW



Marine ecosystem impacts
LOW

Resilience & adaptive capacity



Coastal protection
MODERATE



Land-based livelihoods
HIGH



Marine livelihoods
MODERATE



Forest cover
LOW



Freshwater availability
HIGH



Social mobility & infrastructure
MODERATE



Social & human capital
HIGH



Financial capital
MODERATE

Figure 4.8. Community risk and adaptive capacity within Nadi District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)

4.9 Wailevu District – Natuvu, Vatuele & Urata

Wailevu district is located in Cakaudrove Province, along the southeastern coastline of Vanua Levu. Three (out of nine) villages from the district were included in the fisheries vulnerability assessment: Natuvu, Vatuele and Urata. All are coastal villages, with Urata located along the main highway to Savusavu town, making it accessible to good roads and infrastructure.

The main water source for Urata derives from an open-air water catchment, which is usually affected by soil erosion from the hilltop, littering and intensive use of agricultural chemicals.

Coastal and land erosion and chemical run-off are also common problems facing Natuvu village. These chemicals are affecting coastal ecosystems, in particular local seagrass beds which provide critical feeding areas for other marine species. Coral bleaching has also been observed. This may also be due to the increased water temperatures and marine heatwaves, and unsustainable land use practices.

All three villages are highly exposed to cyclones, storm surge and coastal flooding. During a recent tropical cyclone, Vatuele village lost most of its housing infrastructure, fishing vessels and agricultural crops.

4.9.1 Risk (exposure and sensitivity)

Wailevu's coastal communities are experiencing crop failure, changing wave patterns, coastal erosion and widespread degradation of marine ecosystems, including coral die-off and habitat loss. Farming and fishing remain the main income sources, supplemented by government welfare and remittances for about half the population. Income inequality is pronounced, especially in Natuvu, where a large share of households cannot meet basic needs.

4.9.2 Resilience and Adaptive Capacity

Social and cultural adaptive capacity is comparatively strong. Tabu areas are present, and trust in leadership institutions is high, particularly in Vatuele, where people feel able to participate in climate-related decision-making. Access to post-disaster financial support is diverse, with communities drawing on government funds, civil-society assistance and remittances. Traditional knowledge remains active, especially in Natuvu, where there is interest in reviving customary practices and expanding tabu areas. Community infrastructure is also strong: all three villages have evacuation centres and climate-resilient public buildings, and many households are already renovating homes and planting climate-resilient crops.

Community recommendations for future adaptation actions include:

- Erosion control mechanisms, along rivers and coastal areas.
- Climate-smart agriculture, agroforestry.
- Extend mangrove restoration.
- DRM training and support for preparation, including preparation of disaster foods. evacuation centers.
- Support equality, diversity and women's participation in community decision making.
- Strengthening relationships with key government departments (e.g. DISMAC).
- Enforcement of tabu and other protected areas.

Wailevu District

Assessment Villages: Natuvu, Vatulele, Urata



Overall vulnerability
HIGH

Community locations



Coastal

Primary livelihoods



Fisheries



Agriculture

Risk (exposure & sensitivity)



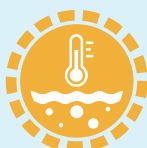
Cyclone, floods and inundation
LOW



Agriculture production impacts
MODERATE



Impacts on community livelihoods
HIGH



Marine ecosystem impacts
MODERATE

Resilience & adaptive capacity



Coastal protection
LOW



Land-based livelihoods
MODERATE



Marine livelihoods
LOW



Forest cover
HIGH



Freshwater availability
LOW



Social mobility & infrastructure
MODERATE



Social & human capital
HIGH



Financial capital
HIGH

Figure 4.9. Community risk and adaptive capacity within Wailevu District. (Risk and adaptive capacity indicators are summary indicators - see Annex D for detail)



5. Vulnerability Assessment of the Vatu-i-Ra Seascape

5.1 National Climate Vulnerability Context

To contextualise the findings of this assessment, a national-scale CVA was conducted across all 182 administrative districts in Fiji using the same indicator framework and composite scoring approach described in Section 3 (Exposure Index divided by Adaptive Capacity Index, log-transformed and rescaled 0–1). Refer to indicators in Annex A. This national baseline provides an objective benchmark against which the relative vulnerability of Vatu-i-Ra Seascape districts can be assessed.

Nationally, climate vulnerability is unevenly distributed across Fiji's 182 districts (Figure 5.1). Districts in the Lau archipelago and Cakaudrove Province record the highest overall vulnerability, driven by very high exposure to cyclones, coastal inundation, and thermal stress on coral reefs, combined with very low adaptive capacity reflecting geographic isolation and limited access to freshwater, agricultural land, and services. At the other end of the spectrum, inland districts of Viti Levu record the lowest vulnerability, benefiting from reduced coastal exposure and relatively high adaptive capacity (Figure 5.1 and Figure 5.2).

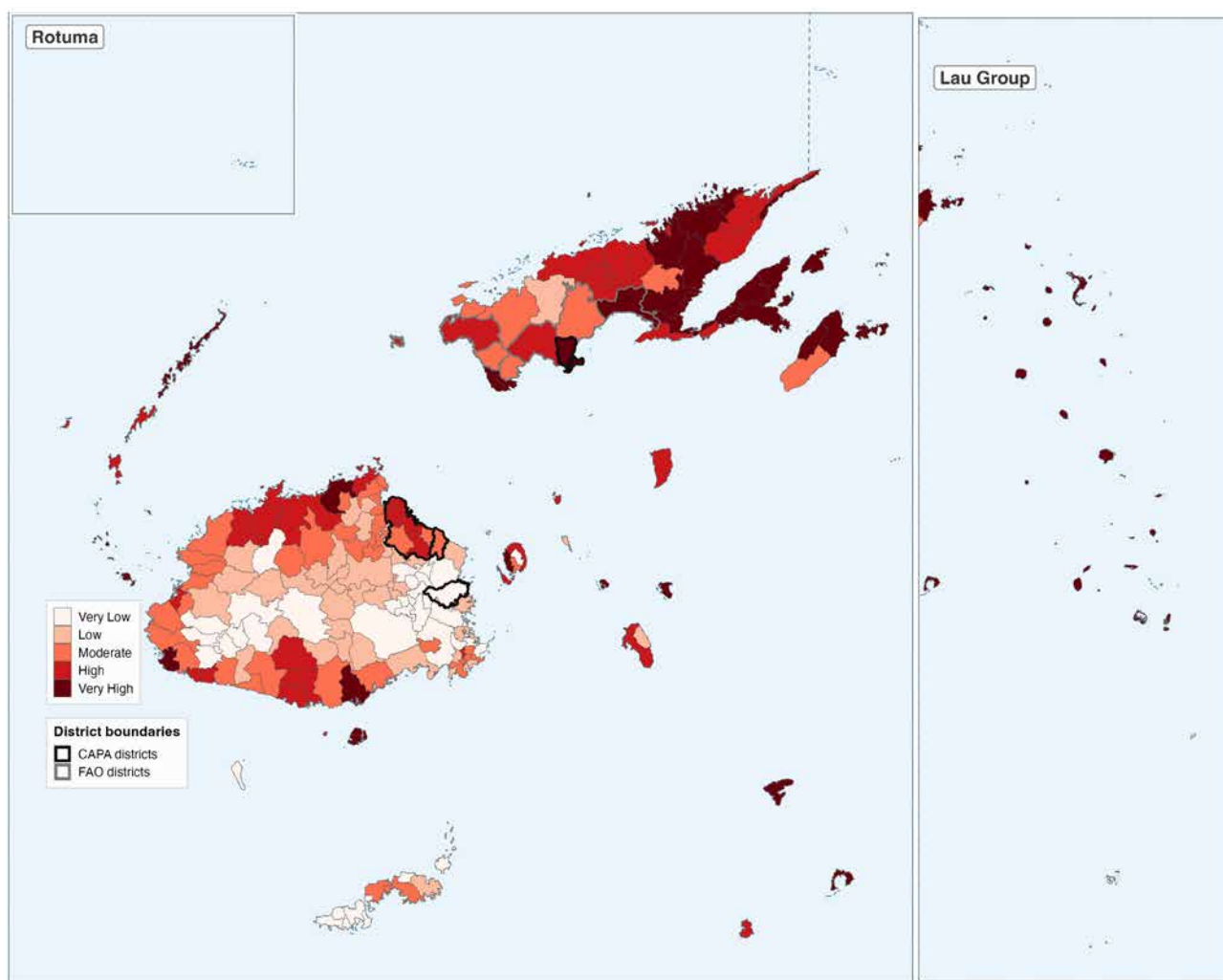


Figure 5.1. National distribution of climate vulnerability across Fiji's 182 administrative districts.

Climate Vulnerability Index rescaled 0–1 (higher values = greater vulnerability). CAPA project districts are outlined in black; FAO assessment districts are outlined in grey. The inset shows the Lau and Lomaiviti island groups. Districts in the remote eastern Lau archipelago are among the most vulnerable nationally.

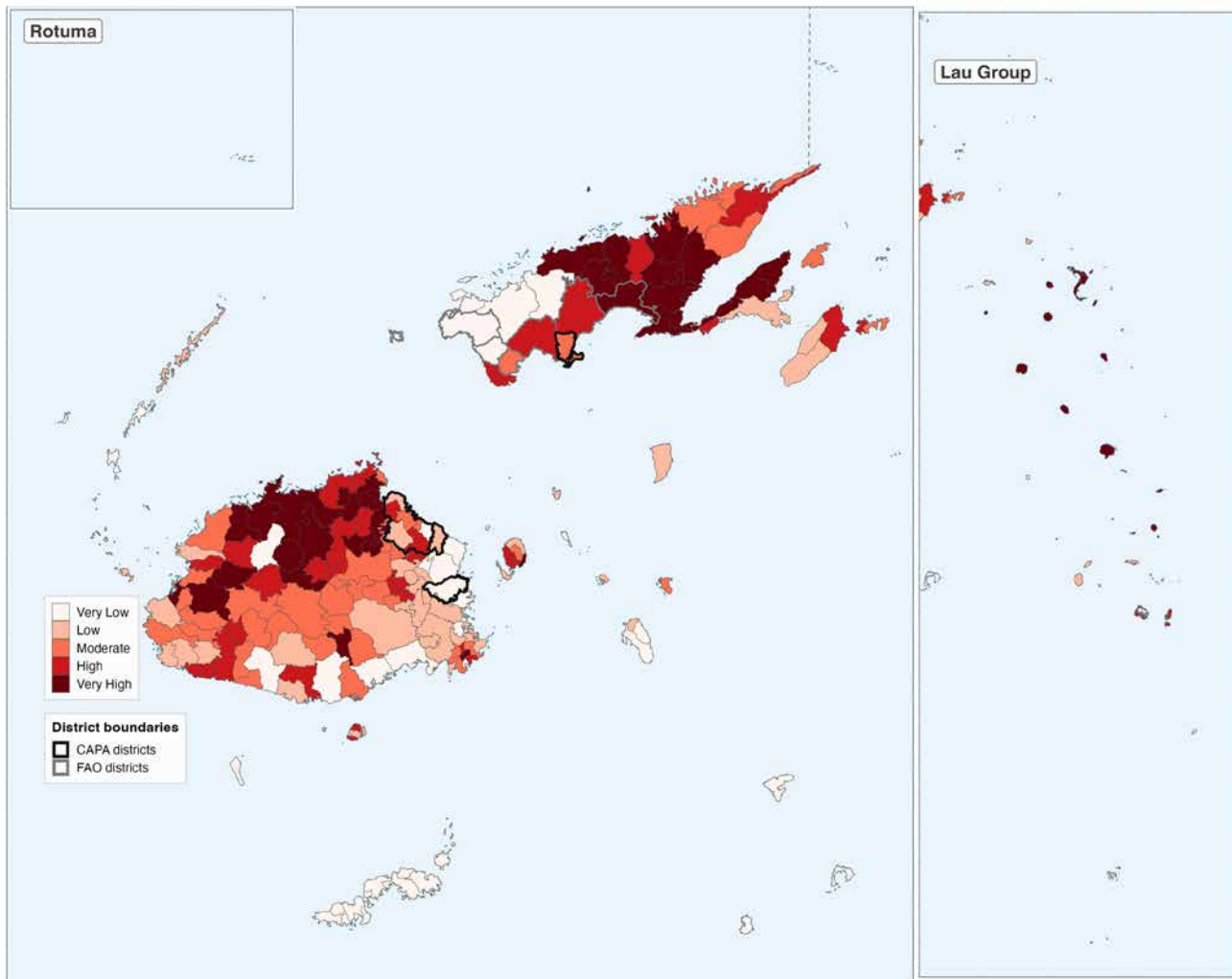


Figure 5.2. National distribution of composite climate exposure across Fiji's 182 administrative districts. Climate Composite Index calculated as mean climate exposure across all indicators, rescaled 0–1 (higher values = greater exposure).

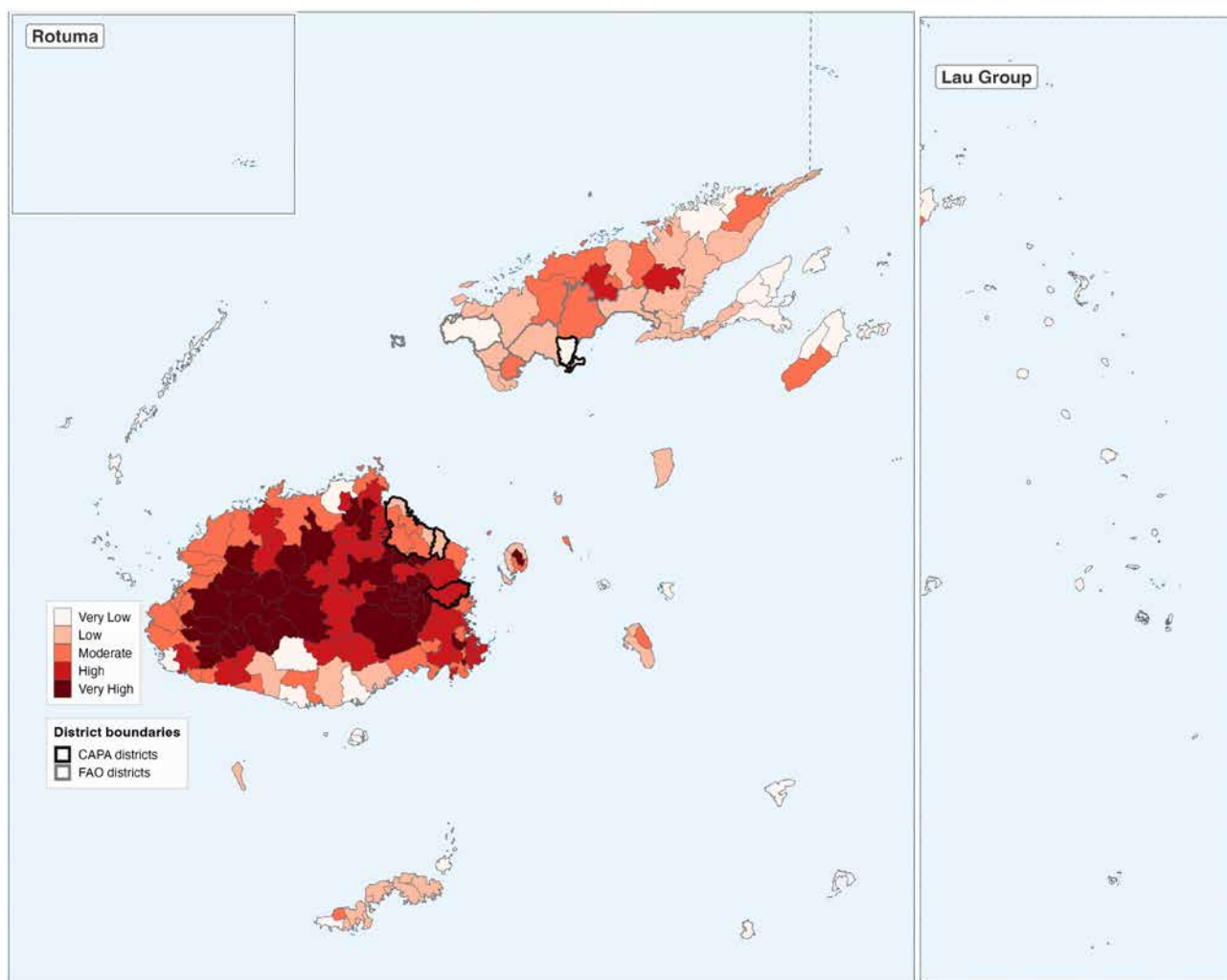


Figure 5.3. National distribution of composite adaptive capacity across Fiji's 182 administrative districts. Climate Composite Index calculated as mean adaptive capacity across all indicators, rescaled 0–1 (higher values = greater adaptive capacity).

Nationally, the median Climate Vulnerability Index is 0.23 (on a 0–1 scale, where 0 = least vulnerable and 1 = most vulnerable) and the mean is 0.25 (see Figure 5.3).

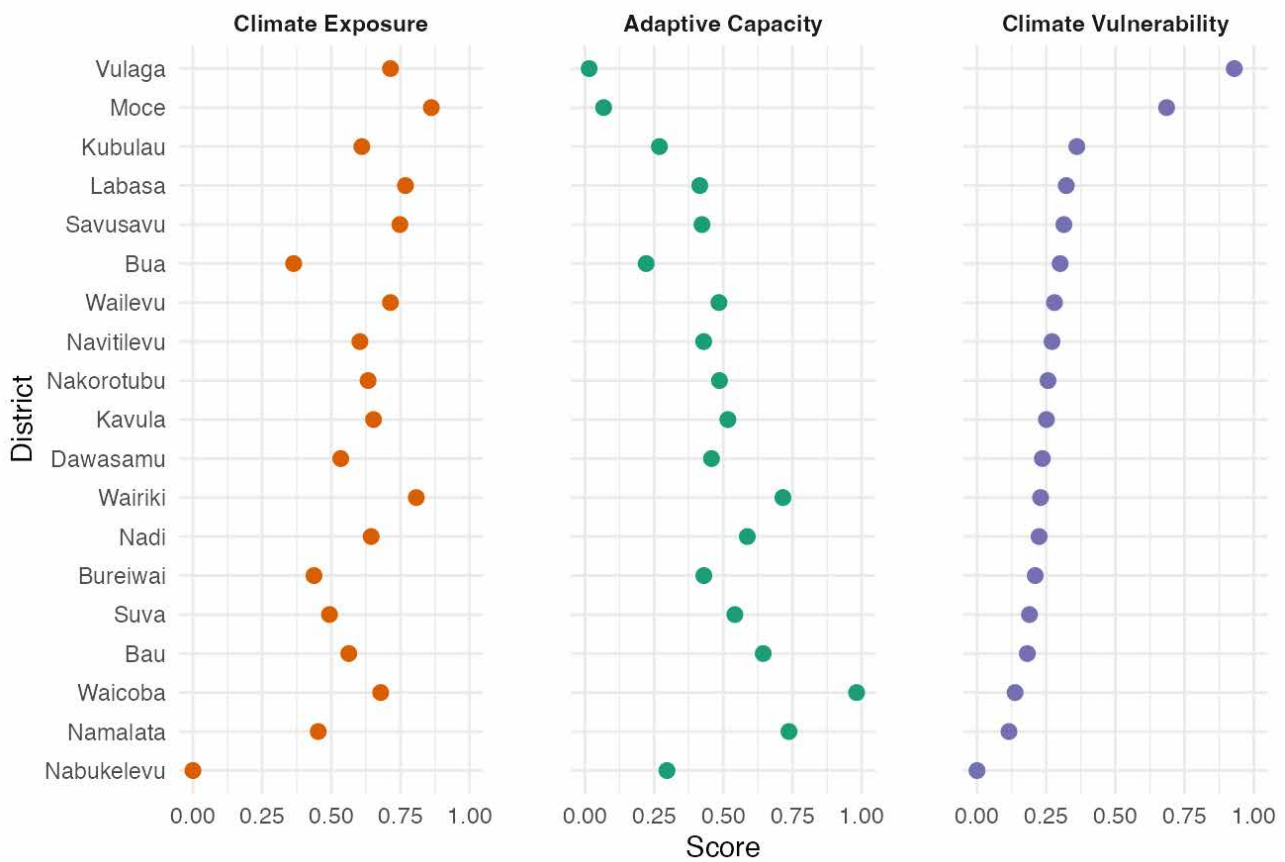


Figure 5.4. Climate exposure, adaptive capacity, and climate vulnerability scores for a subset of districts.

Eight of the nine districts analysed in the community and fisheries vulnerability assessments rank above the national median vulnerability score (0.23), and the mean Climate Vulnerability Index across the Seascapes (0.26) exceeds both the national mean (0.25) and median (Table 5.1). This elevated vulnerability is driven primarily by below-average adaptive capacity across Seascapes districts (mean 0.46, compared to a national average of 0.56), rather than substantially higher climate exposure. Kubulau is the most vulnerable Seascapes district nationally (rank 21/182; 88th percentile), followed by Wailevu East (29/182; 84th percentile), Bua (40/182; 78th percentile), and Wainunu (46/182; 75th percentile). Dama, Nakorotubu, Dawasamu, Wailevu West, and Nadi sit close to or just above the national median, while Namalata stands apart as among the least vulnerable districts nationally (173/182; 5th percentile) owing to its comparatively high adaptive capacity.

Table 5.1. Climate vulnerability indices and national ranking for Vatu-i-Ra Seascape districts.

District	Exposure Index	Adaptive Capacity Index	Vulnerability Index	National Rank	Assessment
Kubulau	0.61	0.27	0.36	21 of 182	Community
Wailevu East	0.83	0.42	0.33	29 of 182	Fisheries
Bua	0.36	0.22	0.30	40 of 182	Fisheries
Wainunu	0.71	0.46	0.29	46 of 182	Fisheries
Wailevu West	0.70	0.56	0.25	75 of 182	Fisheries
Nadi	0.64	0.59	0.22	94 of 182	Fisheries
Dama	0.50	0.41	0.24	82 of 182	Fisheries
Nakorotubu*	0.62	0.51	0.24	83 of 182	Community
Dawasamu	0.53	0.46	0.24	87 of 182	Community
Namalata	0.45	0.74	0.12	173 of 182	Community
Vatu-i-Ra Seascape average	0.58	0.46	0.26	–	–
National average (182 districts)	0.62	0.56	0.25	–	–

All indices rescaled 0–1 (higher = greater exposure or vulnerability; lower = greater adaptive capacity). Districts shaded blue rank in the top quartile nationally. Community = Community vulnerability Assessments (CAPA project); Fisheries = Fisheries-focused vulnerability assessment (FAO project).

* Nakorotubu covers 7 national sub-districts (Bureivanua, Bureivai, Kavula, Mataso, Nakorotubu, Nakuailava, Navitilevu); values are unweighted means.

5.2 Vulnerability across the Seascape

All communities in the Vatu-i-Ra Seascape are inherently exposed to climate risk. Their level of exposure is highly influenced by the location of villages, resource dependence and environmental characteristics. Across the assessment, the main climate-related risks include sea-level rise, coastal erosion, flooding, storm surge, drought and cyclones. The assessment identifies several common drivers of vulnerability across the Seascape (Table 5.2).

Communities located close to the coast are generally the most vulnerable because they are simultaneously highly exposed to sea-level rise, storm surge, erosion and cyclones, heavily dependent on fisheries and coastal agriculture, reliant on healthy reefs, mangroves and freshwater systems for food security and livelihoods, and are constrained by limited or poor infrastructure, freshwater security and market access (See Box 1).

Inland communities tend to experience lower direct coastal exposure but are increasingly vulnerable to drought, heat stress, rainfall variability causing flooding and freshwater shortages and declining agricultural productivity (See Box 2).

Box 1 Case Study – Kubulau

Kubulau's communities experience a complex mix of climate related risks, influenced by their coastal setting, reliance on natural resources, and limited infrastructure. Coastal villages are highly exposed to sea level rise, storm surge, coastal erosion, and coral reef degradation, with projections showing substantial increases in extreme heat days across the district. Sensitivity is heightened by the district's strong dependence on fishing, coastal harvesting, and subsistence agriculture, combined with low agricultural land potential in most villages and widespread reliance on rainwater for drinking, which becomes unreliable during prolonged dry periods.



Natural capital is a major source of resilience. Extensive mangrove systems, the Namena Marine Reserve and the Kilaka Forest Conservation Area provide ecological buffers, maintain biodiversity and support fisheries productivity. These ecosystems underpin food security and livelihoods, and their health contributes directly to the district's capacity to absorb climate related shocks.

Traditional leadership remains central to decision making with the Kubulau Resource Management Committee, and TEK is implemented in NRM, particularly in relation to harvesting practices, species identification and seasonal patterns, which strengthens the district's ability to anticipate and respond to environmental change. Current community climate adaptation actions include upgrading cyclone-resistant housing, afforestation and nursery establishment, and planting of climate resilient crops (e.g. uto, vudi, tivoli). Future proposed adaptation measures include, enhancing existing community-managed tabu's, and expanding mangrove, seagrass and reef restoration programs to buffer climatic impacts and increase food and livelihood security. Other measures include enhancing existing water collection measures, agroforestry and afforestation efforts that target erosion, and supporting future diversification of livelihoods.

Box 2 Case Study – Namalata

Communities in Namalata experience a distinct climate-risk profile influenced by the geographical mostly inland location, terrestrial ecosystems and mixed livelihood base. Some coastal communities are highly exposed to the climate risks, whereas inland communities show lower exposure to heat stress and extreme-heat days, but high exposure to drought and cyclone impacts. Agriculture is the primary livelihood, supported by freshwater harvesting and small-scale resource use. While agricultural systems are diverse, they remain vulnerable to climate related drought, rainfall variability and prolonged dry periods, which can reduce yields and affect food security.

Namalata is a good case study to highlight strong community led initiatives in implementing proactive adaptative measures. Currently, cyclone resilient housing upgrades are underway, with many households strengthening structures to withstand severe storms. Tree and vetiver planting are being used to strengthen soil stability to reduce erosion. In addition, bamboo planting along roadsides is aiming to reduce erosion of roads. Climate resilient crops (e.g., cassava, dalo, yaqona, leafy greens) are being adopted to maintain food security under variable rainfall and drought. There are active community committees for natural resources (Yabula), water, health, and development that are able to support coordinated preparedness and response to impacts from natural hazards. Hazard reduction practices are being implemented locally such as clearing drains, securing houses before cyclones and maintaining access routes are routinely carried out. These activities help Namalata district have high adaptive capacity scores (Figure 5.1, Table 5.1) compared to most other districts.

Future adaptation actions proposed include increased community training on the potential impacts of climate change, natural resource management, protection, health and well-being, and financial literacy. Enhancement of existing food and livelihood security by implementing agroforestry systems and afforestation inland to improve soil stability and drought resilience, and small-scale, community-led watershed and flood protection rehabilitation to reduce impacts from flooding. Lastly, consideration of the possibility of relocating houses away from coastal hazard zones.



Ecosystem condition is a critical determinant of resilience throughout the Seascape. Healthy mangroves, reefs, seagrass systems and forests provide natural coastal protection, support fisheries productivity and strengthen food security, while ecosystem degradation significantly increases vulnerability. Overall, vulnerability is strongly influenced by the interaction between current environmental conditions, livelihood dependence on natural resources, and the strength of local social and institutional systems. Common drivers and sources of vulnerability across the Seascape are shown in Table 5.2.

Exposure is intensified where communities depend heavily on climate-sensitive livelihoods such as fishing, marine harvesting and coastal agriculture, with most communities in the Seascape relying heavily on farming and fishing. However, exposure alone does not determine vulnerability; communities with stronger social cohesion, diversified livelihoods, healthier ecosystems and better access to resources demonstrate greater resilience.

Communities with healthier natural ecosystems — particularly coral reefs, mangroves and coastal forests — tend to have lower vulnerability because these systems provide natural protection from waves, flooding and erosion while also supporting food security and livelihoods. These ecosystems reduce wave energy and erosion, buffer storm impacts, support fisheries productivity, improve water and food security and sustain livelihoods. Communities with strong traditional knowledge, social networks and mobility also show higher adaptive capacity (see Box 1).

In contrast, settlements with degraded ecosystems, limited infrastructure, weak governance, fewer livelihood alternatives or restricted access to resources are consistently more vulnerable (See Box 3).

Box 3 Case Study – Bua

Communities in the villages of Koroinasolo, Tacilevu and Waitabu depend strongly on subsistence farming and fishing, relying heavily on marine resources. Income diversity is low and basic water systems are fragile. Koroinasolo's dam clogs with sediment during heavy rain and dries during drought, requiring government water deliveries. Tacilevu and Waitabu face coastal flooding, storm surge and erosion, with cyclone damaged mangroves reducing natural protection and forcing fishers further offshore. Communities are implementing few climate adaptive measures like planting resilient crops such as kumala and tivoli, however, limited income and weak institutions constrain long term resilience. Future community recommendations for future adaptation actions include establishment of community committees for NRM, mechanisms for disaster preparation, community training on climate change awareness and adaptation action, and support for strengthening TEK.



Access to markets and services also shapes vulnerability. For example, Nakorotubu and Dawasamu are more remote, with longer distances to markets and reliance on middlemen, increasing post-disaster recovery challenges and reducing income stability. Namalata is better connected due to proximity to Korovou meaning easier access to market and services.

Demographic structure adds another layer of vulnerability. All districts have significant working-age populations with many individuals skilled in carpentry or other similar skills important in climate-proofing and rebuilding housing and community infrastructure. All districts also have notable elderly populations supported through social welfare, along with female-headed households. These groups are typically more exposed during disasters and have fewer resources for recovery. However, the presence of active community groups (women, youth, and resource management committees) across all districts strengthens social cohesion and local response capacity, which can reduce vulnerability when effectively supported. Elderly populations are, in most communities, the holders of TEK and can help community members observe and make sense of environmental changes.

Financial capital also plays an important role, particularly in communities' abilities to save and plan for future needs as well as their ability to recover from disasters. For most communities across the Seascope, household incomes are insufficient to allow for savings, reducing their ability to carry out simple yet proactive adaptation strategies such as renovating houses to withstand category 4 and 5 tropical cyclones and trialling new crop varieties.

Governance and natural resource management capacity is a major point of difference. Kubulau stands out with strong conservation governance structures and active partnerships supporting ecosystem protection, which increases resilience. Namalata and Dawasamu also have established committees, but many groups require capacity building and awareness training. Nakorotubu appears more limited in organisational capacity and resource availability, which may reduce its ability to coordinate adaptation and disaster response effectively. The quality of infrastructure also varies across communities. Climate-proofing community shelters and other public infrastructure are critical, as well as the relocation of critical infrastructure (roads, wells) away from coastal or other hazardous areas.

Importantly, communities are already responding to climate hazards and impacts. However, most existing hazard reduction strategies focus on a small subset of possible strategies and target only a discrete number of climate risks; namely tropical cyclones and droughts/water reduction. These are mostly individual responses and can drain household income and savings. Collective and proactive responses are needed at the district or seascope level.

Overall, the findings suggest that vulnerability across the Seascope is unevenly distributed both within and between districts. The most resilient communities are those combining healthy ecosystems, diversified livelihoods, strong social cohesion and access to resources, while the most vulnerable are those facing multiple overlapping pressures from environmental change, economic dependence and limited adaptive capacity.

The most consistent sources of vulnerability across all districts are the combination of livelihood dependence on natural resources, ecosystem degradation, coastal settlement patterns, and uneven adaptive capacity (especially infrastructure, services and governance strength). These interacting factors amplify climate exposure and explain why some communities remain highly vulnerable even when hazard levels are similar. The findings also highlight the value in NbS which can both reduce risk and strengthen adaptive capacity.

This is consistent with results from the recent coastal inundation modelling, regarding the importance of mangroves, coral reefs and other forms of coastal protection in reducing exposure and increasing the adaptive capacity of coastal communities. Mangroves, seagrass and reefs that are extensive and stable confer high levels of protection (Figure 5.5, Figure 5.6).

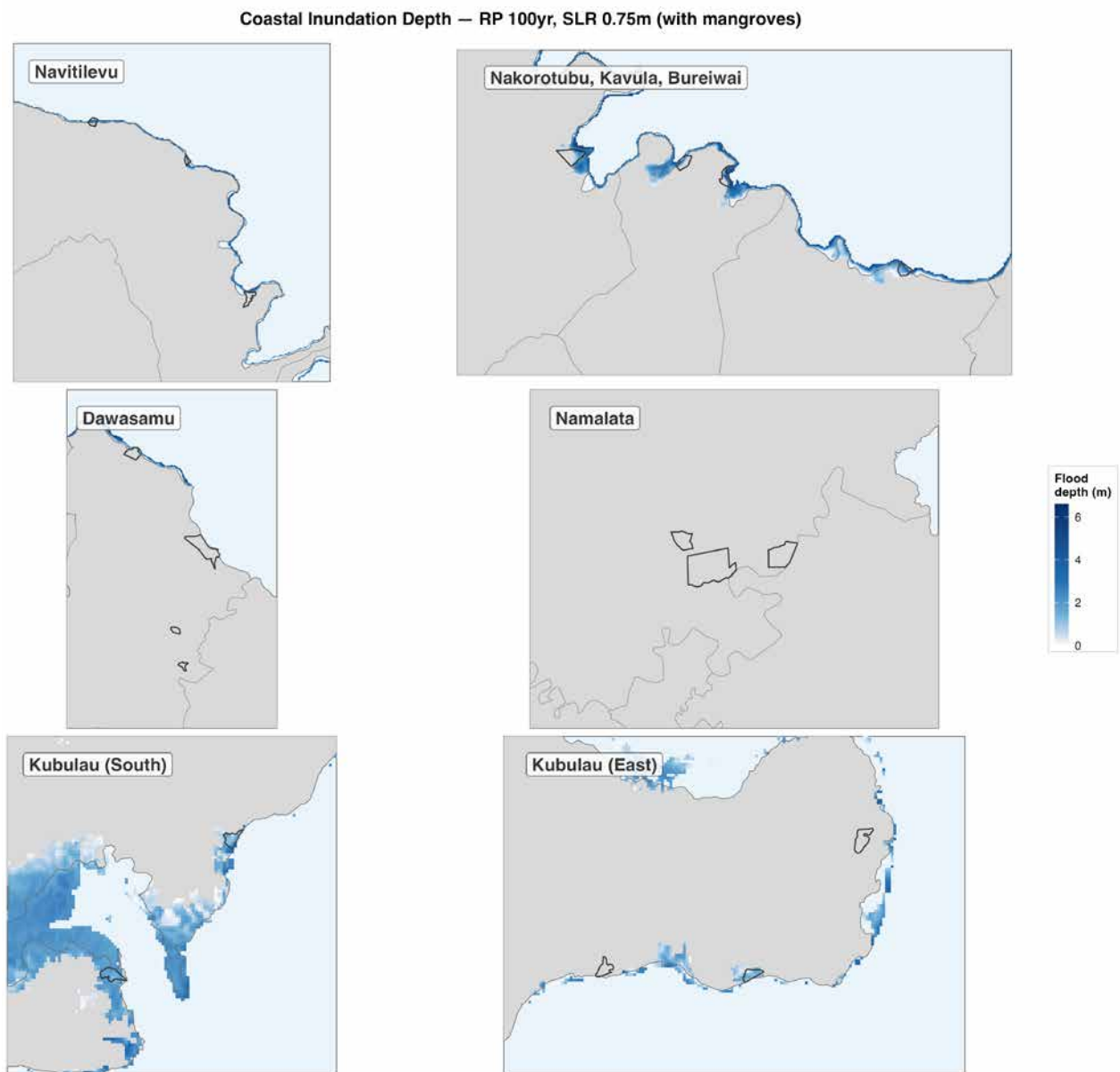


Figure 5.5. Probabilistic coastal inundation maps for selected communities corresponding to the 100-year return period under a +0.75 m sea-level rise scenario, including existing mangrove coverage.

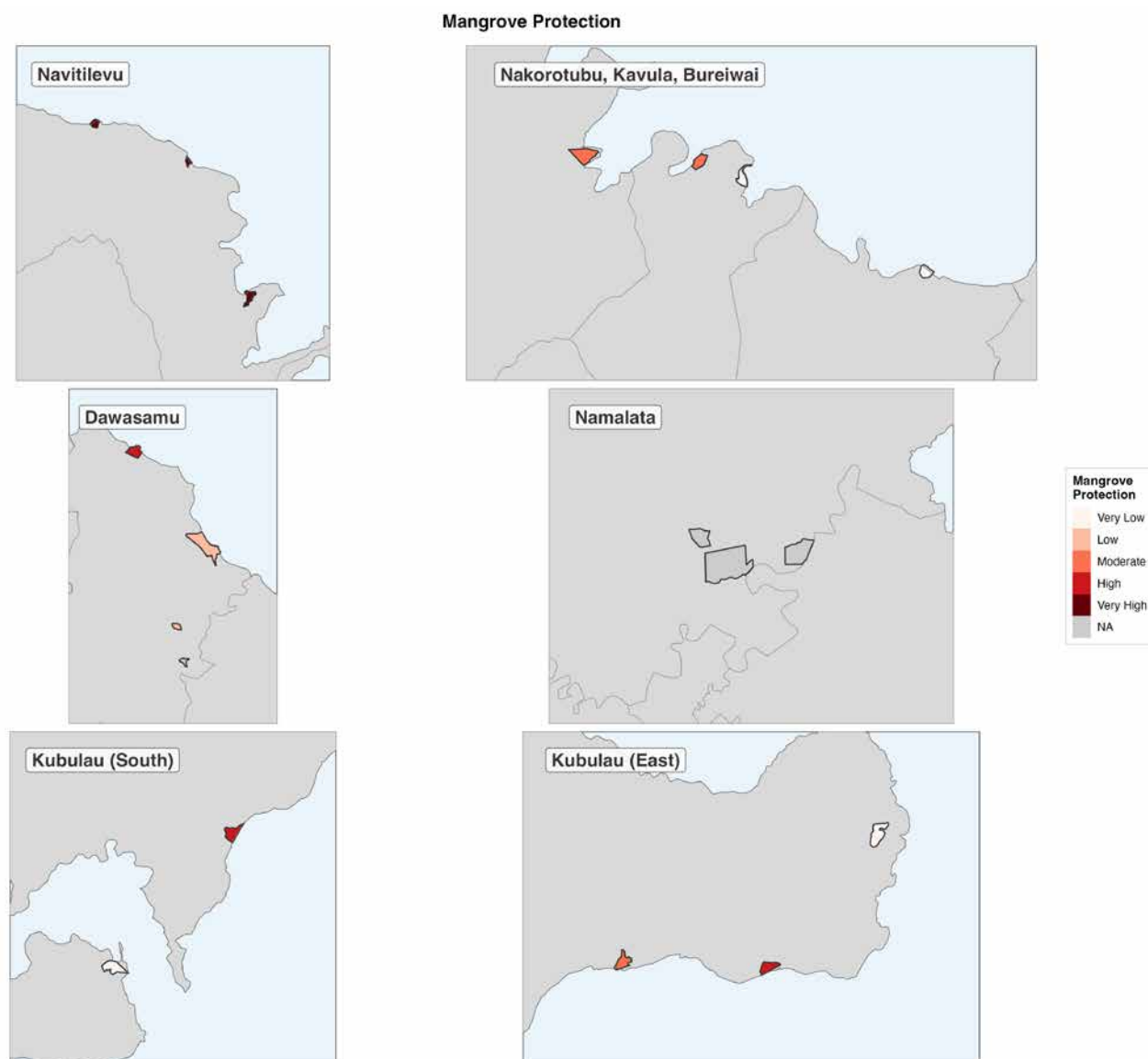


Figure 5.6. Maps of the contribution of mangrove ecosystems to coastal inundation reduction for selected communities.

Table 5.2. *Drivers of vulnerability across the Seascape*

Main driver / source of vulnerability	Effect across the seascape
Dependence on climate-sensitive livelihoods	Fishing, subsistence farming and coastal harvesting are highly sensitive to drought, changing rainfall, reef decline and sea conditions, increasing food and income insecurity.
Exposure of settlements in low-lying coastal areas	Coastal villages face increasing risks from flooding, erosion, storm surge, sea-level rise and cyclones.
Ecosystem degradation	Declining coral reefs, mangroves, seagrass systems and catchments reduce natural protection and weaken fisheries and freshwater systems.
Water insecurity	Drought, sedimentation and reliance on rainwater or vulnerable freshwater systems increase stress on households and agriculture.
Limited livelihood diversification	Communities with few alternative income sources are less able to absorb climate shocks.
Uneven infrastructure and service access	Limited evacuation centres, roads, resilient housing, transport and health services reduce preparedness and recovery capacity.
Remoteness and isolation	Remote communities often experience delayed emergency response and reduced market access.
Poor soils and limited agricultural land	In several districts, environmental limitations constrain agricultural adaptation and livelihood diversification.
Sedimentation and catchment degradation	Logging, gravel extraction and erosion damage freshwater systems, reefs and fisheries habitats.
Weak or uneven governance capacity	Vulnerability increases where customary governance and community organisation are weaker.
Declining transfer of TEK	Reduced intergenerational knowledge transfer may weaken long-term adaptation capacity.
Increasing climate extremes	Drought, heat stress, erratic rainfall, flooding and stronger cyclones are intensifying across the seascape.

Recommendations, or key adaptation actions to address these seascape vulnerabilities are provided in Section 6.

5.3 Variation within the Seascape

Across the Seascape, all districts face increasing exposure to climate hazards associated with sea-level rise, coastal erosion, storm surge, flooding, drought, shifting rainfall patterns, coral reef degradation and increasing heat extremes. These pressures are particularly significant because communities throughout the Seascape depend heavily on fisheries, coastal resources and small-scale agriculture for food security and income. The assessment also identifies broader regional risks affecting small island systems, including biodiversity loss, declining fisheries productivity, water insecurity and damage to settlements and infrastructure. Despite these common pressures, vulnerability is not uniform across the Seascape.

Kubulau demonstrates relatively strong resilience despite high coastal exposure and is the most vulnerable district overall (Table 5.1). Communities face significant risks from sea-level rise, storm surge, coastal erosion, heat stress and freshwater insecurity, yet adaptive capacity is somewhat strengthened by strong customary governance, active resource management, intact ecosystems and extensive conservation areas including mangroves, reefs and protected forests. The district illustrates how healthy ecosystems and effective local governance can help reduce vulnerability even where physical exposure remains high, although Kubulua still remains in one of the highest vulnerability districts at the national scale (Figure 5.3, Table 5.1).

By contrast, Namalata is comparatively less vulnerable overall because of its more inland geography, productive agricultural land, stronger freshwater access, diversified livelihoods and better infrastructure (Table 5.1). Coastal hazards are less significant, although drought, rainfall variability and agricultural stress remain major risks. Namalata highlights how diversified livelihoods and lower coastal exposure can improve resilience.

Nakorotubu exhibits one of the most complex vulnerability profiles in the Seascape. Communities face overlapping pressures from drought, flooding, landslides, sedimentation, cyclone impacts and heat stress. Poor soils, rugged terrain and remoteness increase sensitivity and constrain recovery capacity, while limited agricultural potential and reduced market access further intensify vulnerability. Although healthy reefs and seagrass systems support resilience, environmental and economic pressures remain severe. At the national scale, Nakorotube ranks as a district with medium levels of vulnerability overall (Table 5.1).

Dawasamu also experiences high vulnerability driven by multiple interacting hazards, including flooding, erosion, storm surge, sedimentation and drought. Vulnerability is compounded by heavy dependence on fisheries and farming, environmental degradation associated with gravel extraction and catchment disturbance, and limited cyclone-resilient infrastructure. However, agricultural potential, freshwater access and strong community structures provide some adaptive strengths. The district highlights the importance of integrated ridge-to-reef management.

The communities assessed for fisheries vulnerability reveal additional dimensions of vulnerability. Tavulomo in Dama District experiences severe water insecurity, drought, landslides and sedimentation associated with upstream logging and plantation activity. While catchment-based activities are impacting on marine resource, strong local leadership and tabu systems support resilience. Bua communities are highly vulnerable because of increasing heat stress, marine ecosystem decline, fragile water systems and limited financial resilience, combined with weaker governance structures. Saolo in Wainunu faces unreliable water supplies, landslides and low financial resilience, although strong evacuation infrastructure and external support improve adaptive capacity. Sawani in Nadi District is increasingly vulnerable because of unsustainable fishing, marine ecosystem degradation, water shortages and limited livelihood diversity. Meanwhile, Wailevu communities demonstrate relatively strong adaptive capacity despite high exposure, due to strong customary governance, active tabu systems, resilient infrastructure and diversified support networks.

A key contrast across the Seascape is the balance between ecological resilience and socio-economic vulnerability. Districts with relatively healthy ecosystems and stronger governance arrangements, particularly Kubulau, demonstrate greater adaptive capacity despite high exposure. Areas with more degraded ecosystems, weaker infrastructure, narrower livelihood options or greater settlement exposure tend to exhibit higher overall vulnerability.

Another important difference lies in the forms of adaptive capacity present in different districts. The assessment highlights that resilience in the Seascape is strongly linked to:

- customary governance and traditional leadership
- social cohesion and collective action
- traditional ecological knowledge
- livelihood diversity
- ecosystem condition
- access to infrastructure, water and services.

Where these factors are strong, communities are generally better able to cope with shocks and adapt over time. However, resilience remains uneven both between and within districts. Even relatively resilient districts continue to face major constraints associated with remoteness, limited evacuation infrastructure, unreliable water supplies and dependence on natural-resource livelihoods.

The assessment therefore suggests that climate vulnerability across the Vatu-i-Ra Seascape is best understood as a continuum rather than a simple ranking. All districts are highly exposed to escalating climate risks, but the sources and expressions of vulnerability differ according to geography, ecosystem condition, livelihood structure and governance capacity. The findings support a strong case for place-based adaptation responses that combine ecosystem protection, livelihood diversification, water security improvements, strengthened local governance and NbS tailored to the distinct conditions of each district.

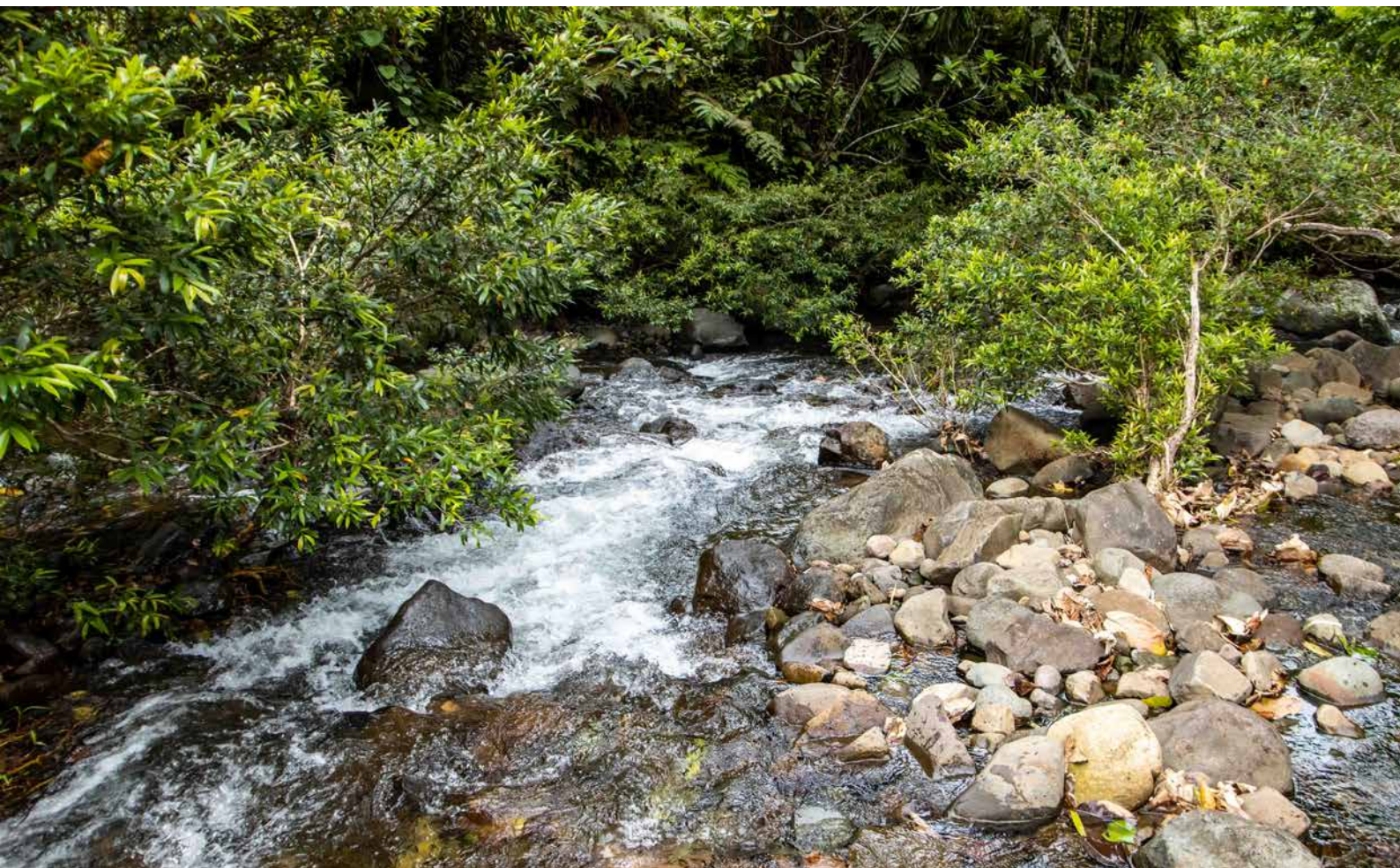


Table 5.3. *Vulnerability across the seascape districts*

District	Dominant exposure pattern	Distinct sources / states of vulnerability	What makes this district different from the others
Kubulau	High exposure to coastal hazards including erosion, storm surge, sea-level rise, coral bleaching, cyclone impacts and increasing heat stress. Inland areas also experience rainfall variability and flooding.	Strong dependence on fisheries and coastal harvesting; limited agricultural land; widespread rainwater dependence; coastal settlement patterns; external pressure from potential mining impacts.	Combines very high ecological value and strong community-based conservation governance with high coastal exposure and limited freshwater/agricultural capacity.
Namalata	Lower exposure to coastal hazards due to inland geography, but high exposure to drought, rainfall variability and cyclone impacts.	Agricultural dependence; drought sensitivity; variable freshwater access during prolonged dry periods; some localised flooding and drainage issues.	More inland, agriculturally productive and infrastructure-connected than most districts, with comparatively strong adaptive capacity.
Nakorotubu	Exposure to heat stress, drought, flooding, landslides, sedimentation and indirect cyclone impacts.	Poor talasiga soils; rugged terrain; limited arable land; remoteness; water contamination during heavy rain; dependence on farming and fisheries.	Experiences one of the broadest combinations of inland and coastal climate risks alongside significant environmental constraints.
Dawasamu	High exposure to flooding, erosion, storm surge, sedimentation, drought and variable cyclone-wave impacts.	Sedimentation from gravel extraction; declining reef and seagrass condition; dependence on farming and fisheries; limited cyclone-resilient housing and infrastructure.	Strong interaction between catchment degradation and coastal vulnerability, with environmental pressures directly compounding climate risks.
Dama (Tavulomo)	Exposure to cyclones, landslides, drought and water shortages.	Severe water insecurity; sedimentation from logging and plantations; dependence on fishing; fragile water infrastructure.	Water vulnerability is especially acute and directly linked to upstream land-use impacts.
Bua (Koroinasolo, Tacilevu, Waitabu)	Exposure to increasing heat stress, cyclones, coastal flooding, storm surge and marine ecosystem decline.	Weak governance systems; low savings capacity; fragile water systems; mangrove degradation; heavy dependence on fishing and farming.	Strong marine dependence combined with comparatively weaker governance and financial resilience.

District	Dominant exposure pattern	Distinct sources / states of vulnerability	What makes this district different from the others
Wainunu (Saolo)	Exposure to cyclones, landslides, sedimentation and increasing crop pests and diseases.	Extremely low financial capital; unreliable water supply; sedimentation affecting fisheries and mangroves; declining agricultural productivity.	Strong public resilience infrastructure despite very weak household financial resilience.
Nadi (Sawani)	Exposure to drought, declining water supply and marine ecosystem degradation.	Unsustainable fishing; sedimentation from inland deforestation; low livelihood diversity; emerging inequality between households.	Social inequality and environmental degradation are emerging as important vulnerability drivers.
Wailevu (Natuvu, Vatuale, Urata)	Exposure to coastal erosion, changing wave patterns, coral degradation and crop failure.	Dependence on fishing and farming; marine ecosystem degradation; inequality in some communities.	Despite high coastal exposure, adaptive capacity is comparatively strong because of governance systems, evacuation infrastructure and active customary management.

The assessment highlights that vulnerability does not always align directly with exposure across the Seascape. Some communities facing high environmental exposure exhibit lower vulnerability due to strong ecosystem health, governance systems, and diversified livelihoods. Conversely, communities with lower physical exposure may remain highly vulnerable where poverty, ecosystem degradation, infrastructure limitations, or livelihood dependence constrain adaptive capacity. These contrasting patterns are reflected across districts in the sections below.

5.4 Importance of marine and coastal ecosystems

The CVA demonstrates that marine and coastal ecosystems are fundamental determinants of resilience across the Vatu-i-Ra Seascape. Mangroves, coral reefs, seagrass beds, coastal forests and associated marine environments not only provide natural protection from climate hazards, but also sustain fisheries, food security, livelihoods and customary resource management systems that underpin community adaptive capacity.

Across the Seascape, many communities are highly exposed to sea-level rise, coastal erosion, storm surge, cyclones and increasing heat stress because settlements and livelihoods are concentrated along the coast. However, the assessment shows that communities with healthier coastal and marine ecosystems are often more resilient than equally exposed communities where ecosystems are degraded. Mangroves and reefs reduce wave energy, stabilise shorelines and buffer storm impacts (Figure 5.4, Figure 5.5), while healthy marine ecosystems maintain fisheries productivity and food security during climate shocks.

Kubulau provides the strongest example of the positive relationship between ecosystem health and resilience. The district experiences high exposure to coastal erosion, storm surge, cyclones and heat stress, and has high vulnerability overall (Table 5.1). However, this vulnerability would be much worse if not moderated by extensive mangrove systems, healthy reefs and conservation areas including the Namena Marine Reserve and Kilika Forest Conservation Area. These ecosystems function as ecological buffers that protect coastlines, sustain fisheries and support local livelihoods. Importantly, ecosystem health in Kubulau is reinforced by active customary governance and resource management systems, demonstrating how marine conservation and traditional stewardship together strengthen adaptive capacity.

A similar pattern is evident in Wailevu, where communities remain highly exposed to coastal erosion and changing wave patterns but maintain comparatively strong resilience through active tabu systems, strong leadership and community stewardship of marine resources. In these communities, customary marine management arrangements help sustain fisheries and ecosystem health while reinforcing social cohesion and collective adaptation capacity.

Nakorotubu further demonstrates the importance of marine ecosystems to resilience. Despite facing one of the most complex risk profiles in the Seascope — including drought, flooding, landslides, sedimentation and cyclone impacts — healthy reefs and seagrass systems continue to support fisheries, livelihoods and ecological resilience. However, the district also illustrates that ecosystem resilience alone cannot fully offset vulnerability where remoteness, poor soils and overlapping environmental pressures remain severe.

In contrast, districts where coastal and marine ecosystems are increasingly degraded generally show lower adaptive capacity and greater vulnerability. In Dawasamu, sedimentation associated with gravel extraction and catchment disturbance is weakening freshwater and coastal ecosystems, increasing vulnerability to flooding, erosion and storm surge. Degraded catchments are directly affecting downstream reefs, mangroves and fisheries systems that communities rely upon for livelihoods and natural coastal protection.

Similar processes are evident in Sawani in Nadi District, where sedimentation from upstream deforestation, declining marine ecosystems and unsustainable fishing are undermining fisheries productivity, water security and livelihood resilience. The assessment highlights how environmental degradation can compound climate vulnerability by reducing both ecosystem protection and livelihood security simultaneously.

Tavulomo in Dama District also demonstrates the close connection between catchment condition and coastal vulnerability. Sedimentation linked to upstream logging and plantation activity is affecting both freshwater systems and coastal ecosystems, contributing to declining resilience alongside drought and water insecurity. Nevertheless, active tabu systems and strong local leadership continue to provide an important foundation for adaptation.

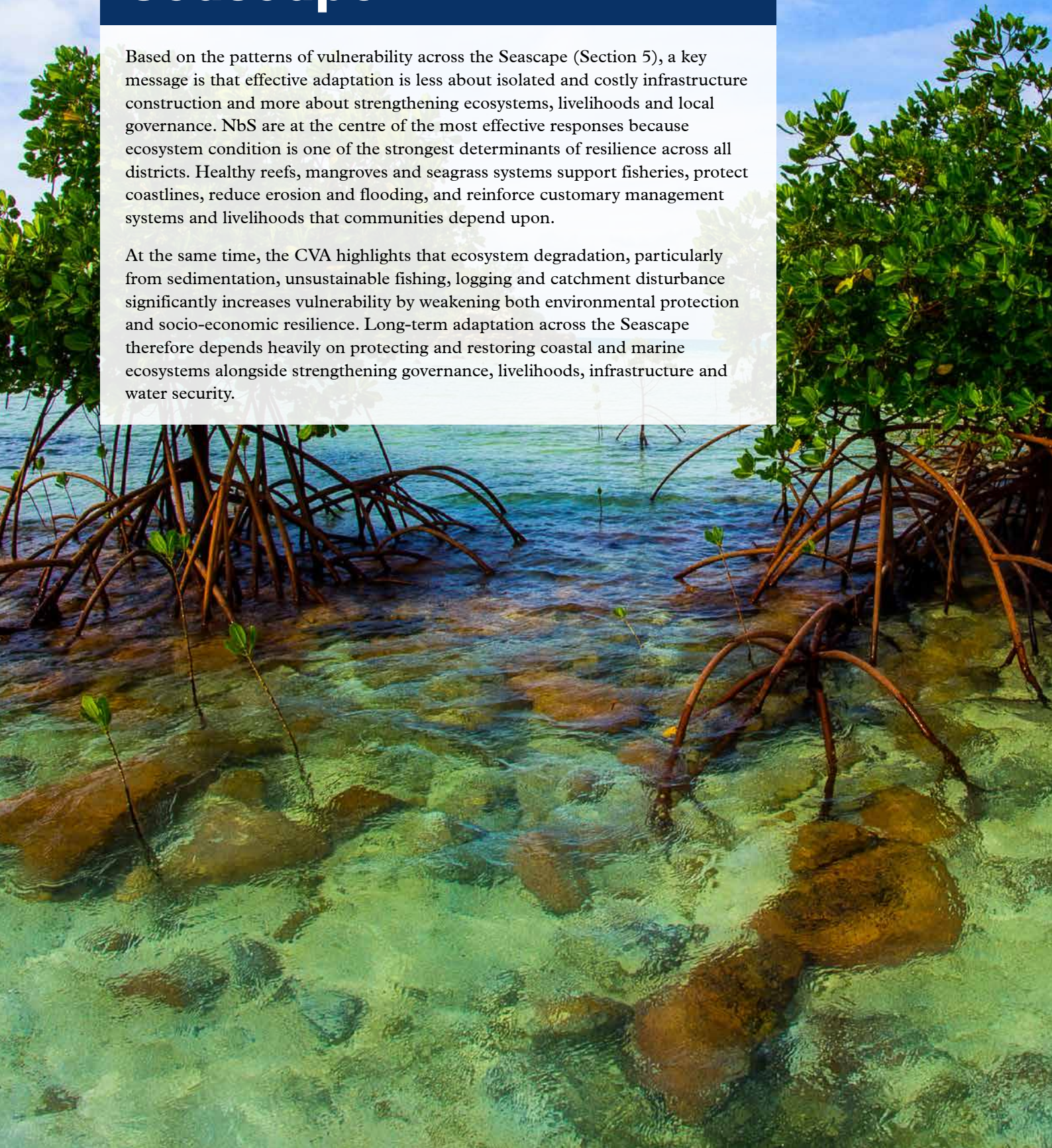
The assessment further shows that communities with declining marine ecosystems often experience increased livelihood vulnerability. In Bua communities, marine ecosystem decline combines with fragile water systems, low financial resilience and dependence on fishing and farming to increase overall vulnerability. Similarly, in Wainunu, sedimentation is damaging mangroves and fisheries systems that are important for food security and livelihoods.

Overall, the vulnerability assessment findings demonstrate that marine and coastal ecosystems are central to both reducing exposure and strengthening adaptive capacity across the Vatu-i-Ra Seascope.

6. Climate Adaptation across Vatu-i-Ra Seascape

Based on the patterns of vulnerability across the Seascape (Section 5), a key message is that effective adaptation is less about isolated and costly infrastructure construction and more about strengthening ecosystems, livelihoods and local governance. NbS are at the centre of the most effective responses because ecosystem condition is one of the strongest determinants of resilience across all districts. Healthy reefs, mangroves and seagrass systems support fisheries, protect coastlines, reduce erosion and flooding, and reinforce customary management systems and livelihoods that communities depend upon.

At the same time, the CVA highlights that ecosystem degradation, particularly from sedimentation, unsustainable fishing, logging and catchment disturbance significantly increases vulnerability by weakening both environmental protection and socio-economic resilience. Long-term adaptation across the Seascape therefore depends heavily on protecting and restoring coastal and marine ecosystems alongside strengthening governance, livelihoods, infrastructure and water security.



6.1 Community identified adaptation actions

Communities within each of the districts across the Vatu-i Ra Seascape are already implementing a range of these adaptation actions and have also identified future adaptation actions as summarised at the district level in Table 6.1. A large majority of existing adaptation actions are NbS and commonly include:

- Tabu areas
- Mangrove, reef and seagrass restoration
- Disaster Risk Reduction
- Strengthen water security (rainwater storage, spring protection, relocation of water catchment infrastructure)
- Climate resilient crops
- Agroforestry and afforestation (targeting coastal and river erosion)
- Use of TEK for hazard awareness
- Food security supported through small scale farming and fishing
- Diversified livelihoods; and
- Other non-NbS actions (community gardens, relocation of houses and climate awareness training and programs).



Table 6.1. Existing and proposed adaptation response across the Seascape.

Current Adaption Actions (✓ in place) and Community Proposed Future Actions (◆)	Vatu-i-Ra Seascape Adaptation Actions								
	Kubulau	Nama-lata	Nakoro-tubu	Dawasamu	Dama	Bua	Wainunu	Nadi	Wailevu
Tabu areas managed by the community	✓		✓	✓	✓	✓		✓	✓
Mangrove restoration	◆		◆	◆					◆
Seagrass restoration				◆					
Reef restoration	◆		◆	◆					
Afforestation and nursery establishment to target coastal and river erosion, also increase protected area coverage of forests.	✓	◆	◆	◆				◆	◆
Agroforestry systems inland to improve soil stability, food security and drought resilience.		◆	◆	◆				◆	◆
Planting of climate resilient crops (e.g. uto, vudi, tivoli, cassava, dalo, yaqona, leafy greens).	✓	✓		✓	✓	✓		◆	✓
Tree and vetiver planting to stabilize soils, reduce erosion and improve microclimates.	◆	✓		✓					
Erosion reduction measures such as bamboo planting along roads.		✓							◆
Strengthen water security (rainwater storage, spring protection, relocation of water catchment infrastructure)	◆			◆				◆	
Improve freshwater systems and infrastructure and reduce contamination risk e.g. banning fertiliser use near water resources			◆	✓				◆	

Current Adaption Actions (✓ in place) and Community Proposed Future Actions (◆)	Vatu-i-Ra Seascape Adaptation Actions								
	Kubulau	Nama-lata	Nakoro-tubu	Dawasamu	Dama	Bua	Wainunu	Nadi	Wailevu
Plant community food gardens	◆								
Support diversified livelihoods e.g. support fishers to diversity the fishery resources they rely on	◆		◆						
Facilitate community climate awareness and NRM trainings and programs (can also include health and well-being, financial literacy, etc).	◆	◆	◆	◆		◆	◆	◆	◆
Community committees (e.g. to support iYaubula, water, health, development)		✓	✓		◆	◆			
TEK used e.g. for hazard awareness; small-scale farming and fishing continue to support food security.			✓	◆	✓	◆			✓
Natural Hazard Preparedness and Response Plan (also includes hazard reduction practices such as clearing drains, securing houses before cyclones and maintaining access routes).		✓	✓	✓	✓		✓	◆	✓
Cyclone resilient housing	✓	✓		✓	✓	✓	✓		✓
Relocation of houses away from hazard zones (e.g. coastal areas)		◆							
Small-scale, community-led watershed and flood protection rehabilitation to improve land and water resilience and reduce impacts from flooding.		◆							

6.2 Recommended adaptation responses

Across all districts, vulnerability was found to be influenced by three interacting factors: high exposure to coastal and climate hazards, strong dependence on natural resources, and uneven adaptive capacity. This means future adaptation needs to focus on reducing exposure where possible by strengthening ecosystem buffers and building adaptive capacity by expanding livelihood and institutional resilience. Additional and alternate adaptation options to those identified by communities were also derived and summarised in Table 6.2.

A consistent finding is that communities with intact mangroves, coral reefs and coastal vegetation experience lower impacts from erosion, storm surge and flooding. Where these systems are degraded, vulnerability rises sharply. This makes NbS – specifically those focused on ecosystem restoration and protection – a foundational adaptation strategy rather than an optional add-on.

The comparison between community-identified adaptation actions (Table 6.1) and those derived from the vulnerability assessment (Table 6.2) reveals several notable differences in both scale and level of specificity.

In general, communities tended to prioritise practical, operational interventions. For example, where the assessment recommended broad approaches such as the protection of coastal habitats, communities identified specific actions such as seagrass planting. Similarly, where the assessment highlighted watershed management (e.g., in Namalata), communities more commonly prioritised concrete measures such as rainwater harvesting and improvements to local water infrastructure. In cases where the assessment suggested strengthening governance or building capacity, communities often translated these into targeted needs such as financial literacy training and other specific skill-building activities.

These differences likely reflect the differing scales at which each process operates. Importantly, there were no conflicting adaptation priorities between the two approaches. This suggests strong complementarity and indicates that integrating both perspectives could strengthen future planning processes. Where resources allow, sharing vulnerability assessment findings with communities could support more informed decision-making and help align community resource management plans with wider seascape-scale priorities.

One key observation was that the most frequently identified community priority not explicitly highlighted in the vulnerability assessment was the need for training on climate change awareness and adaptation action. This suggests that capacity building is not only an enabling factor but also a direct adaptation priority for communities across the Seascope.



Table 6.2. Comparison of community adaptation actions with this seascape assessment, categorised broken down by district.

District	Community adaptation priority	VA recommendation
Kubulau	Strengthen water security (rainwater storage, spring protection, relocation of water catchment infrastructure) Agroforestry and afforestation efforts that target coastal and river erosion, and provide space for community food gardens Expand mangrove and reef restoration Support diversified livelihoods Facilitate climate awareness trainings and programs	Prioritise ecosystem protection, mangrove and reef restoration, water security and water infrastructure, ridge-to-reef management, climate awareness trainings climate-resilient infrastructure and strengthening locally managed marine areas.
Namalata	Establishing DRM committee Relocation of houses away from coastal hazard zones Community training on climate change, natural resource management and protection, health and well-being, financial literacy. Agroforestry systems and afforestation inland to improve soil stability, food security and drought resilience. Small-scale, community-led watershed and flood protection rehabilitation to improve land and water resilience, and reduce impacts from flooding.	Focus on drought resilience, watershed rehabilitation, erosion and flood control (relocation if necessary), agroforestry and afforestation, climate-resilient agriculture and maintaining reliable freshwater systems, community training on climate change and NRM.
Nakorotubu	Improve freshwater systems and infrastructure and reduce contamination risk Agroforestry systems and afforestation inland to improve soil stability, food security and drought resilience. Expansion of protected areas to cover forests Expand mangrove and reef restoration, to also support coastal protection Community training and support for climate smart and organic agriculture Support fishers to diversity the fishery resources they rely upon	Strengthen freshwater systems, climate-resilient agriculture, agroforestry and afforestation, soil rehabilitation, emergency connectivity, community capacity-building, and diversification of fishery resources.

District	Community adaptation priority	VA recommendation
Dawasamu	Integrated coastal ecosystem restoration (mangroves, seagrass, reef systems) Leadership and governance training, alternative livelihood training Strengthen water security and reduce contamination. Relocation of water supply infrastructure Catchment rehabilitation and native tree reforestation, protecting areas prone to erosion Support TEK transfer, training on NRM and conservation Expand climate-resilient agriculture, moving away from exposed areas (coasts and river banks)	Prioritise integrated catchment and coastal restoration, mangrove rehabilitation, water security, climate-resilient housing, climate resilient agriculture, awareness of climate change , NRM and TEK transfer and fisheries management.
Dama	Setting up a community disaster preparedness committee to coordinate post-disaster responses and resources from government and civil society	Improve water security, stabilise catchments, reduce sedimentation, strengthen fisheries resilience and support community-led DRM and adaptation measures.
Bua	Establishment of community DRM and climate change plans, mechanisms for disaster preparation, messaging and information Community training on climate change awareness and adaptation action Support for strengthening TEK, including documentation of existing TEK.	Restore mangroves and coastal ecosystems, improve freshwater systems, strengthen governance capacity, including in DRM, diversify livelihoods and support for TEK maintenance and transfer.
Wainunu	Development of climate change adaptation plans, mechanisms for disaster preparation, messaging and information Community training on climate change awareness and adaptation action	Strengthen water systems, improve slope and catchment management, support resilient agriculture, build household-level economic resilience, build DRM and adaptation planning into governance capacity.

District	Community adaptation priority	VA recommendation
Nadi	Maintain and enforce marine and terrestrial protected areas Extend water catchment infrastructure (more water tanks in the village to meet demand during long drought) Support to change farming practices, agroforestry, climate-smart agriculture and afforestation Support gender equality/women's participation in community decision making DRM training and support for preparation, including preparation of local health clinic (need for more medical supplies)	Improve fisheries governance, restore catchments, strengthen water security and diversify livelihoods while building local resource management capacity, strengthen governance systems focusing on gender equality and DRM planning.
Wailevu	Erosion control mechanisms, along rivers and coastal areas Climate-smart agriculture and agroforestry Extend mangrove restoration DRM training and support for preparation, including preparation of disaster foods. evacuation centers Support equality, diversity and women's participation in community decision making Strengthening relationships with key government departments (e.g. DISMAC) Enforcement of tabu and other protected areas.	Build on strong customary governance and tabu systems, strengthen diversity and women's representation, strengthen ecosystem restoration, support climate-smart agriculture and maintain climate-resilient infrastructure.

***bold** text in the community adaptation column are the actions also supported (and recommended) by the vulnerability assessment.

****bold** text in the VA recommendations column were not identified explicitly by communities as a priority.

6.3 Adaptation across the Seascape

The assessment indicates that adaptation responses are likely to be most effective where they strengthen both ecological resilience and the social, cultural and economic systems that communities already depend upon. Across the Vatu-i-Ra Seascape, the most successful adaptation pathways are therefore those that combine NbS with stronger governance, resilient infrastructure, diversified livelihoods and improved water security. Importantly, many of these approaches align closely with existing customary management systems, community values and livelihood practices, increasing the likelihood of long-term uptake and sustainability.

Protecting and restoring coastal and marine ecosystems is one of the clearest examples of adaptation measures that simultaneously reduce climate vulnerability and reinforce local livelihoods and cultural values. In Kubulau, healthy reefs, mangroves and marine protected areas already provide natural coastal protection, sustain fisheries and strengthen food security. Existing customary governance systems and the Kubulau Resource Management Committee demonstrate how strengthening locally managed marine areas, tabu systems and protection of high integrity climate-resilient coral reefs (HICOR) can build on established community stewardship practices. Expanding mangrove restoration, reef protection and ridge-to-reef catchment management in Kubulau would therefore reinforce systems that communities already value and actively manage.

Similarly, in Wailevu, active tabu systems and strong customary leadership already contribute to resilience despite high coastal exposure. Supporting community-based marine management, seagrass and mangrove protection, and sustainable fisheries management would align strongly with existing governance systems and local livelihood dependence on coastal resources. These approaches would not only reduce erosion and coastal impacts but also help maintain fisheries productivity and food security.

The assessment also demonstrates that integrated ridge-to-reef management is particularly important in districts where upstream land-use pressures are degrading downstream marine ecosystems. In Dawasamu, gravel extraction and catchment disturbance are increasing sedimentation and weakening coastal ecosystems that communities depend on for fisheries and shoreline protection. Catchment rehabilitation, erosion control and sustainable land-use management would therefore provide dual benefits by improving both inland watershed health and downstream reef and mangrove resilience. These interventions are likely to be effective because they directly address the compounding non-climate pressures identified by communities themselves.

The same applies in Tavulomo and Sawani, where sedimentation associated with logging, plantation activity and upstream deforestation is affecting freshwater systems, mangroves and fisheries. In these locations, ridge-to-reef planning, forest protection and sediment reduction measures would help restore ecological function while also protecting fisheries, freshwater reliability and coastal livelihoods.

The findings also show that strengthening customary governance and community institutions is one of the most important determinants of resilience across the Seascape. Communities with active leadership, functioning committees and strong social cohesion consistently demonstrate greater adaptive capacity and stronger disaster recovery. In Kubulau and Wailevu, customary marine management systems and trusted leadership structures already support collective action and long-term stewardship of natural resources. Supporting iTaukei resource management institutions, strengthening iYaubula committees and expanding participatory planning processes would therefore build on governance systems that communities already recognise as legitimate and culturally appropriate.

TEK also emerges as a significant source of resilience. In Kubulau, women and young people maintain detailed knowledge of harvesting practices, seasonal conditions and ecosystem behaviour, which contributes directly to adaptive capacity. Supporting intergenerational knowledge-sharing and integrating TEK into adaptation planning would strengthen existing adaptive practices while reinforcing cultural continuity.

Water security measures are another adaptation priority strongly supported by the assessment. Water insecurity is a major vulnerability across both inland and coastal districts, particularly during droughts and extreme rainfall events. In Kubulau, Bua and Wainunu, reliance on rainwater and unstable freshwater systems significantly increases sensitivity to climate change. Rainwater harvesting, spring protection, resilient storage systems and catchment rehabilitation would therefore directly reduce vulnerability while supporting household health, food security and livelihoods. These interventions are likely to gain strong community support because water insecurity is already recognised locally as a major concern.

Livelihood diversification is also critical because many communities remain heavily dependent on fisheries and subsistence agriculture that are increasingly vulnerable to climate impacts. In Namalata, diversified farming systems and stronger infrastructure already contribute to comparatively lower vulnerability. Expanding climate-resilient agriculture, agroforestry and small-scale enterprises in similar districts could reduce sensitivity to drought, changing rainfall and marine ecosystem decline while maintaining strong links to existing livelihood practices. In coastal districts such as Kubulau, Wailevu and Dawasamu, sustainable fisheries management combined with ecosystem restoration offers a pathway to both maintain cultural fishing practices and improve long-term resilience of marine livelihoods.

The assessment further highlights the importance of investing in resilient infrastructure and preparedness systems, particularly in remote and highly exposed communities. In Wainunu, stronger evacuation infrastructure and cyclone-resilient buildings already contribute positively to resilience despite high climate sensitivity. Similar investments in evacuation centres, communications, resilient housing and emergency access would likely be highly effective in districts where remoteness delays disaster response and recovery.

These crosscutting patterns point to adaptation strategies that are consistent with the literature (Ostrom, 2009, Ensor et al., 2016, Barnett and Waters, 2016 and Basil et.al. 2020) that prioritise ecosystem restoration and protection, strengthen local institutions and public infrastructure, support livelihood diversification and income generation, and guide future settlement and landuse planning away from highly exposed areas.



7. Conclusion

The Vatu-i-Ra Seascape Climate Vulnerability Assessment provides a comprehensive and evidence-based understanding of how climate risk is currently manifesting and is likely to intensify across the Seascape. The findings confirm that climate risk is already high across all districts, with far-reaching implications for ecosystems, infrastructure, livelihoods and food security. While exposure is widespread, vulnerability varies considerably, shaped by the interaction of hazard exposure, ecosystem condition, livelihood dependence, water security, and access to services and infrastructure.

The assessment demonstrates that vulnerability is both widespread and highly variable. It is shaped by the interaction between climate hazards and underlying social, economic and environmental conditions, including settlement patterns, livelihood dependence, ecosystem health, water security and access to services. This differentiation is particularly evident between coastal and inland communities. Coastal settlements face compounded risks due to their direct exposure to marine hazards and heavy reliance on coastal and marine resources, while inland communities are increasingly affected by drought, rainfall variability, flooding and freshwater constraints that threaten agricultural productivity and household wellbeing.

A consistent and critical finding is the central role of ecosystem condition in influencing resilience. Healthy coral reefs, mangroves, seagrass systems and forests provide essential protective and productive functions, significantly reducing exposure and supporting livelihoods. Conversely, where ecosystems are degraded, vulnerability increases.

The assessment further highlights that effective adaptation is not solely dependent on physical or ecological factors, but on the strength of social and institutional systems. Customary governance, community cohesion and traditional ecological knowledge are key enablers of adaptive capacity, particularly where they support collective action and local resource management. At the same time, disparities in access to infrastructure, services, markets and financial resources continue to constrain recovery capacity particularly in more remote and exposed communities.

Overall, the findings emphasise the need for integrated, place-based adaptation strategies that prioritise NbS alongside targeted investments in resilient infrastructure, water security, disaster preparedness and livelihood diversification. Strengthening ecosystem integrity, while simultaneously enhancing social and economic resilience, will be essential to reducing vulnerability in a sustained and equitable manner. This assessment provides a strategic basis for directing such efforts, supporting locally grounded and adaptive responses to ensure the long-term sustainability of communities and ecosystems across the seascape.



References

- Andrello, M. et al. (2022). Local-scale processes drive long-term changes in biodiversity in reef-building corals. *Nature Ecology & Evolution*, 6, 123–132. <https://doi.org/10.1038/s41559-021-01593-4>
- Araujo, M.B. et al. (2025). *Global drought projections*. [Dataset].
- Atkinson, A.L. et al. (2016). Mangrove wave attenuation and associated coastal protection. *Estuarine, Coastal and Shelf Science*, 160, 1–11. <https://doi.org/10.1016/j.ecss.2015.05.019>
- Barnett, J., Waters, E. (2016). Rethinking the Vulnerability of Small Island States: Climate Change and Development in the Pacific Islands. In: Grugel, J., Hammett, D. (eds) *The Palgrave Handbook of International Development*. Palgrave Macmillan, London. https://doi.org/10.1057/978-1-137-42724-3_40
- Basil, M., et al. (2020). *Climate Change and Food Security in the Pacific Islands*. FAO / Pacific Community (SPC).
- Berkes, F. & Ross, H. (2013). Community Resilience: Toward an Integrated Approach. *Society & Natural Resources*, 26(1), 5–20. <https://doi.org/10.1080/08941920.2012.736605>
- Beyer, H.L. et al. (2018). Risk-sensitive planning for conserving coral reefs under rapid climate change. *Conservation Letters*, 11(6), e12587. <https://doi.org/10.1111/conl.1258>
- Bowden-Kerby, A. (2025). Creating a national coral-focused climate change adaptation plan for Fiji to prevent coral species extinction in the face of rapid climate change: Applying the UNESCO-endorsed “Reefs of Hope” Ocean Decade Action. *Sustainability*, 17(18), 8430. <https://doi.org/10.3390/su17188430>
- Cameron, C., Maharaj, A., Kennedy, B., Tuiwawa, S., Goldwater, N., Soapi, K., & Lovelock, C. E. (2021). Landcover change in mangroves of Fiji: Implications for climate change mitigation and adaptation in the Pacific. *Environmental Challenges*, 2, 100018. <https://doi.org/10.1016/j.ENVC.2020.100018>
- Chaston, T. et al. (2016). *Fiji Post-Disaster Needs Assessment: Tropical Cyclone Winston, February 20, 2016*. Government of Fiji.
- Cohen-Shacham, E., Andrade, A., Karangwa, C. & Maginnis, S. (2024). *Proposing the IUCN Global Standard for Nature-based Solutions as the main operational framework to implement UNEA Resolution 5/5 on NbS for supporting sustainable development*. Information Paper. IUCN. <https://iucn.org/resources/information-brief/proposingiucn-global-standard-nature-based-solutions-main-operational>
- Copernicus Climate Change Service (2022). *Climate extreme indices and heat stress indicators derived from CMIP6 global climate projections*. C3S Climate Data Store.
- Dumaru, P., Dau, I., Koroiwaga, I., Caginitoba, A., Radway, C. & Mangubhai, S. (2020). *Climate Resilient Mobility: An Integrated Vulnerability Assessment of Koro Island, Lomaiviti Province*. University of the South Pacific & Wildlife Conservation Society, Suva, Fiji.
- Dumaru, P., Martin, T., Lowry, B., Manuella, T., Koppert, T., ... Southcombe, D. (2017). *Framework guide for community resilient development: Pacific Islands Community Integrated Vulnerability Assessment (CIVA): A tool for resilience management*. University of the South Pacific.
- Elsen, P.R. et al. (2021). Topography and human pressure in mountain ranges alter expected species responses to climate change. *Nature Communications*, 12, 1315. <https://doi.org/10.1038/s41467-021-21581-9>
- Ensor, J., Park, S., Attwood, S., Kaminski, A. & Matin, N. (2016). Can community-based adaptation increase resilience?. *Climate and Development*, 8(1), 46–56. <https://doi.org/10.1080/17565529.2014.934774>

- Espejo, A. (2025). *Probabilistic coastal inundation maps for Fiji CAPA districts (Bua, Kubulau, Nakorotubu)*. [Unpublished dataset].
- Ford, A.K., Hamilton, M., Nand, Y., Puotinen, M., Jupiter, S.D., Dulunaqio, S., Naisilisili, W. & Mangubhai, S. (2025). Comparing impacts and recovery of locally managed reefs after exposure to extreme waves from a category 5 cyclone. *Coral Reefs*, 44, 1909–1926. <https://doi.org/10.1007/s00338-025-02717-7>
- Gillett, R. (2009) *Fisheries in the Economics of Pacific Island Countries and Territories*. Pacific Studies Series, Asian Development Bank, Manila.
- Government of Fiji (2020). Hybrid Seawall Helps Address Sea-Level Rise. [Press Release]. Government of the Republic of Fiji, Suva. <https://fiji.gov.fj/Media-Centre/News/Feature-Stories/Hybrid-Seawall-Helps-Address-Sea-Level-Rise>
- Government of Fiji (2018). *Fiji National Adaptation Plan: A Pathway to Climate Resilience*. Government of the Republic of Fiji, Suva.
- Government of Fiji (2024). *National Development Plan 2025–2029: Transforming Fiji's Future*. Government of the Republic of Fiji, Suva.
- Government of the Republic of Fiji (2017). *Climate Vulnerability Assessment: Making Fiji Climate Resilient*. Government of Fiji & World Bank, Suva/Washington DC.
- Hansen, M.C. et al. (2013). High-resolution global maps of 21st-century forest cover change. *Science*, 342(6160), 850–853. <https://doi.org/10.1126/science.1244693>
- Haigh, I. (2017). *An analysis of mean and extreme sea levels for Fiji*.
- ICEM (International Centre for Environmental Management) (2023). *Assessment of Needs and Opportunities for Ecosystem Resilience and Climate Change Adaptation in Fiji: National Assessment Report*. Prepared for The World Bank.
- ICEM (International Centre for Environmental Management) (2024). *Fiji Ecosystem and Biodiversity Baseline Assessment*. ICEM, Hanoi.
- IPCC (Intergovernmental Panel on Climate Change) (2019). *Special Report on the Ocean and Cryosphere in a Changing Climate*. Intergovernmental Panel on Climate Change. <https://doi.org/10.1017/9781009157964>
- IPCC (Intergovernmental Panel on Climate Change) (2022). *Sixth Assessment Report (AR6): Synthesis Report*. IPCC, Geneva. <https://doi.org/10.59327/IPCC/AR6-9789291691647>
- IUCN (2020). *Global Standard for Nature-based Solutions: A user-friendly framework for the verification, design and scaling up of NbS*. First edition. IUCN. <https://doi.org/10.2305/IUCN.CH.2020.08.en>
- IUCN (2026). *IUCN Global Standard for Nature-based Solutions™: A user-friendly framework for assessing, implementing, and monitoring scalable, high-integrity NbS*. Second edition. IUCN.
- IUCN Members' Assembly (2016). *Resolution 69: Defining Nature-based Solutions (WCC 2016-Res-069)*. IUCN. https://portals.iucn.org/library/sites/library/files/resrecfiles/WCC_2016_RES_069_EN.pdf
- Johnson, J.E., & Wabnitz, C.C.C. (2025). *Climate Change Implications for Fisheries and Aquaculture in the Pacific Islands Region*. Pacific Community (SPC), Noumea, New Caledonia.
- Karger, D.N. et al. (2017). Climatologies at high resolution for the earth's land surface areas (CHELSA). *Scientific Data*, 4, 170122. <https://doi.org/10.1038/sdata.2017.122>
- Lehner, B. & Grill, G. (2013). Global river hydrography and network routing. *Hydrological Processes*, 27(15), 2171–2186. <https://doi.org/10.1002/hyp.9740>
- Long, T. et al. (2021). Monitoring burned areas using Landsat time series. *Remote Sensing*.
- MCTA (2024). *Fiji National Sustainable Tourism Framework 2024-2034*. Ministry of Tourism and Civil Aviation.

- Mendez, F.J., Rueda, A., Cagigal, L. & Antolinez, J.A.A. (2017). *Preliminary assessment of TC-induced coastal flooding in Fiji*. Report prepared for the Fiji Climate Vulnerability Study.
- Murray, N.J. et al. (2019). The global distribution and trajectory of tidal flats. *Nature*, 565, 222–225. <https://doi.org/10.1038/s41586-018-0805-8>
- Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science*, 325(5939), 419–422. <https://doi.org/10.1126/science.1172133>
- Pacific Community [SPC] (2025) Fiji Summary. In: Johnson J.E. and Wabnitz C.C.C. (Eds) *Climate change implications for fisheries and aquaculture in the Pacific Islands region*. Noumea, New Caledonia, Pacific Community (SPC).
- Perry, R.I., et al. (2019). *Climate change and Pacific Island fisheries*. Pacific Community (SPC).
- Rentschler, J. et al. (2022). Global flood exposure from a global dataset. *Nature Communications*, 13, 6229. <https://doi.org/10.1038/s41467-022-33944-5>
- Schneider, U.A. et al. (2022). *Global cropland and food security*. [Dataset, LUH2].
- Scoones, I. (1998). *Sustainable rural livelihoods: A framework for analysis (IDS Working Paper 72)*. Institute of Development Studies.
- Shiiba, N., Singh, P., Charan, D., Raj, K., Stuart, J., Pratap, A., & Maekawa, M. (2023). Climate change and coastal resiliency of Suva, Fiji: A holistic approach for measuring climate risk using the Climate and Ocean Risk Vulnerability Index (CORVI). *Mitigation and Adaptation Strategies for Global Change*, 28(2), Article 1. <https://doi.org/10.1007/s11027-022-10035-3>
- United Nations Environment Assembly (UNEA) (2022). *Resolution UNEP/EA.5/Res.5: Nature-based Solutions for Supporting Sustainable Development*. United Nations Environment Assembly, Nairobi.
- Wakwella, A. (unpublished). Sediment delivery modelling for Fiji CAPA catchments. InVEST SDR model outputs.
- Webb L., Chand S., Gooley G., 2025. Chapter 2: Observed and projected changes in the atmosphere and ocean climate of the Pacific Islands region. In: *Climate Change Implications for Fisheries and Aquaculture in the Pacific Islands Region*, Johnson J.E. and C.C.C. Wabnitz (eds.), Pacific Community, Noumea, New Caledonia
- Weiss, D.J. et al. (2018). A global map of travel time to cities. *Nature*, 553, 333–336. <https://doi.org/10.1038/nature25181>
- Weiss, D.J. et al. (2020). Global maps of travel time to healthcare facilities. *Nature Medicine*, 26, 1835–1838. <https://doi.org/10.1038/s41591-020-1059-1>
- Wildlife Conservation Society (2000). *Vatu-i-Ra Seascape*. IUCN Contributions for Nature Platform. Available at: www.iucncontributionsfornature.org/contributions
- Wildlife Conservation Society (2025). *2025–2030 Coral Reef Strategy*. Wildlife Conservation Society, Bronx, NY.
- World Bank (2016). *Fiji Post Disaster Needs Assessment: Tropical Cyclone Winston, February 20, 2016*. Government of Fiji & World Bank, Suva/Washington DC.
- World Bank (2017). *Climate Vulnerability Assessment: Making Fiji Climate Resilient*. Government of Fiji & World Bank, Suva/Washington DC.
- World Bank (2018). *Pacific Possible: Long-term Economic Opportunities and Challenges for Pacific Island Countries*. World Bank, Washington DC.
- World Bank (2025). *Climate Change Knowledge Portal: Fiji Climate Data and Projections*. World Bank, Washington DC.
- Zawada, K.J.A. et al. (2026). Temporal stability of coral reefs under projected climate change. [In preparation].

Annex A

Community CRVA methods & indicators

Introduction

As part of the CAPA initiative, a community-level Climate Vulnerability and Risk Assessment (CRVA) was conducted for 19 communities across four terrestrial sites (Kubulau, Nakorotubu, Dawasamu, and Waibula) and three marine sites (Nakorotubu, Bua, and Bureta). The assessment characterised relative climate vulnerability across multiple dimensions to inform localised NbS interventions and actions.

The methods used to conduct the community-level CRVA, including the conceptual framework, indicator selection, data sources, spatial processing procedures, and calculation of composite vulnerability scores are provided.

Conceptual Framework

Climate vulnerability was assessed using a widely applied framework comprising two principal components:

- **Climate Exposure:** The degree to which a community is exposed to current and/or projected future climate hazards and environmental stressors.
- **Adaptive Capacity:** The ability of a community to adjust to, cope with, or recover from climate threats, including the availability of natural resources that buffer climate impacts.

No sensitivity data were available at the community level, so the assessment focused on exposure and adaptive capacity. The overall Climate Vulnerability Index was calculated as the ratio of exposure to adaptive capacity, reflecting that communities with high exposure but low adaptive capacity are most vulnerable.

This framework builds directly on the district-level CRVA previously conducted under the CAPA Initiative, adapted for application at finer spatial scales.

Study Area and Community Boundaries

The assessment covered 19 CAPA communities represented as polygon boundaries (note: one of the 20 communities did not have a polygon boundary and was not included in the analysis). These communities span four districts: Kubulau, Nakorotubu, Dawasamu, and Namalata (Waibula). All spatial data were projected to the Fiji Map Grid (EPSG:3460) for area calculations and spatial operations.

To capture both direct (local) and indirect (landscape-scale) climate impacts on each community, two spatial zones were defined:

- **Small Buffer (SB):** A community-specific buffer based on distances from each community to associated plantation/management sites, as provided by the CAPA project team. This buffer represents the immediate landscape within which direct climate impacts are most relevant.
- **Large Buffer (LB):** A fixed 10 km buffer around each community boundary, representing the broader landscape context from which indirect climate impacts may arise.

Both buffers were clipped to district boundaries and dissolved to eliminate overlapping areas. A composite weighted mean was then calculated for each indicator using a 60:40 weighting (SB:LB), with unweighted values used when only one buffer zone contained valid data.

For marine indicators tied to *qoliqoli*, values were extracted from the relevant *qoliqoli* polygons associated with each district, with weights inversely proportional to the number of districts sharing each fishing ground.

Indicator Selection

A total of 65 candidate indicators were reviewed. Of these, 35 were deemed suitable based on data availability and applicability at the community scale:

- 21 exposure indicators characterising climate and environmental stressors
- 14 adaptive capacity indicators characterising ecosystem services and resource availability that buffer climate impacts

Indicators from the district-level assessment were retained where data were applicable at the community scale. Coarse-resolution datasets that lacked meaningful spatial variation at the community scale were excluded. Several indicators were supplemented with sub-national datasets providing finer spatial resolution across the districts (notably fine-scale coastal inundation models for Bua, Kubulau, and Nakorotubu).

Exposure Indicators

The 21 exposure indicators used in the assessment, including their descriptions, data sources, and spatial processing steps are summarised in Table A.1.

Table A.1. Exposure indicators used in the community-level CRVA.

Indicator	Description	Source	Processing
Agricultural Suitability Change	Projected change in the proportion of land suitable for crop cultivation by 2040–2069 under RCP 8.5.	Schneider et al. (2022)	Zonal mean across SB and LB; weighted mean (60:40 SB:LB).
Coral Reef Historical Thermal Stress	Historical degree of thermal exposure to coral reefs (1985–2017), measured as a cumulative thermal stress score.	Beyer et al. (2018)	Weighted mean from qoliquoli fishing ground polygons, with weights inversely proportional to district sharing. District-level values assigned to CAPA communities.
Coral Reef Recent Thermal Stress	Recent thermal exposure to coral reefs (2014–2017).	Beyer et al. (2018)	As for Coral Reef Historical Thermal Stress indicator.
Coral Reef Future Thermal Stress	Projected future thermal exposure to coral reefs (2006–2050).	Beyer et al. (2018)	As for Coral Reef Historical Thermal Stress indicator.
Precipitation Seasonality Change	Projected change in precipitation seasonality (CHELSA BIO15) by mid-century (2041–2070) under SSP5-8.5, averaged across five CMIP6 models (GFDL-ESM4, IPSL-CM6A-LR, MPI-ESM1-2-HR, MRI-ESM2-0, UKESM1-0-LL).	Karger et al. (2017), CHELSA v2.1	Multi-model mean calculated; zonal mean across SB and LB; weighted mean computed.
Extreme Heat Days (TX90p)	Projected change in the percentage of days with maximum temperature above the 90th percentile calendar-day threshold by mid-century (2041–2070 vs. 1981–2010 baseline) under SSP5-8.5, averaged across four CMIP6 models.	Copernicus Climate Change Service (2022)	Per-model baseline and future 30-year means computed; future minus baseline change derived; models resampled to common resolution and ensemble-averaged; zonal mean across SB and LB; weighted mean computed.
Extreme Precipitation Days (R20mm)	Projected change in the number of days per year with daily precipitation ≥ 20 mm by mid-century (2041–2070 vs. 1981–2010 baseline) under SSP5-8.5, averaged across four CMIP6 models.	Copernicus Climate Change Service (2022)	As for Extreme Heat Days indicator.

Indicator	Description	Source	Processing
Future Drought	Projected future drought severity by mid-century (2041–2070) measured by the 12-month SPEI, averaged across multiple climate scenarios.	Araujo et al. (2025)	Zonal mean across SB and LB; weighted mean computed.
Drought Change	Projected change in drought severity by mid-century (2041–2070) relative to historical baseline (1981–2010) using SPEI-12.	Araujo et al. (2025)	Future minus historical SPEI values; zonal mean across SB and LB; weighted mean computed.
Total Precipitation Change	Projected change in mean annual precipitation (CHELSA BIO12) by mid-century (2041–2070) under SSP5-8.5, averaged across five CMIP6 models.	Karger et al. (2017), CHELSA v2.1	As for Precipitation Seasonality Change Indicator.
Aridity Change	Projected change in aridity (PET:precipitation ratio) by 2061–2080 under RCP 8.5, ensemble of five GCMs.	Elsen et al. (2021)	Future minus baseline PET:P ratio; zonal mean across SB and LB; weighted mean computed.
Marine Sediment Load	Sediment delivery to coral reefs modelled from land cover, rainfall-runoff erosivity, slope, soil erodibility, and management.	Andreello et al. (2022)	Area-weighted sum from qoliqoli fishing ground polygons, normalised by fishing ground area and weighted by district sharing. District-level values assigned to CAPA communities.
Terrestrial Sediment Export	Sediment delivered from terrestrial catchments to coral reefs from an InVEST Sediment Delivery Ratio model.	Wakwella (unpublished)	As for Marine Sediment Load Indicator.
Coral Reef Bleaching	Cumulative coral reef bleaching stress from annual composites of SST anomaly hotspots.	Coral Reef Watch (NOAA)	Zonal mean from qoliqoli fishing ground polygons weighted by district sharing. District-level values assigned to CAPA communities.
Tidal Flat Loss	Change in tidal flat area between 1984 and 2016 from satellite-based classification.	Murray et al. (2019)	Cell sizes computed; area summed within SB and LB; change = final minus initial area; weighted mean computed.

Indicator	Description	Source	Processing
Fire Extent	Cumulative proportion of community area burned 1990–2021 from annual burned area maps.	Long et al. (2021)	Binary burned raster derived; burned area (km ²) calculated; divided by buffer area for proportion; weighted mean computed.
Flood Risk	Number of people exposed to high fluvial, pluvial, and coastal flood risk, standardised by community buffer area.	Rentschler et al. (2022)	Zonal sum of flood-exposed population within SB and LB; divided by buffer area; weighted mean computed. Zero values set to NA.
Cyclone Risk (Direct)	Direct (land-based) risk from cyclone wave damage; area-weighted cyclone risk score within community boundaries.	Beyer et al. (2018)	Cyclone polygons intersected with SB and LB; area-weighted scores summed; divided by buffer area; weighted mean computed.
Cyclone Risk (Indirect)	Indirect (sea-based) risk from cyclone wave damage to marine resources within fishing grounds.	Beyer et al. (2018)	Cyclone polygons intersected with qoliqoli polygons; area-weighted sum normalised by fishing ground area and weighted by district sharing. District-level values assigned to CAPA communities.
Landslide Susceptibility	Annual frequency of significant landslide events triggered by seismicity and rainfall, weighted by area.	World Bank	Hazard values multiplied by cell area; summed within SB and LB; divided by buffer area; weighted mean computed.
Coastal Inundation	Proportion of community extent projected to experience coastal inundation (flood depth ≥ 0.5 m) at 100-year return period with 0.75 m sea level rise by 2100.	Espejo (2025)	Inundation rasters for Bua, Kubulau, and Nakorotubu (with mangroves) mosaicked and projected. Binary mask applied (≥ 0.5 m). Inundated area divided by buffer area; zero values set to NA; weighted mean computed.

Adaptive Capacity Indicators

Table A.2 summarises the 14 adaptive capacity indicators used in the assessment.

Table A.2. Adaptive capacity indicators used in the community-level CRVA.

Indicator	Description	Source	Processing
Agricultural Suitability	Proportion of land currently suitable for crop cultivation under historical conditions (1980–2009).	Schneider et al. (2022)	Zonal mean across SB and LB; weighted mean (60:40 SB:LB).
Potentially Available Cropland	Potentially cultivable cropland accounting for institutional restrictions, regulations, and nature protection policies.	Schneider et al. (2022)	Zonal mean across SB and LB; weighted mean computed.
Potentially Cultivable Land	Potentially suitable agricultural land excluding impervious surfaces (settlements, roads).	Schneider et al. (2022)	Zonal mean across SB and LB; weighted mean computed.
Freshwater Availability	Volumetric index of freshwater from rivers and streams: product of river length and estimated discharge class within each community area.	HydroRIVERS v1.0 (Lehner & Grill, 2013)	River network clipped to buffers; length calculated; mean Strahler order mapped to discharge class (10^{-1} to 10^5 m ³ /s); volume index = length × class; weighted mean computed.
Tree Cover	Proportion of community area covered by trees >5 m in height (2024).	Hansen et al. (2013) updated to 2024	Binary raster multiplied by cell area; tree cover area summed within buffers; divided by buffer area; capped at 1.0; weighted mean computed.
Onshore Wave Reduction	Mean proportion of wave energy reduced by mangroves in nearshore/onshore areas.	Atkinson et al. (2016)	Mean wave reduction value within SB and LB; weighted mean computed.
Offshore Wave Reduction	Mean proportion of wave energy reduced by mangroves in offshore areas within fishing grounds.	Atkinson et al. (2016)	Zonal mean from qoliqoli polygons, weighted by district sharing. District-level values assigned to CAPA communities.
Coral Reef Extent	Distribution and extent of coral reefs within fishing grounds.	Allen Coral Atlas	Computed at district level and assigned to CAPA communities based on district membership.
Seagrass Extent	Distribution and extent of seagrass within fishing grounds.	Allen Coral Atlas	As for Coral Reef Extent Indicator.

Indicator	Description	Source	Processing
Mangrove Extent	Proportion of community buffer area covered by mangroves.	Global Mangrove Watch (GMW)	Binary mangrove raster multiplied by cell area; total area summed within buffers; divided by buffer area; NA values set to zero; weighted mean computed.
Travel Time to Healthcare	Mean travel time to hospitals and clinics, averaged across walking and driving time surfaces.	Weiss et al. (2020)	Mean of walking and driving time rasters; zonal mean within SB and LB; weighted mean computed.
Travel Time to Cities	Mean travel time to the nearest city using available infrastructure.	Weiss et al. (2018)	Raster projected to district CRS; zonal mean within SB and LB; weighted mean computed.
Coral Reef Temporal Stability	Degree to which current coral reef cover is projected to be maintained by 2050.	Zawada et al. (2026)	Computed at district level and assigned to CAPA communities based on district membership.
Coastal Inundation Protection	Reduction in proportion of community area inundated with mangroves present vs. absent, at 100-year return period with 0.75 m sea level rise. Positive values indicate mangrove protection benefit.	Espejo (2025)	Inundation rasters with/without mangroves mosaicked for Bua, Kubulau, and Nakorotubu; difference in inundated proportion computed within buffers; weighted mean computed.

Indicator Aggregation and Rescaling

All indicator values were rescaled to a common 0–1 scale using min-max normalisation:

$$rescaled = (x - min) / (max - min)$$

where min and max are computed across all 19 communities. This ensures all indicators contribute equally to composite scores regardless of their original units.

Where higher raw values indicate better conditions for adaptive capacity (e.g., greater tree cover, more freshwater), no inversion was applied. Where higher raw values for exposure indicators indicate less threat (e.g., a decrease in aridity is beneficial), values were multiplied by -1 prior to rescaling so that higher rescaled values consistently indicate greater exposure or lesser adaptive capacity.

The indicator inversion logic was controlled by a central metadata table specifying for each indicator: its vulnerability component (exposure or adaptive capacity), the source file, the relevant column name, and whether inversion was required.

Composite Index Calculation

Composite Exposure Index

The Composite Exposure Index was calculated as the unweighted mean of all rescaled exposure indicator values across the 21 included indicators, computed row-wise for each community:

$$Exposure_mean = mean(exposure\ indicators, na.rm = TRUE)$$

The resulting values were then rescaled 0–1 across all communities.

Composite Adaptive Capacity Index

The Composite Adaptive Capacity Index was calculated as the unweighted mean of all rescaled adaptive capacity indicator values across the 14 included indicators:

$$AC_mean = mean(adaptive\ capacity\ indicators, na.rm = TRUE)$$

The resulting values were rescaled 0–1 across all communities. To avoid division by zero in the subsequent vulnerability calculation, the minimum adaptive capacity value was replaced with a value slightly below the next lowest non-zero value (minimum non-zero AC – 0.001).

Composite Climate Vulnerability Index

The Composite Climate Vulnerability Index was calculated as:

$$Composite = Exposure_mean / AC_mean$$

This ratio was rescaled 0–1 across all communities. To reduce the influence of extreme values and improve the spread of scores, a log transformation was applied:

$$Log_composite = log(Composite)$$

Zero composite values were first replaced with a small positive offset (minimum non-zero value + 0.000001) before log transformation. The log-transformed values were then rescaled 0–1 to produce the final Climate Vulnerability Index reported for each community.

Output and Visualisation

Final community-level outputs were saved as a geopackage containing the community polygon boundaries merged with all rescaled indicator values, composite exposure and adaptive capacity indices, and the final log-transformed vulnerability index.

Maps were produced for each indicator and composite metric using a quintile classification scheme (Very Low to Very High), displayed at both a national scale and at six zoomed panels corresponding to geographic clusters of communities within the districts.

Annex B

Community climate risk and vulnerability assessment

Methodology

The purpose of this study was to assess climate risk and vulnerability, with a particular focus on biodiversity, community, and gender perspectives. The assessment was undertaken through the Climate Adaptation and Protected Areas (CAPA) initiative and was used to inform the design and implementation of nature-based interventions aimed at reducing vulnerability and strengthening resilience.

The methodology was adapted from the Community Integrated Vulnerability and Socio-Economic Assessment Tool developed by Pacific regional agencies (Dumaru et al. 2017). The adapted approach was designed as a rapid and practical assessment tool suitable for community-level application. It consists of three parts:

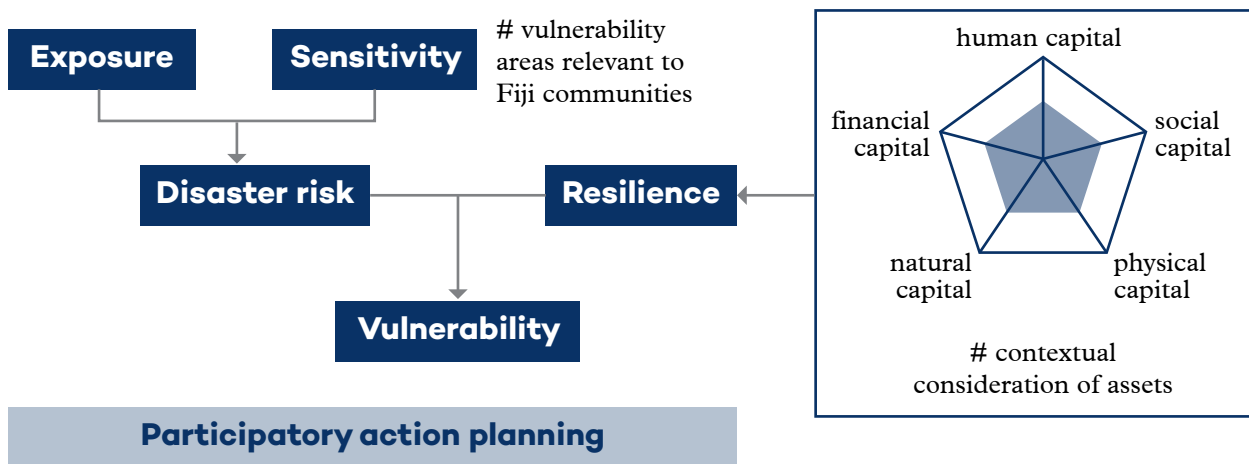
- Focus group discussions (FGD) (questionnaire A)
- Household surveys (Questionnaire B).
- Community resource mapping (incorporated into the FGDs)

Collectively, these methods obtain information on biodiversity, community and gender vulnerability, as well as community resilience. See below conceptual model.

Vulnerability (exposure and sensitivity) is assessed using the areas of vulnerability below:

1. Farms and gardens
2. Fishing ground
3. Fishing infrastructure/facilities
4. Housing areas and settlements
5. Community infrastructure and services

Community resilience is assessed through five rural livelihood assets (Scoones 1998).



The assessments were conducted across 20 communities in the Provinces of Ra, Tailevu, and Bua. These communities were selected based on the prioritisation of vulnerability and exposure to climate-related hazards. Focus group discussions (Questionnaire A) were conducted in gender-specific groups, with approximately 15 participants per group. This approach enabled gender-based perspectives and experiences to be more effectively captured during the assessment process. The focus groups were facilitated by staff members of the same gender who were fluent in the iTaukei language and trained in inclusive, non-subjective facilitation practices. Household surveys (Questionnaire B) were conducted with up to 20 households per community. In communities with fewer than 20 households, all households were surveyed. These household surveys were designed to capture information that may be considered sensitive or culturally inappropriate to discuss openly in a rural Fiji context, such as household income and financial circumstances.

Questionnaire A: Focus Group Discussion

Date		Facilitator(s)	
Province			
District		# women	
Village		# men	

Section 1: Community Description

Demographic Information

# men	
# women	
# children	
# households	
Avg people/household	

Population distribution

Years of age	% of population
<5	
6-18	
18-64	
>65	

Education

Details	% of population
Incomplete primary	
Primary graduates	
High school graduates	
College/Uni	

Community Infrastructure

Item	Present	Comments
Sealed road		
Phone service		
Clean water		
Piped water		
Public transport		
Health centre		
Internet		
Primary school		
Secondary school		
Electricity		
Medical clinic		

Section 2: Vulnerability of natural ecosystems

Resource Mapping

On the printed maps, draw the following:

- Major ecosystems and natural resources in the community (noting use by different gender groups)
 - Observed impacts on natural ecosystems from climate changes (including through the traditional ecological lens)
 - Protected areas (*Tabu areas*)
1. Do you think that your current ecosystem can buffer your community from extreme weather events and impacts of climate change. If so, can you please elaborate?

Section 3: Community risk and vulnerability

2. What are the most common climatic changes and climate-related impacts your community has experienced?

Note: mark the locations of the above-mentioned climate related impacts on the resource map (used during section 2 of the questionnaire)

Exposure and sensitivity risk rating

Key for Exposure:

1 = frequency every 10+ years/only a few people or areas impacted.

2 = frequency from time to time (every 5-10 years)/ up to half the people in the community

3 = impacted frequently (e.g. every 1-4 years)/ large number of people in the community

Vulnerability areas	Frequency	Level of Impact	Notes
Farms / gardens (permanent or temporary damage)			
Fishing grounds / reduction in the number of fish resources (e.g., through the damage to habitat or sedimentation)			
Fishing infrastructure / facilities (e.g., jetty, boat storage, boats, fishing gear)			
Housing areas or settlements			
Community infrastructure and services (e.g., health clinic, church, electric, water systems, cell phone towers, roads)			
Water supply (damage or limited supply)			

Resilience (adaptive capacity)

Key for resilience: 3 = high; 2 = average; and 1 = low

Factor / area of concern	Rating	Notes
Natural Assets		
Availability and health of coastal and marine ecosystems (e.g. coral reefs)		
Presence of tabu areas within the communities customary fishing ground		
Availability and health of forest and terrestrial ecosystems (e.g., adequate arable land)		
Water supply (e.g., are there alternative / multiply water sources)		
Human Assets		
Awareness of climate related hazards and risk mitigation (e.g., planning for change)		
Working age population (e.g., presence of able-bodied workers 18yrs – 60yrs)		
Skills within the community to respond to climate related disasters (e.g. ability to rebuild houses, fish in more distant locations)		
Traditional Knowledge (e.g., knowledge of fishing grounds, spawning seasons, fruiting and cultivating plants and crops)		
Gender equality (e.g., level of women and youths in community development plans, increased collective action and inclusivity by all gender groups in development projects)		
Disaster preparedness and management (e.g., development, implementation, monitoring and evaluation of resilient development plans)		
Physical Assets		
Cyclone proof housing		
Cyclone proof community infrastructure		
Evacuation centers		
Access to communication		

3. Have these climatic changes and/or climate-related impacts changed over time (e.g., more intense, more frequent)? If so, how and which ones?

Community vulnerability action plan

Facilitated discussion on actions and interventions that support climate change adaption in the community (with identified actions to be written on butchers' paper)

4. Are there existing strategies the community uses to respond to climate related impacts or severe weather events?
5. What strategies or options are available to increase climate resilience through the restoration, conservation and sustainable management of ecosystems?

Section 4: Gender vulnerability assessment

6. Is the Natural Resource Committee active in this community? Yes/No
7. How are different community groups involved in the natural resource management decision-making?
8. How do the community members raise their opinions/concerns during a natural resource management decision-making?
9. Are there any barriers for these different groups to participate in natural resource decision-making?
10. How do you perceive the participation and natural resource decision-making capabilities of the different groups within the community (e.g., women, youth and elderly)?
11. What are the greatest needs that your group has for information, skills, and capabilities regarding natural resources management and conservation?
12. How do the climate risks and impact affect different members of the community e.g. men, women, youth, elderly, and people with disabilities?

Gender vulnerability action plan

Facilitated discussion on overcoming the barriers to underrepresented groups in natural resource decision-making (with identified actions to be written on butchers' paper)

Questionnaire B: Household Survey

Respondent Information

Interviewer name(s): _____

Gender	
Age (Years)	
Village	
Years lived in this location	
Household composition	(Adult male / Adult female / Male children / Female children)

Financial Assets

1. What is the main source of income for your family? *(If respondent has more than 1, rank with 1 is most important):*

- ☐ Fishing ☐ Farming ☐ Livestock ☐ Small business / Informal activities
☐ Remittances ☐ Pension ☐ Government social welfare ☐ Salary
☐ Other: _____

2. Is the household weekly/bi-monthly/monthly income sufficient to?

- ☐ Save money for future needs *(Go to 3)*
☐ Meet house needs *(Go to 3)*
☐ Not sufficient *(Provide the main method the household meets their basic needs)*
 - ☐ Assisted by extended family members
 - ☐ Borrow from community
 - ☐ Barter exchange
 - ☐ Other
 - ☐ None

Financial Impact

3. Please rank from 1 to 6 (1 being 'most impact') the impact of the following obligations on household's financial situation?

	Rank
Traditional obligations	
Church obligations	
Food security	
Health care	
Shelter / clothing	

4. Do members receive FNPF (pension) payments?

- ☐ Full pension
- ☐ Can access during disasters or other specific needs
- ☐ No

Human Assets

5. For each statement, rate your level of agreement (*1 = disagree, 2 = neither agree or disagree, 3 = strongly agree*)

- ☐ Our community leaders are interested in issues relating climate change and impacts on our community
- ☐ Our community leaders inform us where we can get climate-related information
- ☐ Our leaders suggest to us what we can do to adapt to changing climate
- ☐ My voice is heard in community planning on natural resource management

Natural Assets

6. Compared with other households in my community, my household has

- ☐ More access to natural resources___
- ☐ Less access to natural resources___
- ☐ The same access to natural resources___

(*1 = disagree, 2 = neither agree or disagree, 3 = strongly agree*)

Social Assets

7. Have you received support from government following past natural disasters?

- ☐ Yes ☐ Sometimes ☐ No

8. Have you received support from civil society or aid organisations following past natural disasters?

- ☐ Yes ☐ Sometimes ☐ No

9. Do you have members of your family that send remittance to support household needs?

- ☐ Yes ☐ Sometimes ☐ No

Climate Adaptation Actions

10. List ways in which you and your household have mitigated some of the climate-related hazards you have experienced in the last 10 years?

Annex C

Community fisheries risk and vulnerability assessments

Methodology

The methodology for the fisheries-specific climate risk and vulnerability assessment in Vanua Levu was adapted from the community integrated vulnerability assessment tool, which was developed by Pacific regional agencies (Dumaru et al. 2017). The adapted approach has been designed to be a rapid and simple tool ‘at level’ for Ministry of Fisheries and Forestry community engagement officers. It consists of three parts:

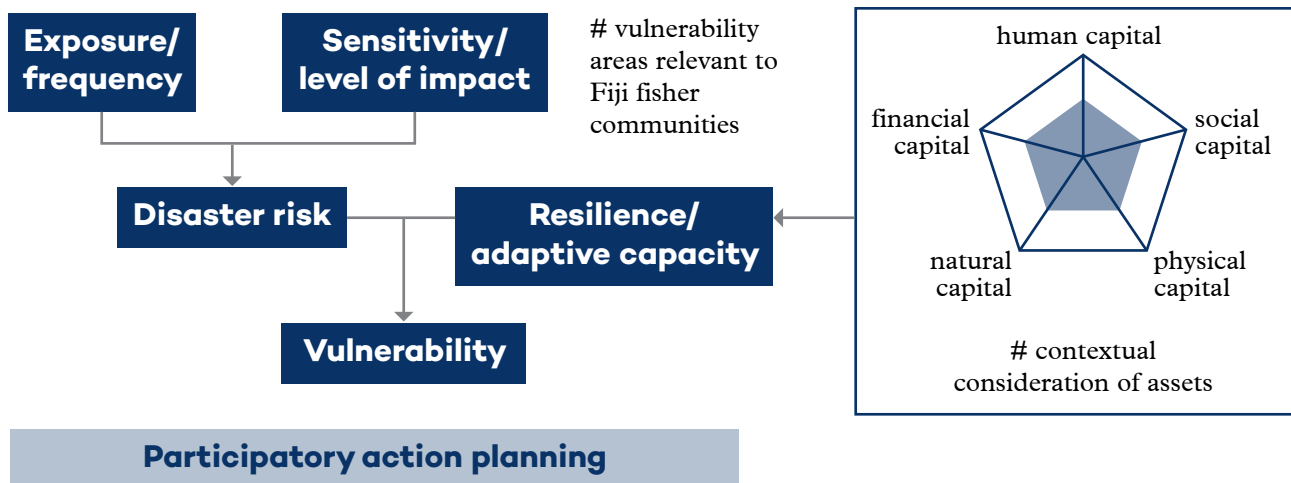
- Focus group discussions (FGD) (questionnaire A)
- Household surveys (questionnaire B).
- Community resource mapping, identifying spatial areas of vulnerability

Collectively, these methods obtain information on disaster risk and community resilience, determining overall vulnerability for fisher specific communities. See below conceptual model. The FGD and household survey questionnaires have been approved by the WCS ethics committee.

Disaster risk (exposure and sensitivity) is assessed using the areas of vulnerability below:

1. Farms and gardens
2. Fishing ground
3. Fishing infrastructure/facilities
4. Housing areas and settlements
5. Community infrastructure and services

Community resilience is assessed through five rural livelihood assets (Scoones 1998). The focus group discussions conducted in gender specific groups, with approximately 10 participants in each. This will allow for gender-based perspectives to be captured in the evaluation. The focus groups are to be facilitated by staff members of the same gender, who are fluent in the iTaukei language and have been trained in inclusive, non-subjective group facilitation practices. The community resource mapping should be undertaken during the focus group discussions. The household surveys are conducted in five households per community, capturing information that is sensitive or not culturally appropriate (e.g., income) within a Fiji rural community group setting. The vulnerability assessments should take a single day per community.



Methodology conceptual model

WCS conducted assessments with the methodology in 10 fisher communities in Bua and Cakaudrove provinces, see below map. These communities were *Tavulomo*, *Koroinasolo*, *Tacilevu*, *Saolo*, *Urata*, *Naturu*, *Vatulele*, *Savani*, *Waitabu*, and *Kiobo*. The communities were selected based on their dependence and use of coastal resources.

The assessments were conducted in December 2023 by two field teams over five days. Importantly, WCS undertook a free, prior, and informed consent process before beginning the assessments.

Questionnaire A – focus group discussion

Date:		Facilitator(s):	
Province:			
District:		# women:	
Village:		# men:	

Community Context

Demographic

# men	
# women	
# children	
# of households	
average # people in each household	

Age structure

years of age	% of population
< 5	
6-18	
18-64	
> 65	

Education

	% of population
incomplete primary schooling	
primary school graduates	
high school graduates	
college graduates	

Livelihood and infrastructure

	Description
Drinking water source	
House construction type	
Community infrastructure	
Fishing infrastructure	
Profession in the community (type and estimated % within community – broken down by gender)	
Fishing activities	
Gardening / farming activities	

Exposure and sensitivity to climate related risks rating

Key for Exposure:

1 = frequency every 10+ years/only a few people or areas impacted.

2 = frequency from time to time (every 5-10 years)/ up to half the people in the community

3 = impacted frequently (e.g. every 1-4 years)/ large number of people in the community impacted

Vulnerability areas	Frequency	Level of Impact	Notes
Farms / gardens (permanent or temporary damage)			
Fishing grounds / reduction in the number of fish resources (e.g., through the damage to habitat or sedimentation)			
Fishing infrastructure / facilities (e.g., jetty, boat storage, boats, fishing gear)			
Housing areas or settlements			
Community infrastructure and services (e.g., health clinic, church, electric, water systems, cell phone towers, roads)			
Water supply (damage or limited supply)			

Resilience

Key for resilience: 3 = high; 2 = average; and 1 = low

Factor / area of concern	Rating	Notes
Natural assets		
Availability and health of coastal and marine ecosystems (e.g. coral reefs)		
Presence of tabu areas within the communities customary fishing ground		
Availability and health of forest and terrestrial ecosystems (e.g., adequate arable land)		
Water supply (e.g., are there alternative / multiply water sources)		
Human assets		
Awareness of climate related hazards and risk mitigation (e.g., planning for change)		
Working age population (e.g., presence of able-bodied workers 18yrs – 60yrs)		
Skills within the community to respond to climate related disasters (e.g. ability to rebuild houses, fish in more distant locations)		
Traditional Knowledge (e.g., knowledge of fishing grounds, spawning seasons, fruiting and cultivating plants and crops)		
Gender equality (e.g., level of women and youths in community development plans, increased collective action and inclusivity by all gender groups in development projects)		
Disaster preparedness and management (e.g., development, implementation, monitoring and evaluation of resilient development plans,)		
Physical assets		
Cyclone proof housing		
Cyclone proof community infrastructure		
Evacuation centers		
Access to communication		

Resource Mapping

Please draw or label all climate-related hazards in your community. *(Among these hazards each gender group should prioritize 3-5 that have a greatest impact and rate them from lowest (1-2) Average (3) High (4-5) and the frequency of these hazards)*

Recommendations / Action plan

Facilitated discussion on community recommendations on preparing for climate-related risks

Questionnaire B: Focus Group Discussion

Respondent Information

Gender			
Age (Years)			
Location:			
Years lived in this location			
Date			
Household composition	Adult male (#)	Adult female (#)	
	Male children (#)	Female children (#)	

Financial assets

1. What is the main source of income for your family? *(If respondent has more than 1, rank with 1 is most important)*

- ☐ Fishing
 ☐ Farming
 ☐ Small business/Informal economic activities
☐ Remittances
 ☐ Pension
 ☐ Government social welfare
☐ Livestock (includes poultry)
 ☐ Salary
 ☐ Other (Please specify)_____

2. If fishing is one of the sources of income for the respondent, ask the following questions:

Types of Fisheries Targeted

Types of Marine resources you fish?	Please tick or specify Species <i>(if applicable)</i>
Sea cucumber	
Sea urchins	
Lobster	
Mud crab	
Inshore crustaceans (moci, kuka etc.)	
Land crab	
Giant clam	
Shrimps	
Other bivalves (Kaikoso etc.)	
Mollusc and collector shells (yaga etc.)	
Finfishes	
Edible seaweed	

3. Is the household weekly/bi-monthly/monthly income sufficient to?

- ☐ Save money for future needs (*Go to 3*)
- ☐ Meet house needs (*Go to 3*)
- ☐ Not sufficient (*Provide the main method the household meets their basic needs*)
- Assisted by extended family members
 - Borrow from community
 - Barter exchange
 - Other
 - None

4. Financial impact

Please rank from 1 to 6 (1 being 'most impact') the impact of the following obligations on household's financial situation?

	Rank
Traditional obligations	
Church obligations	
Food security	
School fees	
Health care	
Shelter, clothing, etc	

5. Do member(s) of your household receive FNPF (pension) payments?

- ☐ Full pension (*Go to 3*)
- ☐ Can access during disasters or other specific needs (*Go to 3*)
- ☐ No

Human assets

6. Governance and participation

For each statement, rate your level of agreement (*1 = disagree, 2 = neither agree or disagree, 3 = strongly agree*)

- a. __ Our community leaders are interested in issues relating climate change and impacts on our fisheries and the impacts on our community
- b. __ Our community leaders inform us where we can get climate-related information
- c. __ Our leaders suggest to us what we can do to adapt to changing climate
- d. __ My voice is heard in community planning for climate-related hazards and impacts adaptation
- e. __ I have had the opportunity to participate in community-level decision-making

Natural assets

7. Compared with other households in my community, my household has:

- i. More access to natural resources____
- ii. Less access to natural resources____
- iii. The same access to natural resources____

1 = disagree, 2 = neither agree or disagree, 3 = strongly agree

Social assets

8. Have you received support from government following past natural disasters?

- ☐ Yes
- ☐ Sometimes
- ☐ No

9. Have you received support from civil society or aid organisations following past natural disasters?

- ☐ Yes
- ☐ Sometimes
- ☐ No

10. Do you have members of your family that send remittance to support household needs?

- ☐ Yes
- ☐ Sometimes
- ☐ No

11. List ways in which you and your household have mitigated some of the climate-related hazards you have experienced in the last 10 years?

Annex D

Focal district vulnerability and adaptive capacity

At a district level, indicators for risk (exposure and sensitivity) and resilience and capacity were combined to provide an overall pictorial representation of risk, adaptive capacity and overall vulnerability (as shown in Figure 4.1–Figure 4.7).

The indicators presented combine the data at a district level for risk (Table A.1) and adaptive capacity (Table A.2), retaining data were applicable at the community scale. Each indicator was rescaled between 0–1 using min-max normalisation where min and max are computed across all 19 communities. Overall risk and adaptive capacity scores were calculated as the unweighted mean of all rescaled component indicators, with resulting scores rescaled between 0–1 across communities. Finally, overall vulnerability was calculated as the mean of overall risk and adaptive capacity scores, rescaled 0 – 1. While acknowledging the limitations in this approach, it provides an indicative representation of climate vulnerability.

Summarised risk and adaptive capacity indicator were combined as per Figure D.1.



$$\text{Overall vulnerability} = \frac{\text{risk (exposure and sensitivity)}}{\text{resilience and adaptive capacity}}$$

Risk (exposure & sensitivity)



Cyclone, floods & inundation

- Cyclone risk (direct)
- Flood risk
- Coastal inundation
- Extreme precipitation days
- Coastal inundation



Agriculture production impacts

- Agriculture suitability change
- Precipitation seasonality
- Future drought
- Drought change
- Total precipitation change
- Aridity change



Impacts on community livelihoods

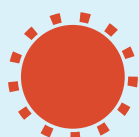
- Extreme heat days
- Fire extent
- Landslide susceptibility



Marine ecosystem impacts

- Historical thermal stress
- Recent thermal stress
- Future thermal stress
- Marine sedimentation
- Coral reef bleaching
- Tidal flat loss

Risk rating



HIGH



MODERATE



LOW

Resilience & adaptive capacity



Coastal protection

- Onshore wave reduction
- Offshore wave reduction



Freshwater availability

- Freshwater availability



Land-based livelihoods

- Agricultural suitability
- Potential cropland
- Cultivable land



Social mobility & Infrastructure

- Travel time to healthcare
- Travel time to cities
- Cyclone proof infrastructure



Marine livelihoods

- Coral reef extent
- Seagrass extent
- Mangrove extent
- Coral temporal stability



Social & human Infrastructure

- Social structures
- Governance
- Use of TEK



Forest cover

- Tree cover



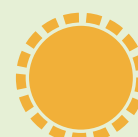
Financial Capital

- Income diversity
- Access to finance

Adaptive capacity rating



LOW



MODERATE



HIGH

Figure D.1 Summarised risk and adaptive capacity indicators used in pictorial diagrams (Figure 4.1 to Figure 4.7)



**Climate Adaptation
and Protected Areas
Initiative**