CLIMATE RESILIENT MOBILITY

An Integrated Vulnerability Assessment of Koro Island, Lomaiviti Province

USP
THE UNIVERSITY OF THE SOUTH PACIFIC

Wildlife Conservation Society

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A report jointly prepared by
University of the South Pacific
and the Wildlife Conservation Society

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WCS

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CONTENTS

Glossary

Bose va koro	Village meeting
iTaukei	Indigenous Fijian, first settlers, custodians
Koro	*iTaukei* village
Lotu	Faith
Mana	Power, wisdom
Mataqali	Clan
Roko	Head of government administrative jurisdiction (at provincial or district/island level)
Tabu	Restriction or restricted area (e.g. sacred site or fishing ground)
Tikina	District
Tokatoka	Extended family within a *mataqali*
Turaga ni koro	The village headman or mayor in charge of day to day operations and development management
Turaga ni Yavusa	Tribal Chief (Chief of a *Yavusa*)
Turaga ni vanua	*Vanua* chief or leader (high level), overseeing a collection of villages, districts or provinces
Turaga	*Vanua* chief or leader (shortened); or (mature) male
Vanua	*iTaukei* notion of the social ecological system of which spirituality, identity and relationships between people and place is implied
Vasu	Relationship that is based on maternal lines
Vuvale	Family (household)
Vola ni kawa bula	Registry of living members of a *mataqali* or *tokatoka* that is managed by the *iTaukei* Land Trust Board
Yasana	Province
Yavusa	A tribe (made up of several *mataqali*)

Acronyms

CCA	Climate Change Adaptation
CCD	Climate Change Division
CRD&M	Climate Resilient Development and Mobility
DPRR	Disaster Preparedness, Response and Recovery
DRM	Disaster Risk Management
HSO(s)	Human Security Objective(s)
IVA	Integrated Vulnerability Assessment
LA(s)	Livelihood Asset(s)
LAHSO	Livelihood Asset Human Security Objectives
LOU	Land owning unit
M&E	Monitoring and Evaluation
MRD	Mineral Resources Department
NAP	National Adaptation Plan
NDMO	National Disaster Management Office
PRG	Planned Relocation Guidelines
SPC	Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
TC	Tropical Cyclone
UNDP	United Nations Development Programme
USP	University of the South Pacific
USP PACE-SD	USP Pacific Centre for Environment and Sustainable Development
WCS	Wildlife Conservation Society

Summary

In 2016, Category 5 Tropical Cyclone (TC) Winston passed through Fiji causing extensive damage and losses, particularly in remote islands and rural areas. Koro Island, in the Lomaiviti Province, was among the most severely impacted by TC Winston, and 13 of the 14 villages on the island were among the 63 coastal communities identified for inland relocation by the National Disaster Management Office (NDMO). In response, the University of the South Pacific (USP) and the Wildlife Conservation Society (WCS) undertook a study to provide data to inform discussions on the relocation of communities and assets away from coastal hazards on Koro Island. This report describes the process and outcomes of an integrated vulnerability assessment (IVA) conducted on the island from 8–17 June, 2016, and subsequent consultations with the communities' Suva-based diaspora. The study included a review of secondary documents, individual surveys and focal group discussions with all 14 villages.

The report comprises six key sections beginning with an introduction on the theoretical framing of coastal hazards and climate resilient mobility. This is followed by a description of the approach and methods of the study which features the integration of local and Indigenous knowledge with modern science in the analysis of climate and disaster risks linked to livelihoods, human security and social inclusivity. The report then provides the context of this study, the island of Koro, and the social and ecological factors that shape vulnerability processes there. The study findings explain how TC Winston affected each village's livelihood assets (natural, human, infrastructure, finance and institutional) in a combination of ways that lead to impacts on human security (in terms of environment and human health and access to water, place, food, income and energy). Community perceptions of coastal hazards and relocation, from the perspective of men, women and youth were also examined in the assessment of vulnerability. A continuum of climate resilient mobility options are then proposed, based on the study findings and lessons. The report concludes with recommendations for informing climate and disaster resilient development and mobility planning, implementation and learning on Koro Island.

The study highlights the significance of customary institutions and language in mediating climate-related mobility in Fiji, and the importance of holistically considering livelihoods and incorporating a participatory gender and socially inclusive approach to relocation decision-making. The importance of linking community level relocation decision-making processes to overarching sub-national, national and regional resilient sustainable development institutional frameworks for planning, monitoring and evaluation was also emphasised. The recommendations encourage a renewed focus on ecosystem-based adaptation and spatial planning, improved early warning systems and evacuation procedures, and the institutionalisation of climate change and disaster risk knowledge production processes that enable local communities to adapt to a changing environment in a participatory way.

The work built upon efforts by WCS and the Lomaiviti Provincial Office between 2014–2015 to develop an ecosystem-based management plan for Koro Island, which included the establishment of a network of community *tabus* or marine protected areas (MPAs) within the inshore traditional fishing grounds (*qoliqoli*).

1 Introduction

1.1 Coastal resilience and climate mobility

An average of 22.5 million people are displaced by disaster-related events every year, with most occurring within national borders.[1] The displacement of people and communities due to weather-related disasters is already a growing problem for Pacific Island countries[2] and is expected to become more critical as global warming increases the intensity of floods, cyclones and droughts.[3] Vanuatu, Tonga, the Solomon Islands, Papua New Guinea and Fiji are ranked in the top 15 countries most at risk to natural hazards by the 2018 World Risk Report, while the atoll states of Kiribati, Marshall Islands and Tuvalu face existential threats due to sea level rise[4]. In Fiji, sea level has been increasing by 6 mm annually since 1993, two to six times the global average[2]. The lack of progress to reduce greenhouse gas emissions via the United Nations Framework Convention on Climate Change negotiations suggests that sea levels may increase by 5–16 cm by 2030 and 8–31 cm by 2055, and will likely worsen existing wave inundation, flooding and storm surge impacts in Fiji's coastal areas where roughly 80 percent of the country's population lives and trades.[5,6] Living in low-lying islands and coastal areas will become increasingly hazardous and a resilience-based approach to coastal management will be necessary to ensure climate-driven human mobility is "well managed and safe, not irregular and dangerous".[7]

Climate resilient mobility (CRM) refers to mobility processes that prioritise the sustainable management of social-ecological systems based on knowledge of current and future vulnerability drivers stemming from the interacting influences of climate change, natural disasters, development.[8] The coupled social-ecological approach of CRM resonates with the Indigenous Fijian philosophical concept of '*vanua*' (literally meaning 'land' but also incorporating the people, marine areas, ecosystems species that belong to it) signifying the interdependence between the natural environment, social and cultural systems, "and the various other institutions established for the sake of achieving harmony, solidarity and prosperity within a particular social context".[9] The affinity between the principles of CRM and the *vanua* makes it an appropriate approach for coastal adaptation in Fiji's context because cultural identity, local values and systems of meaning shape perceptions of risk and learning and, hence, adaptive action in the Pacific.[10,11] While transformation is accepted as an "essential property of resilient systems", the CRM also recognises that people and institutions can impose transformation that supports or undermines social-ecological resilience and, hence, appropriate tools are needed to mediate change that ensures well-being.[8]

1 Yonetani, M. (2016). *Disaster-related Displacement in a Changing Climate*. Internal Displacement Monitoring Centre (IDMC).

2 Secretariat of the Pacific Regional Environment Program. (2016). *Climate Induced Displacement: A Stark Reality for Pacific Islands*. SPREP. Retrieved from: https://www.sprep.org/news/climate-induced-displacement-stark-reality-pacific-islands

3 Pacific Climate Science Program. (2011). *Current and future climate of the Fiji Islands*. Aspendale.

4 United Nations University. (2018). *World risk report: Analysis and prospects 2017*. Berlin.

5 GoF. 2011. *The Integrated Coastal Management Framework of the Republic of Fiji*. Suva, Fiji: Department of Environment, Government of Fiji.

6 https://stats.pacificdata.org/vis?dataquery=A...&period=2010%2C2020&frequency=A&locale=en&term=coastal&start=0&dataflow[datasourceId]=SPC2&dataflow[dataflowId]=DF_POP_COAST&dataflow[agencyId]=SPC&dataflow[version]=2.0&fbclid=IwAR2nElpKW6aWFUP5_uPRtlAi_ifC9g4dMfHojHf9F9od1foERpkvs_VF44U&filter=PANEL_PERIOD

7 United Nations Secretary-General. (2018). *Secretary-General's remarks at the Intergovernmental Conference to adopt the Global Compact for Migration*. 10th December, 2018. Marrakech.

8 Mcleod, E., Anthony, K. R., Mumby, P. J., Maynard, J., Beeden, R., Graham, N. A., ... & Mangubhai, S. (2019). The future of resilience-based management in coral reef ecosystems. *Journal of environmental management*, 233, 291–301.

9 Ravuvu, A. (1983). *Vaka iTaukei: The Fijian way of life*. Institute of Pacific Studies of the University of the South Pacific.

10 Warrick, O., Aalbersberg, W., Dumaru, P., McNaught, R., & Teperman, K. (2017). The 'Pacific adaptive capacity analysis framework': guiding the assessment of adaptive capacity in Pacific Island communities. *Regional environmental change*, 17(4), 1039–1051.

11 Campbell, J., & Barnett, J. (2010). *Climate change and small island states: power, knowledge and the South Pacific*. Routledge.

A variety of climate change vulnerability and adaptation tools have been developed by Pacific regional institutions and have been applied via 'learning-by-doing' processes to strengthen the resilience of island communities across sectors and levels of governance. This study builds on these.[12]

Relocating communities and assets away from coastal hazards, termed *retreat*, is one of four established coastal resilience measures communities adopt to respond to coastal risks and disaster impacts.[13] The other three coastal adaptation approaches are: *protect*, such as the construction of engineering structures (e.g. dykes and seawalls); *accommodate* by increasing the resilience of facilities such as infrastructure (e.g. constructing flood proof houses or reservoirs); and *avoid* by proactively preventing the construction of houses and infrastructure in coastal areas that have been determined hazardous.[14]

Community retreat is expected to become increasingly important as the incremental impacts of climate change on natural resources, settlements and infrastructure are experienced in the medium to long term.[15] Recognising this, the Fiji Government developed the *Planned Relocation Guidelines* (PRG) to assist and guide relocation efforts at the local level.[16] The PRG sits under the *Fiji National Adaptation Plan* (NAP) which addresses vulnerability by integrating environmental and climate risks.[17] The PRG is a three-pillared process comprising: making the *decision* to relocate; developing a sustainable plan for relocation; and implementing, monitoring and evaluating the relocation plan process and outcomes to minimise and avoid negative impacts that may arise during and after the move.[16] The three-pillared process is underpinned by five key principles: human-centeredness (context sensitivity); livelihoods-based (considered access to resources and basic services); human-rights based (gender-sensitivity and social inclusivity); pre-emptive (avoids potential humanitarian crises); and regional (adheres to principles and norms related to human mobility at Pacific regional level).[16] Based on these principles, planned community relocation will only be considered "when all other adaptation options, as provided by the NAP, are exhausted and only with the full, free, and informed consent and cooperation of the communities".[16]

This study is primarily concerned with gathering information to inform decision-making related to retreating from climate and disaster induced coastal hazards on Koro Island. A vulnerability approach to the environment-mobility nexus is essential to determining the potential effects of community relocation on future resilience to climate and disaster risks.[18] Community relocation or retreat is a climate adaptation and disaster reduction measure that has the potential to increase or reduce vulnerability depending on how much the impacts of a hazard are avoided, reduced or recovered and the extent to which access to livelihood assets are impacted. The study aimed to assess how the proposed relocation of 13 coastal villages on Koro following a Category 5 tropical cyclone (TC) might affect their vulnerability to future natural disasters and climate change, in order to make recommendations for climate resilient mobility for the island.

[12] Hay, J. E., & Mimura, N. (2013). Vulnerability, risk and adaptation assessment methods in the Pacific Islands Region: Past approaches, and considerations for the future. *Sustainability Science*, *8*(3), 391–405.

[13] Hino, M., Field, C. B., & Mach, K. J. (2017). Managed retreat as a response to natural hazard risk. *Nature Climate Change*, *7*(5), 364.

[14] Doberstein, B., Fitzgibbons, J., & Mitchell, C. (2018). Protect, accommodate, retreat or avoid (PARA): Canadian community options for flood disaster risk reduction and flood resilience. *Natural Hazards*, 1–20.

[15] GoF. 2017. *Climate Vulnerability Assessment: Making Fiji Climate Resilient*. Prepared by the World Bank for the Government of Fiji.

[16] Government of Fiji. (2018). *Planned Relocation Guidelines: A Framework to Undertake Climate Change Related Relocation*. Fiji Ministry of Economy.

[17] Government of Fiji. (2018). Republic of Fiji National Adaptation Plan: A Pathway Towards Climate Resilience. Fiji Ministry of Economy.

[18] International Organization for Migration. (2013). *Compendium of IOM activities in disaster risk reduction and resilience*. Geneva, Switzerland.

1.2 Background and purpose

TC Winston struck Fiji on 20 February, 2016, and at the time was the most powerful cyclone ever to make landfall in the southern hemisphere. The winds of the Category 5 TC Winston peaked at around 306 km/hour and were accompanied by 20+ metre high storm surges with a run up of up to 200 m inland in the worst hit areas.[19] Land, lives and property were severely impacted; about 62,000 (~8 percent of the national population) men, women and children were accommodated in evacuation centres and after the event 63 communities and 10 health centres were identified for relocation inland by the National Disaster Management Office (NDMO).[19]

Three weeks following TC Winston, the NDMO deployed a team comprising members from the Mineral Resources Department (MRD), the Ministry of iTaukei Affairs and the iTaukei Land and Fisheries Commission to conduct a post-disaster geo-hazard assessment on Koro Island and identify safer new sites on which communities that were severely impacted could rebuild.[20] The 14 villages included the eight villages in Mudu District on the island's east coast, and six in Cawa District located along the western shorelines. Under the National Disaster Management Act 1998, NDMO is responsible for disaster mitigation and prevention and the establishment of a Disaster Mitigation Program that facilitates community relocation based on the outcomes of geophysical hazard risk assessments by the MRD, as mandated in Section 39, clause (3) of the Act. Under the Native Lands Act of 1905, the iTaukei Land Commission is mandated to govern customary land management including the demarcation and formal registration of *iTaukei* village boundaries.

The outcomes of the two-week geo-hazard assessment included recommendations to relocate 13 of the 14 villages on the island to identified elevated and safer places upslope or inland as well as the identification, demarcation and transfer of land as new village sites for nine of the communities.[20] Rebuilding elsewhere was already necessary for numerous households on Koro's eastern coast where house ruins were either covered by the sea or buried in beach sediments. Vatulele Village was the only community not considered for relocation as it was located on elevated land, was less impacted and considered relatively less exposed to coastal hazards.[21]

In May 2016, the then Climate Change Division (CCD) in the Ministry of Economy requested the University of the South Pacific (USP) to assess how the recommendations for community relocation made by NDMO following TC Winston, would affect the 13 villages' vulnerability to climate change in the longer term. The incorporation of climate vulnerability assessments into post-disaster community relocation was not a requirement by regulation or policy at the time. However, the CCD initiated a vulnerability assessment for Koro in its commitment to reduce vulnerability and enhance "the resilience of Fiji's communities to the impacts of climate change and disasters" as stated under Objective 5 of the Fiji Climate Change Policy 2012.[22] Moreover, Strategy 5 of the Policy's fifth objective directs support towards the "ecosystem-based approach throughout Fiji, recognising that ecosystem services such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience".[22] As such, CCD intended to ensure that the relocation recommendation made by the MRD after its visit also incorporated the social, economic and environmental vulnerabilities of the respective communities in the longer term.

[19] Government of Fiji. (2018). *Fiji Post-Disaster Needs Assessment: Tropical Cyclone Winston, February 20, 2016.* Government of Fiji.

[20] Government of Fiji. (2016). *Relocation Program, Hard Rock Assessments and Environment Impact Assessments for Koro Island from 12/03/2016 to 22/03/2016.* Mineral Resources Department. Fiji.

[21] Rigieta Ravuiwasa, personal communication, May 27, 2016.

[22] Government of Fiji. (2012). *Republic of Fiji National Climate Change Policy*. Government of the Republic of the Fiji Islands.

USP strategically approached and partnered with the Wildlife Conservation Society (WCS) for this assessment to ensure its process and outcomes were integrated with past, current, and future resilience building efforts on Koro Island. In 2014, WCS commenced a participatory process to develop an ecosystem-based management plan for Koro Island which included a network community marine protected areas (MPAs) referred to as *tabus* within the inshore traditional *qoliqoli* (fishing grounds). USP and WCS further approached personnel from other government and non-government agencies with an interest in current and future resilient development efforts on Koro. A 14-member team eventually carried out field consultations from 8–17 June, 2016.

2 Study approach and methods

2.1 Integrated Vulnerability Assessment framework

An Integrated Vulnerability Assessment (IVA) was done to gather and analyse data to inform decision-making related to retreating from climate induced coastal hazards. The IVA was developed by Pacific regional agencies to support the integration of various knowledge sources (western science and Indigenous and local knowledge) in vulnerability analysis across sectors (environment, health, water, place, etc.), governance levels (community, district, provincial, national) and actors (government, civil society, private sector).[23,24] The IVA's emphasis on community livelihoods and human security in a changing climate aligns with high-level calls by Pacific Island governments for a comprehensive concept of regional security that includes "human security, humanitarian assistance, prioritizing environmental security and regional cooperation in building resilience to disasters and climate change".[25]

This approach was considered essential for identifying how the proposed relocation on Koro Island might affect community exposure to coastal hazards and their access to livelihood assets for meeting their human security. The IVA gathered and analysed primary field data and secondary technical data to assess how relocating the 13 coastal villages inland may affect vulnerability to climate change at village, as well as at island-scale.

Taking a village-based and island-scale approach is important for several reasons. Adaptation projects in the Pacific are thought to be most effective if implemented through existing social systems and incorporate locally determined values, needs and challenges.[26] In the Pacific Islands natural resource ownership is largely kinship and clan-based and embedded within Indigenous traditions and cultural institutions. In Fiji, a significant proportion of the population live in traditional Indigenous *koro* (villages) whereby kin-based *mataqali* (clans) or *yavusa* (tribes) live communally within a defined geographical boundary, sharing custodianship of surrounding land and marine natural resources and from which food, water, income, settlement, health, learning and wellbeing needs are sourced.

[23] SPC, SPREP, and PIFS (2016). *Abaiang Island, Kiribati – A Whole-of-Island Integrated Vulnerability Assessment*. Pacific Community (SPC), Secretariat of the Pacific Regional Environment Programme (SPREP) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

[24] Dumaru, P., Martin, T., Lowry, B., Manuella, T., Koppert, T., Deiye, T., … Southcombe, D. (2017). *The Pacific Islands Integrated Vulnerability Assessment Framework: A guide for community resilient development*. University of the South Pacific, Suva, Fiji.

[25] Pacific Islands Forum. (2018). *Forty-Ninth Pacific Islands Forum Communiqué*. Retrieved from https://uploads. guim. co.uk/2018/09/05/1FINAL_49PIFLM_Communique_for_unof cial_release_rev.pdf

[26] Barnett, J. (2001). Adapting to climate change in Pacific Island countries: the problem of uncertainty. *World Development*, *29*(6), 977–993.

2.2 The LAHSO vulnerability matrix

The IVA is framed by an assessment of five livelihood assets (LA)[27] in terms of their capacity to support seven identified human security objectives,[28] known as human security objectives (HSO), as shown in Figure 2.1 and Table 2.1. The five livelihood assets comprise:[29]

Natural resources (n). Marine and land-based natural resource stocks, flows and services that support people's short and long-term livelihood and human security.

Infrastructure and services (i). Built structures and equipment (e.g. roads, bridges, buildings, freezers, etc.), as well as technical extension services provided by governmental and non-governmental agencies. Infrastructure and services may be categorized by systems that support basic services such as housing, water and sanitation, health, education, justice and others; and those that enable economic activities including transport (roads, bridges, airports, ports/jetties), information and communication technology, energy, agriculture, fisheries, forestry and tourism and other sector industries.

Finance (f). Money that can be accessed via available stocks such as cash and bank savings, liquid assets such as livestock and jewellery, insurance and credit availability, regular inflows such as income earnings, pension, state transfers and remittance, and income in-kind.

Human resources (h). Traditional and modern knowledge and skills of people in a community that enable them to utilize existing resources to meet daily livelihood needs as well as to plan, implement and monitor development actions and processes, of which demography, mobility and health are critical factors.

Institutions and governance (g). Informal mechanisms (values, norms, customs and culture) and formal rules (policies, laws and regulations) that influence the ways individuals and groups interact, govern and act collectively (via informal and formal organizations). Hence, institutions shape the way people and groups respond to climate change and disaster risks and impacts, by channelling the flow of resources and influences needed to adapt to change.

The seven HSO, represented in seven segments of the IVA Framework (Figure 2.1) and the LAHSO Vulnerability Matrix (Table 2.1) are:

Ecosystem Health (E). The status and potential of an ecosystem to maintain its structure, function and resilience under stress, and to continuously provide quality ecosystem services for present and future generations.[30]

Community Health (H). "A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition".[31]

Security of Place (P). Having access to adequate housing[32] in a place that is physically and socially safe.

[27] Scoones, I. (1998). *Sustainable rural livelihoods: a framework for analysis*.

[28] Maslow, A., & Lewis, K. J. (1987). Maslow's hierarchy of needs. *Salenger Incorporated*, *14*, 987.

[29] SPC, SPREP, and PIFS (2016a). *Integrated Vulnerability Assessment Framework for Atoll Islands: A collaborative approach*. Pacific Community (SPC), Secretariat of the Pacific Regional Environment Programme (SPREP) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

[30] Lu, Yonglong, et al. (2015). Ecosystem health towards sustainability, *Ecosystem Health and Sustainability*, 1 (1), 1–15.

[31] WHO (2013) Available online: http://www. who. int/about/definition/en/print. html (accessed on 20 June 2016) (World Health Organisation).

[32] Habitat, UN (2009). 'The right to adequate housing', Fact Sheet No, 21

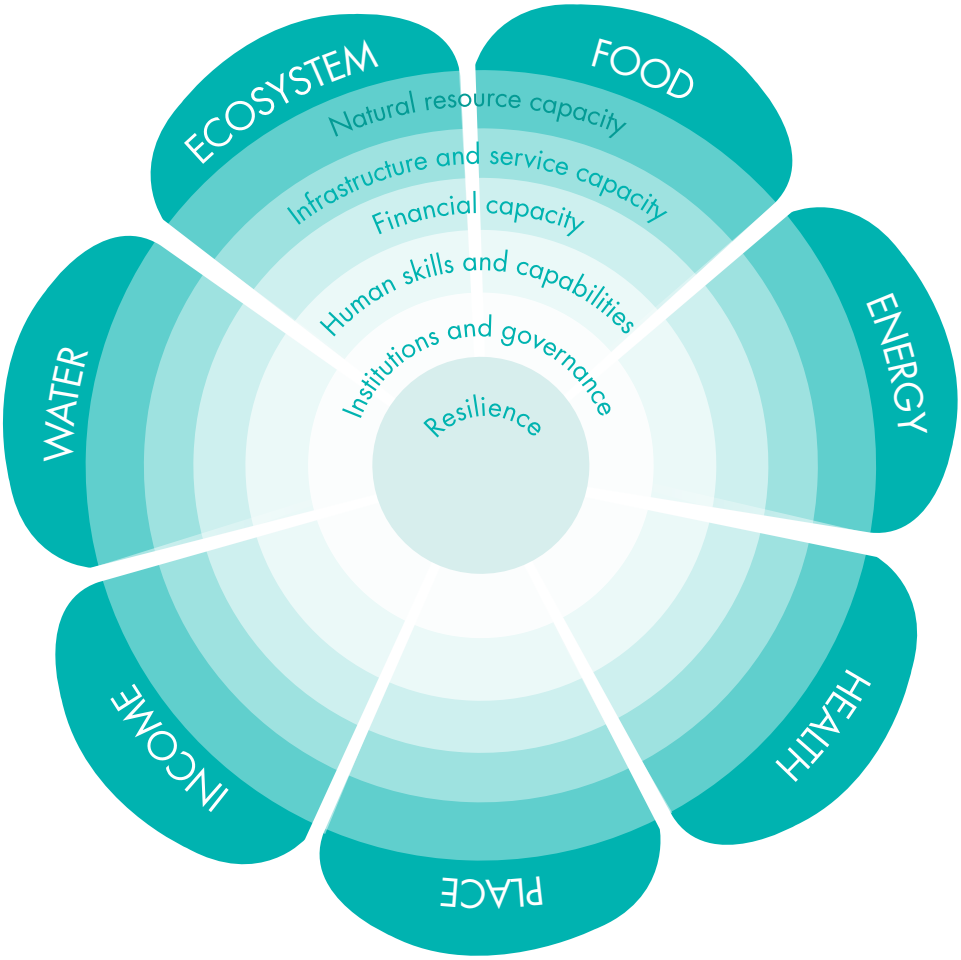

FIGURE 2.1 The community Integrated Vulnerability Assessment Framework. *Source: The Pacific Islands Integrated Vulnerability Assessment Framework: A guide for community resilient development*[25]

Water Security (W). Having access to protected healthy water systems that are relatively safe from the impacts of water-related hazards such as floods and droughts, as well as access to water supply functions and services that are managed in an integrated and equitable way.[33]

Food Security (F). Food security exists "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life".[34]

Income Security (I). The ability to generate the financial income required to pay for necessities at the household and community levels.

Energy Security (N). The "uninterrupted availability of energy sources at an affordable price".[35]

The IVA framing of the LAHSO Matrix is such that data on each of the 35 vulnerability components, comprising 5 LAs x 7 HSOs, can be aggregated and analyzed vertically at multiple scales (e.g. village, district, island, province, country) and horizontally across sectors (e.g. food, water, ecosystems, etc) over time. Within this IVA framing, communities' resilience is determined by their ability to address each HSO under changing LA conditions which are constantly influenced by the interacting pressures from development, disasters and climate change (see Table 2.1). In this way, the IVA framed LAHSO matrix is designed to enable vulnerability assessments that can be periodically replicated in varied places and, hence,

[33] Cook, Christina and Bakker, Karen (2012). 'Water security: Debating an emerging paradigm', *Global Environmental Change*, 22 (1), 94–102.

[34] FAO (1996). Rome Declaration on World Food Security and World Food Summit Plan of Action. World Food Summit 13–17 November 1996. Food and Agriculture Organisation of the United Nations. Rome.

[35] IEA (2017). 'What is Energy Security?', 16 February

spatially and temporally comparable to inform adaptation planning, implementation and M&E. A vulnerability assessment framework that supports the M&E of adaptation is particularly important for reporting towards Nationally Determined Contributions under the United Nations Framework Convention on Climate Change.

The IVA was tailored for Koro Island to enable a systematic analysis of how the proposed relocation of 13 villages from coastal hazards may affect their vulnerability at village and island level in the longer term. The 14 villages on Koro Island are divided into the two districts of Cawa and Mudu (see Table 2.3). While this study conducted a standard assessment for all 35 components of the LAHSO matrix a more detailed examination of the institutional support for security of place (**Pg**) was also conducted, as per the blue-shaded component (see Table 2.1), to determine how the proposed relocation of the 13 villages affected their vulnerability in the immediate to long term. A detailed assessment of **Pg** was also necessary for examining how community perceived risks, priorities and values could be better incorporated in relocation and resilience-building efforts on Koro Island in the longer term.

TABLE 2.1 The 35 components of the LAHSO Vulnerability Matrix

Human Security Objectives (HSOs)	LIVELIHOOD ASSETS (LAs)				
	Natural Resources (n)	**Infrastructure and Services (i)**	**Finance (f)**	**Human Resources (h)**	**Institutions and Governance (g)**
Ecosystem Health (E)	**En:** *Natural resources and ecosystem health*	**Ei:** *Infrastructure and services support for ecosystem health*	**Ef:** *Finance support for ecosystem health*	**Eh:** *Knowledge and skills support for ecosystem health*	**Eg:** *Institutional support for ecosystem health*
Community Health (H)	**Hn:** *Natural resources support for community health*	**Hi:** *Infrastructure and services support for community health*	**Hf:** *Finance support for community health*	**Hh:** *Knowledge and skills support for community health*	**Hg:** *Institutional support for community health*
Security of Place (P)	**Pn:** *Natural resources support for place security*	**Pi:** *Infrastructure and services support for place security*	**Pf:** *Finance support for security of place*	**Ph:** *Knowledge and skills support for place security*	***Pg:** *Institutional support for place security*
Water Security (W)	**Wn:** *Natural resources support for water security*	**Wi:** *Infrastructure and services support for water security*	**Wf:** *Finance support for water security*	**Wh:** *Knowledge and skills support for water security*	**Wg:** *Institutional support for water security*
Food Security (F)	**Fn:** *Natural resources support for food security*	**Fi:** *Infrastructure and services support for food security*	**Ff:** *Finance support for food security*	**Fh:** *Knowledge and skills support for food security*	**Fg:** *Institutional support for food security*
Income Security (I)	**In:** *Natural resources support for income security*	**Ii:** *Infrastructure and services support for income security*	**If:** *Finance support for income security*	**Ih:** *Knowledge and skills support for income security*	**Ig:** *Institutional support for income security*
Energy Security (N)	**Nn:** *Natural resources support for energy security*	**Ni:** *Infrastructure and services support for energy security*	**Nf:** *Finance support for energy security*	**Nh:** *Knowledge and skills support for energy security*	**Ng:** *Institutional support for energy security*

*Institutional support for place security (Pg), shaded in blue, was the LAHSO component examined in greater detail to how community perceived risks, priorities and values could be better incorporated in relocation and resilience-building efforts on Koro Island in the longer term.

2.3 Data gathering methods

The Koro Island IVA sourced secondary data from research and technical reports across sectors while the primary data was gathered via field assessments in the 13 villages, largely by engaging *talanoa* with community members.

2.3.1 Documentation review

Secondary data about Koro from multiple sources were reviewed to describe key environmental, economic and social characteristics that shaped the island's vulnerability. Reports were gathered from on-line sources as well as from governmental and non-governmental agencies that were engaged in post-disaster relief and recovery work on the island. Key data sources included: MRD's post-TC Winston geo-hazard assessment; the Pacific Community (SPC) GIS maps of land cover changes pre- and post-TC Winston; Shelter Cluster reports on relief efforts in Koro Island; population changes from the Bureau of Statistics; and fisheries and protected area boundaries from WCS.

2.3.2 *Talanoa*

Talanoa, literally meaning 'conversation' in the *iTaukei* language, is a recognised research method that engages people to "story their issues, their realities and their aspirations".[36] Community risk perceptions are culturally and psycho-socially influenced and engaging in *talanoa* is particularly important for making sense of the social-ecological context that "defines and frames the space in which decision-making processes operate".[37] *Talanoa* was also used for participatory action research,[38] whereby the assessment is orientated towards community priorities and capacities and on producing actionable knowledge.

The field assessment was conducted on Koro Island from 8–17 June, 2016 by the 14-member team. All the team members had years of extension fieldwork experience in rural *iTaukei* communities and were officers or project managers in their respective fields of work. The Koro IVA field research team was led by USP and included personnel from the *iTaukei* Affairs Board, CCD, Commissioner Eastern's Office, International Labour Organization/United Nations Development Programme (UNDP), WCS and USP Pacific Centre for Environment and Sustainable Development (PACE-SD) (Annex 1).

All team members were native *iTaukei* speakers, and had been trained on the IVA framework and methods. The *iTaukei* Affairs Board and WCS initiated communications with the Lomaiviti Provincial Council and the *Roko Koro* (the head administrator for the island's *iTaukei* villages), who then requested the *Turaga ni Koro* (village administrators) of the 14 villages give permission for a half-day consultation with each community. The *Turaga ni Koros* were informed that the purpose of the visits was to talk with the community about the impact of the cyclone, and obtain their views on the village relocation proposals. The first village assessment was conducted together by the entire team to gain a common understanding of the process and expected outputs of the consultations, and to ensure consistency between team members.

The sequence of activities for each community workshop (Annex 2) was: (i) introductions and workshop purpose and overview; (ii) community adaptive capacity group *talanoa* (five mixed [gender, age] groups based on the livelihood assets as per the IVA framework; (iii) screening of the Narikoso village (located on Kadavu) relocation video; and (iv) group consultations on respondents' views about community relocation

[36] Vaioleti, S. L. (1999–2002). Series of *Talanoa*. Palo Alto, Oakland, San Francisco, California.

[37] Jones, R.N., A. Patwardhan, S.J. Cohen, S. Dessai, A. Lammel, R.J. Lempert, M.M.Q. Mirza, and H. von Storch, 2014: Foundations for decision making. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach,M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 195–228.

[38] Susskind, Lawrence. "Confessions of a pracademic: Searching for a virtuous cycle of theory building, teaching, and action research." *Negotiation Journal* 29.2 (2013): 225–237.

(men, women and youth disaggregated groups). Individual questionnaires were also administered by the other facilitators during the time spent at each community to allow for individuals to communicate their views about the relocation privately. Respondents included village members who remained in their homes during the community consultations as well as those that engaged in group work in communal areas. The community workshops and questionnaires were facilitated in the *iTaukei* language. The facilitators took their own notes as well as audio and visual recordings of their communications with community members. These were supplemented by the research team leader's notes from the debriefing sessions. Each of the two teams was assigned two communities to assess per day. Each community consultation comprised at least 5 facilitators, 20–30 community members, and would generally take place over 5 hours.

2.3.2a Group *talanoa*

Each village visit comprised two sets of group *talanoa* with the first focusing on the 35 IVA components and the second session centred on community views about relocating. A total of 93 group *talanoa* sessions were conducted (Table 2.2). The focus of the first set of sessions was to facilitate discussions about respondents' views regarding the capacity of a livelihood asset (LA) to meet their seven human security needs before and after TC Winston. This session took up to an hour and was made up of five mixed (gender and age) groups, with each one allocated one of the five LAs. Participants were asked to score each LA from 1 to 5 (1=very problematic; 2=problematic; 3=satisfactory; 4=good; and 5=very good) to represent the capacity of the LA to meet a particular HSO and explain the reasons for the score. The IVA assessors facilitated the discussion as necessary and noted the scores and supporting narratives on the IVA scorecard (Annex 3). All data were entered by each field team member and submitted to the research team leader for verification. In a few cases, where the scores significantly differed from the narrative provided or contradicted available secondary data, the team leader would consult with the relevant assessor, and related secondary data (e.g. post-disaster survey outcomes) and adjust scores to better reflect the narrative.

For the second set of group *talanoa*, community participants were asked what they valued most about a place of settlement and then to rank their answers in order of importance, with 1 being of the highest importance. The outcomes of these discussions were written by respondents on flip charts.

TABLE 2.2 Number of group interview sessions held to understand and document relocation views in different villages

Village	No. of Mixed Group discussion sessions (each LA)	No. of Mixed Group discussion sessions (relocation views)	No. of Men's Group discussion sessions (relocation views)	No. of Women's Group discussion sessions (relocation views)	No. of Youth Group discussion sessions (relocation views)	Total
Nacamaki	5	-	1	1	-	7
Tuatua	5	1	-	-	-	6
Nasau	5	-	1	1	1	8
Naqaidamu	5	-	1	1	-	7
Sinuvaca	5	-	1	1	-	7
Namacu	5	-	1	1	1	8
Nakodu	5	-	1	1	1	8
Mudu	5	1	-	-	-	6
Nabuna	5	1	-	-	-	6
Nabasovi	5	-	1	1	1	8
Tavua	5	-	1	1	1	8
Navaga	5	1	-	-	-	6
Kade	5	-	1	1	1	8
TOTAL	**65**	**4**	**9**	**9**	**6**	**93**

2.3.2b Individual *talanoa*

Talanoa was also conducted with individual members of the community aided by a standardised questionnaire. Data were gathered in this way to allow for respondents to communicate their views about relocation in a more discrete way (Annex 4). All the assessors were briefed on the purpose and details of the questionnaire and were provided copies in both *iTaukei* and English languages to ensure consistency in 'meaning-making'. A conversational approach to administering the questionnaire in the *iTaukei* language was encouraged to enable a *talanoa*. These *talanoa* were completed with 103 respondents, ranging from 19 to 77 years, and comprised 56 women and 48 men (Table 2.3). Respondents were asked about the impacts of TC Winston on their lives and their views about relocating.

TABLE 2.3 Number of individual surveys conducted in each village.

Village	District	Female	Male	Total
Nacamaki	Mudu	6	6	12
Tuatua	Mudu	4	2	6
Nasau	Mudu	5	2	7
Naqaidamu	Mudu	1	4	5
Sinuvaca	Mudu	4	5	9
Namacu	Mudu	8	5	13
Nakodu	Mudu	2	8	10
Mudu	Mudu	3	6	9
Nabuna	Cawa	0	0	0
Nabasovi	Cawa	5	2	7
Tavua	Cawa	8	3	11
Navaga	Cawa	3	3	6
Kade	Cawa	7	2	9
TOTAL		**56**	**48**	**104**


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3 Context: Koro Island

3.1 Location

Koro is a volcanic island located 140 km northeast of Suva in the Lomaiviti group of islands. It is the sixth largest island in Fiji with a land area of 105.3 km^2 (Figure 3.1). The interior of Koro consists of an elevated plateau approximately 15 km long and 3–4 km wide, and more than 300 m above sea level with the highest point at 514 m.[42] This plateau forms a barrier to east-west air streams influencing rainfall, causing increased cloudiness on the plateau and windward coasts and less rainfall on the leeward side. This is similar to the main islands of Viti Levu and Vanua Levu that have pronounced dry and wet zones, which are influenced by the island topography and moisture rich south-east trade winds.[23]

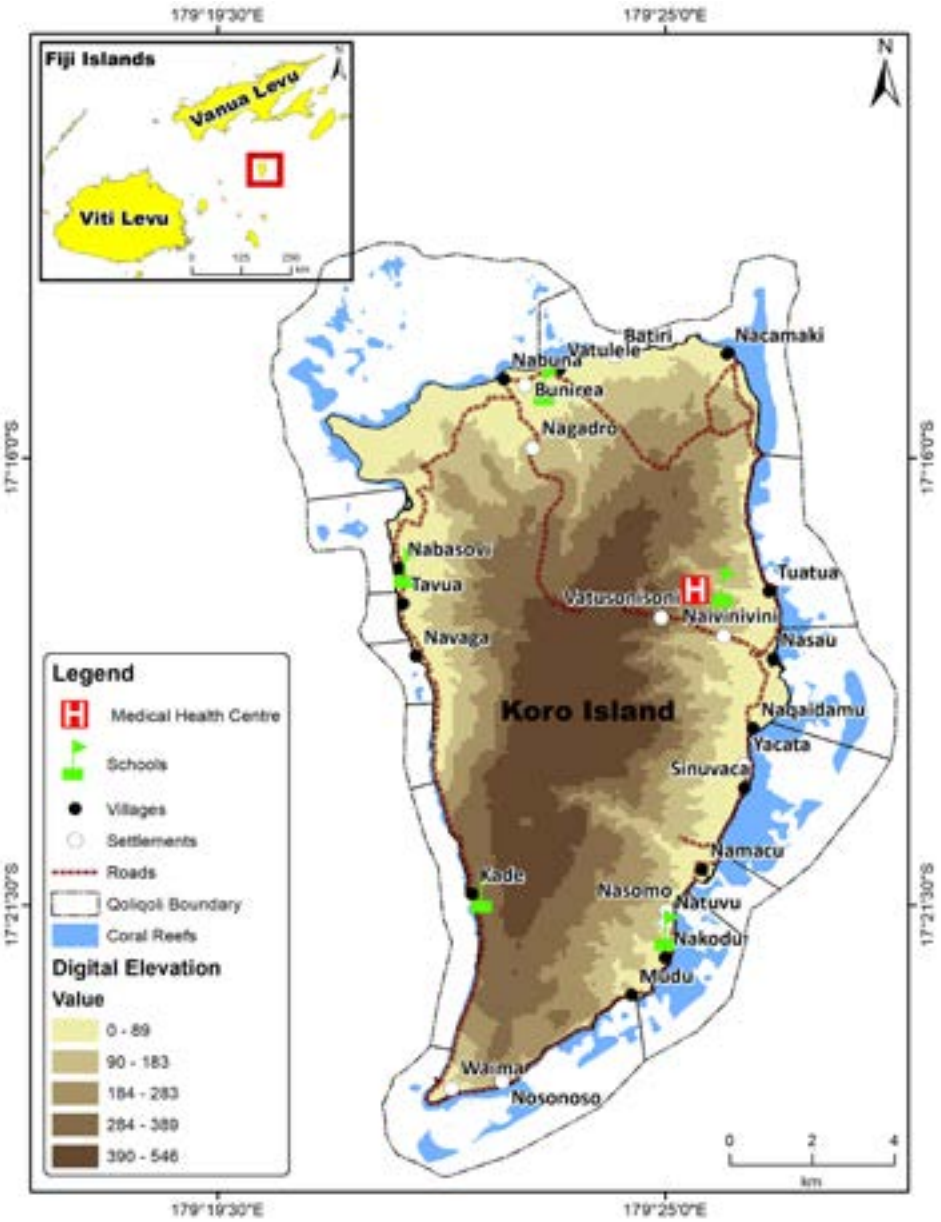


FIGURE 3.1. Villages and settlements on Koro Island. *Source: WCS*

3.2 Climate

Fiji experiences a distinct wet season (November to April) and dry season (May to October), with most rainfall occurring in heavy brief local showers.[23] Average monthly rainfall recorded from 2000 to 2012 at the Koro Airport in Namacu varied from a low of 100 mm in July to approximately 350 mm in March. However, rainfall in Fiji is highly variable and averages have little value as indicators of what rainfall is likely to be in any particular month or season.[39] Fiji often experiences prolonged dry spells lasting three to four months associated with the El Niño Southern Oscillation phenomenon.[23] Fiji occasionally experiences tropical cyclones, mostly occurring from November to April, with the greatest frequency in January and February. An average of 10–12 cyclones per decade affect Fiji, with two or three causing severe damage.[23]

Fiji's climate is anticipated to change in the following ways.[40]

- Temperatures have warmed and will continue to increase: 0.2–1°C by 2030; 0.7–1.5 by 2055; and 0.7–2.1 by 2090;
- Rainfall patterns are projected to change over this century with more extreme rainfall events likely to occur more often;
- Cyclones are expected to decrease in number by the end of this century but will become more intense;
- Sea level near Fiji has risen and will continue to rise throughout this century by: 5–16cm by 2030; 8–31cm by 2055; and 16–62cm by 2090; and
- Ocean acidification will continue to increase in Fiji's waters, threatening coral reef ecosystems.

Fiji is also exposed to non-climate hazards such as earthquakes and tsunamis.

3.3 Land resources

Koro Island comprises approximately 77% steep land, 7% rolling land and 16% flattish land with moderately and highly fertile soils.[41] The upper plateau consists of deep sandy soils that are fairly well leached while "soils from flows and agglomerates are found nearer the sea".[41] Soil types have been mapped by the Land Use Section of the Department of Agriculture, but have not yet been digitised. However, digitised land use recommendations based on soil distribution and topography (Figure 3.2) suggest there are relatively large portions of arable land in the island's centre and towards the northern and eastern coasts.

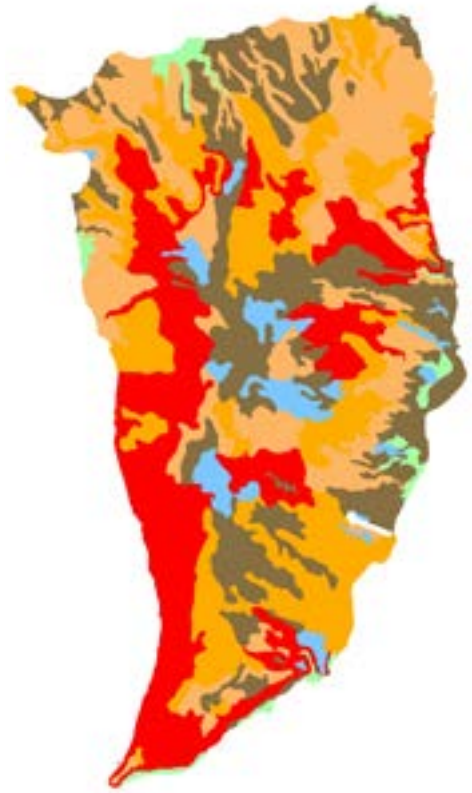
Pre-cyclone satellite data showed that the majority of Koro Island was covered by 86% closed and open forest, 9% bare land, 1% coconut plantations, and less than 1% covered by buildings (Figure 3.3). A finer-scale analysis distinguishing between coconut and open forest, identified 1440 hectares of coconut, including dense, medium-dense, and scattered coconut stands.[42] Much of the inland forest is likely to be secondary given that pre-European settlements on the island were located away from the coast.[42] The seaward slopes used to be the only areas cleared for gardens and coconuts, although cultivation inland was facilitated by road access in the mid-1960s.[42]

[39] Fiji Meteorological Services, 2006, The Climate of Fiji, Private Mail Bag, Nadi Airport, Fiji. https://www.met.gov.fj/ClimateofFiji.pdf

[40] Pacific Climate Science Program. (2011). Current and future climate of the Fiji Islands. Aspendale

[41] Bayliss-Smith, T. (1976). *Koro in the 1970's: Prosperity through diversity* (UNESCO/UNFPA Fiji Island Reports No. 2). Canberra, Australia

[42] Secretariat of the Pacific Community. (2016). *Land cover change detection of Koro Island pre and post Cyclone Winston.* Suva, Fiji



LEGEND

- i Best arable land with no limitation. Suitable to wide range of crops.
- ii Good arable land. Slight limitations making it more difficult to manage than class i.
- iii Fair arable land. Moderate limitations, restrictions.
- iv Marginal arable land. Good to fair tree cropland. Severe limitations.
- v Good grazing land. Slight limitations.
- vi Marginal grazing but good for forestry.
- vii Fair to marginal forestry land. Unsuitable for grazing.
- viii Unsuitable for productive use in agriculture or forestry. Reserve for catchments and wildlife protection purposes.

FIGURE 3.2 Recommended land uses for Koro Island, based on soil distribution and topography.
Source: Ministry of Agriculture, Rural and Maritime Development and National Disaster 2016

LEGEND

- Sand
- Open forest
- Buildings
- Closed forest
- Coconut
- Bare land
- Inland water
- Shrub
- Cropland
- Grassland

FIGURE 3.3 Land cover on Koro Island in 2015 pre-cyclone.
Source: SPC 2016

To date, no detailed inventories of flora and fauna have been conducted on Koro Island. Birds and iguanas are good indicators of the state of forest health of terrestrial ecosystems. Surveyors identified 15 different birds by their calls, which include Kuluvotu (*Ptilino perousii*) assessment for iguanas revealed one female Iguana (*Brachylophus bulabula*), and a Fiji giant forest gecko (*Gehyra vorax*).[44] Only one invasive green iguana (*Iguana iguana*) has ever been seen by locals on Koro Island.

The cultivation of coconuts, *uvi* (yams), *dalo* (taro), *yaqona* (kava), plantains and bananas on the island has replaced coastal forests consisting of *Barringtonia asiatica*, *Hibiscus tiliaceus* and *Cordia subcordata* on flat land along the western side of the island and Vaivai thickets (*Leucaena leucocephala*). Subsistence crops were grown after the initial removal of the natural vegetation and the undergrowth beneath the planted palms and trees cleared.

Much of the drinking water on the island is drawn from surface water and underground freshwater springs. There is limited information available about Koro Island's freshwater resources although satellite imagery analysis detected up to four hectares of inland water cover.[43] According to the Assistant District Officer of Koro Island, there are numerous sources of drinking water within and near the forest that villagers rely on. A few coastal villages such as Kade have access to piped water from inland sources although they rely more on coastal freshwater springs for bathing, which they do during low tides. However, existing inland water sources are not keeping up with demand due increasing population and long dry spells brought on by El Niño events. Hence, new water sources are being sought by most villages and settlements.

3.4 Sea resources

Koro has 15 traditional village-based fishing grounds (*qoliqoli*) covering a total area of 75.1 km^2, including 19 periodically harvested closures (*tabu*) (Figure 3.4). The Navaga *qoliqoli* comprises two separate *qoliqoli*, one for each of the two tribes (*yavusa*) that make up the village. There is limited available information on the flora and fauna in Koro Island's estuarine, coastal and marine ecosystems. Seagrass beds, mangroves, mudflats and coral reefs form the major habitat types within marine, estuarine and coastal environments. These ecosystems are vital for maintaining key functions and processes such as erosion control, storm surge protection, filtration of water flowing from land to sea, regulating and recycling of nutrients, and providing habitats for plants and animals.

FIGURE 3.4. Customary fishing ground boundaries and *tabu* areas within Koro Island.

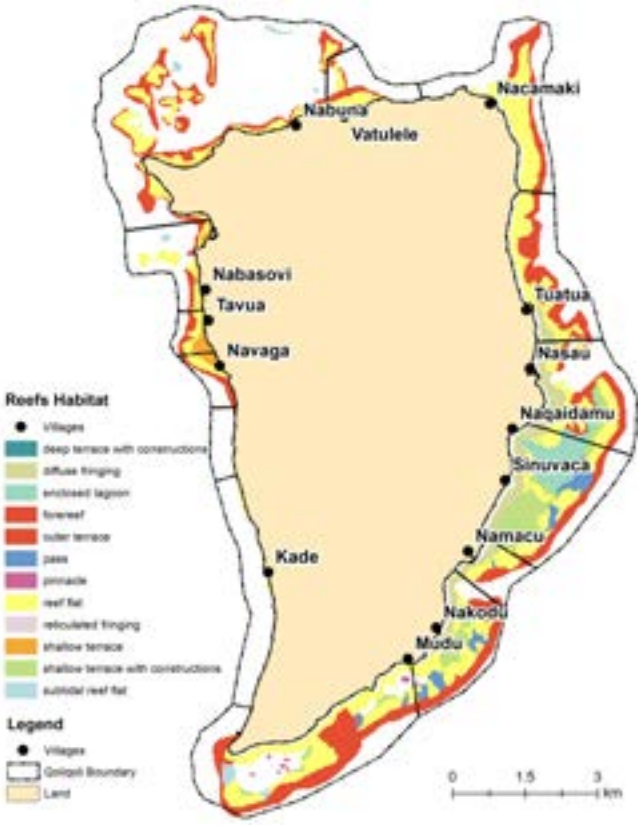


FIGURE 3.5 Coral reef habitats around Koro Island.
Source: WCS

[43] Government of Fiji, 2010, Fiji's Fourth National Report to the United Nations Convention on Biological Diversity, Department of Environment Fiji.

Coral reef habitats include reef flats, fore-reefs, fringing reefs, and deep and shallow terraces. (Figure 3.5). WCS conducted coral cover surveys inside and outside of protected areas in the *qoliqoli* of Nakodu and Tuatua in 2013. Thirty coral species were identified in both *qoliqoli* and average live hard coral cover varied from 11–25% in Nakodu and 20–25% in Tuatua. Average macroalgal cover was between 6–7% in Nakodu and 14–17% in Tuatua and a total of 153 fish species were identified in the Nakodu *tabu*.[44] Mangroves are limited to a small (13 ha) area near Nabasovi Village on the Western side of the island.

3.5 People and institutions

Koro Island is located in the Lomaiviti Province. The island's population is largely made up of the 14 traditional *iTaukei koro* that make up two districts, Mudu and Cawa (Figure 3.1). The villages of Mudu District, located along the island's east coast, include Nacamaki, Tuatua, Nasau, Naqaidamu, Sinuvaca, Namacu, Nakodu and Mudu. The Cawa District villages along the northern and west coast are Kade, Navaga, Tavua, Nabasovi, Nabuna and Vatulele. Village populations range from 70–140 people. More than ten other smaller informal settlements have formed as 'extensions' of the established villages and tenured via customary arrangement. For example, one of the settlements located inland, houses migrants from the Lau Islands group who relocated to Koro for economic reasons in the 1980s. The informal settlements are much smaller than the established villages. Other residents of the island include foreign nationals who have built holiday and retirement homes on elevated freehold land on the island's northeast (between the villages of Nabasovi and Nabuna) and government and industry employed personnel who mostly live in the business centre adjacent to Nasau village.

For an outer island in Fiji (where depopulation is common), Koro Island seems to have maintained a healthy population over the past five decades, although negative growth appears to have been caused by major cyclones passing through the island in 1993 (TC Kina) and 2016 (TC Winston) (Table 3.1). Available 1996 and 2006 data also reveal a dominant younger (below 34) population accounting for 70% and 62% of the total respectively. The establishment of the island's only high school in 1970 may also have contributed to this, having started as a junior-secondary school, then catering for senior students from 1980.

TABLE 3.1 Decadal population change and major cyclones on Koro Island

Year	0–14 years	15–34 years	35–54 years	55–74 years	75 + years	Total	Growth rate	Year major cyclones passed through Koro
1966	-	-	-	-	-	2,843	-	-
1976	-	-	-	-	-	3,199	+1.3	-
1986	-	-	-	-	-	3,888	+2.2	-
1996	1,349	855	626	304	35	3,169	-1.9	1993 TC Kina
2006	1,206	823	784	375	53	3,241	+0.2	-
2017	-	-	-	-	-	2,830	-1.3	2016 TC Winston

Source: Bureau of Statistics Census

[44] Nand Y, Mangubhai S, Naisilisili W, Tamanitoakula J, Dulunaqio S (2020) Assessment of Coral Reefs around Koro Island, Lomaiviti Province. Report No. 01/20. Wildlife Conservation Society, Suva. 44 pp.

Population data sourced from the Lomaiviti Provincial Office immediately before and eight months after the cyclone (January and October 2016) indicates an estimated reduction of up to 26% as shown in Table 3.3. The more exposed Mudu District experienced a 34% reduction compared to 12% drop in Cawa District on the west coast, although these estimates may be conservative. For example, the Fiji Red Cross reported in 2018 that about 100 residents of Nasau village left the island immediately after the cyclone with only 40 having returned since.

TABLE 3.3 Population of Koro Island's villages before and after Tropical Cyclone Winston

Village	District	Pre-cyclone	Post-cyclone*	Difference	(%)
Nacamaki	Mudu	356	205	-151	(42%)
Tuatua	Mudu	320	225	-95	(30%)
Nasau	Mudu	457	451	-6	(1%)
Naqaidamu	Mudu	287	120	-167	(58%)
Sinuvaca	Mudu	149	72	-77	(52%)
Namacu	Mudu	300	120	-180	(60%)
Nakodu	Mudu	380	300	-80	(21%)
Mudu	Mudu	259	164	-95	(37%)
Vatulele	Cawa	236	212	-24	(10%)
Nabuna	Cawa	220	160	-60	(27%)
Nabasovi	Cawa	219	192	-27	(12%)
Tavua	Cawa	165	162	-3	(2%)
Navaga	Cawa	247	247	0	(0%)
Kade	Cawa	243	195	48	(20%)
TOTAL		**3838**	**2824**	**1013**	**(26%)**

* Fiji Times 26/10/16.

Source: Lomaiviti Provincial Council

Koro Island falls within the administrative boundaries of the Commissioner Eastern Division, under whom there is a Divisional Planning Officer. The Provincial Administrator for Lomaiviti works directly under the Divisional Planning Officer Eastern Division and is responsible for issues including rural development machinery, identification, prioritisation, and funding for self-help schemes, farm roads, seawalls, river crossing, housing and other socio-economic projects at the community level.

Rural development is implemented by multiple Ministries in terms of the services they provide. However, the Ministry of Rural and Maritime Development plays the leading role in coordinating government assistance with at least six other ministries and agencies, including those responsible for roads, water and electricity, health, welfare and poverty assistance, agriculture and business. Ministries have their own processes of delivering rural programmes, but the Ministry of Rural and Maritime Development is allocated annual funding specifically for rural development.

Community-level development concerns and initiatives are raised by and discussed at the (usually weekly to monthly) village meetings. Identified issues are then discussed at the district meeting before being proposed for action at the provincial meetings that include governmental representation.
Adopted project submissions are then forwarded to the Divisional Commissioners for funding under the annual budgetary allocations. This process is organised by the *iTaukei* Affairs Board, as the implementing arm of the administration governing Indigenous land and institutional matters. The Provincial Administrator is empowered under the National Disaster Management Act as the District Disaster Coordinator and is responsible for activating and overseeing disaster warning and response activities in the province.

3.6 Natural resource management

Historically, coconut was the main immediate-income commodity of Koro Island with income from *yaqona* primarily used for long-term family and communal obligations. This trend continued until the collapse of the copra (coconut) industry in the 1980s and the Samoan taro blight of 1993 that allowed Fijian *dalo* to enter the New Zealand and Australian markets. In the second half of 1994, it was reported in the Lomaiviti Provincial Council meeting in Suva that Koro *dalo* exports totalled FJ$65,000. The rapid rise in the cultivation of the tausala variety of taro for exports consequently diminished the planting of native *dalo* varieties, namely the *Bavia, Vavai dina, Vavailoa, Samoa vula, Samoa loa, Vutikoto, Sakavi damu, Sakavi loa*.[45] The increased occurrence of slash and burn farming practices and shifting cultivation for new planting areas also caused the disappearance of forests areas and virgin vegetation in parts of the island.

The shift towards commercial agricultural production was boosted further by the government, through the Rural Millionaire Project introduced in 2014 designed specifically for subsistence to commercial farming transformation. The project includes the long-term cultivation of *yasi* (sandalwood), *yaqona* for medium term income and the *tausala* variety of taro and watermelon for more immediate and regular income sources. The cultivation of *kava* was also spurred by the kava boom in recent years. Community livelihoods are also dependent on *voivoi* (pandanus), mostly sourced from the coast, for the production of weaving fibre and for traditional woven mats.

In 2005, Koro Island developed and adopted marine action plans for resource management activities via a community-based process facilitated by USP Institute of Applied Science. This led to the creation of the Koro Island Yaubula Management Support Team, consisting of government departments, chiefs, church leaders and village resource committee representatives, to coordinate community resource management and conservation on the island. Concerns about the unsustainable utilisation of marine resources around the island have led to the formation of village resource committees who manage the 14 *tabu* areas in their *qoliqoli.* The committees have identified other threats to marine habitats and resources including illegal fishing, sea cucumber harvesting, and the poisoning of rivers and streams for prawns.

At community-based natural resources management planning sessions conducted by WCS and USP between 2005 and 2013, villagers identified multiple threats to the forest, including commercial logging, the clearing of buffer zones along rivers, streams, and the overuse of chemical herbicides, pesticides and fertilisers. WCS facilitated ecosystem-based management planning in Koro between 2015–2019 where islanders declared their vision “for a healthy future and resources abundance for Koro and its future generation”.[46] In order to realise this vision, goals were set: to have more fruit and forest yams, protect native forests, plant native root crops (particularly yams), protect catchment areas and reforest buffer zones, maintain old heritage sites, set up protected rivers to increase native fish species’ numbers, clean rivers to contribute to an abundance of fish and invertebrates, increased numbers of crabs and mud crabs, replant mangroves, establish mangrove protected areas, and maintain the network of *tabu* areas.

[45] Nature Fiji, 2015. https://naturefiji.org/colocasia-esculenta-dalo/

[46] Wildlife Conservation Society (2019) *Koro Island Ecosystem-Based Management Plan: Koro Island, 2019–2024.* WCS, Suva, Fiji. 81 pp.

4 Results: Current and future vulnerability

This study sought to assess how inland retreat may affect the vulnerability of Koro's coastal communities to climate change in the longer term. This was done by examining how communities' LAs are exposed and vulnerable to coastal hazards and how this affected their ability to address each HSO. The outcomes of LAHSO assessment was used to identify potential ways in which relocating may strengthen or undermine each village's resilience to future disasters and climate change. The first part of the results section (4.1) describes each villages' exposure to coastal hazards, including a coastal impact assessment of TC Winston while the second part presents the outcomes of the community consultations in terms of their views on the vulnerability of their LA and how that affected their ability to address their HSOs in relation to climate and disaster related coastal hazards and in the medium to long term.

4.1 Village exposure to coastal hazards

The 14 villages on Koro Island are significantly exposed to coastal hazards as all are located along the flat shorelines with numerous houses less than 5 m away from the high-water mark. Village location and expansion patterns also shaped exposure levels. Most villages expanded along the shoreline, possibly determined by the availability of flat land. Villages in Mudu District faced the south-easterly trade winds as well as the TC Winston winds and storm surge wave force. Moreover, there was minimal coastal vegetation to provide a natural defence for most villages and seawalls in several villages had collapsed prior to TC Winston and worsened afterwards.

Community relocation destination sites were identified by MRD and *iTaukei* Land and Fisheries Commission team for all 13 villages after TC Winston and tenure for nine of these was confirmed. Communities with tenure access to contiguous and gently sloping land were able to retreat from the shoreline while others were confined by geography (cliff terrain) and land tenure access.

Highlights of each village's pre-existing vulnerabilities to coastal hazards, tropical cyclone wave impact and associated relocation considerations are detailed below.

4.1.1 Nacamaki

Number of houses: 83

Pre-existing coastal vulnerabilities:

- Most houses were on low lying coastal flat alluvial land gently sloping inland spread along the shoreline.
- Gradual coastal erosion was evident with substantial erosion caused by a past cyclone related wave surge that washed away three houses and scoured the shoreline in 2010.
- There was minimal coastal vegetation cover and no artificial barriers to protect the coastline.
- Heavy rain flooded areas near the creeks.

TC Winston impact:

- The storm surge was ~12.9–25.1 m above mean sea level (msl) and covered most of the village.
- The shoreline was scoured by ~10 m.
- Three rows of houses immediate to the shoreline were washed away and were covered in beach sand.

Proposed relocation site:

- Tenure for an adjacent upslope area behind the village, and about 53 m above msl was approved for relocation previously. Land had been levelled although houses were yet to be built there.

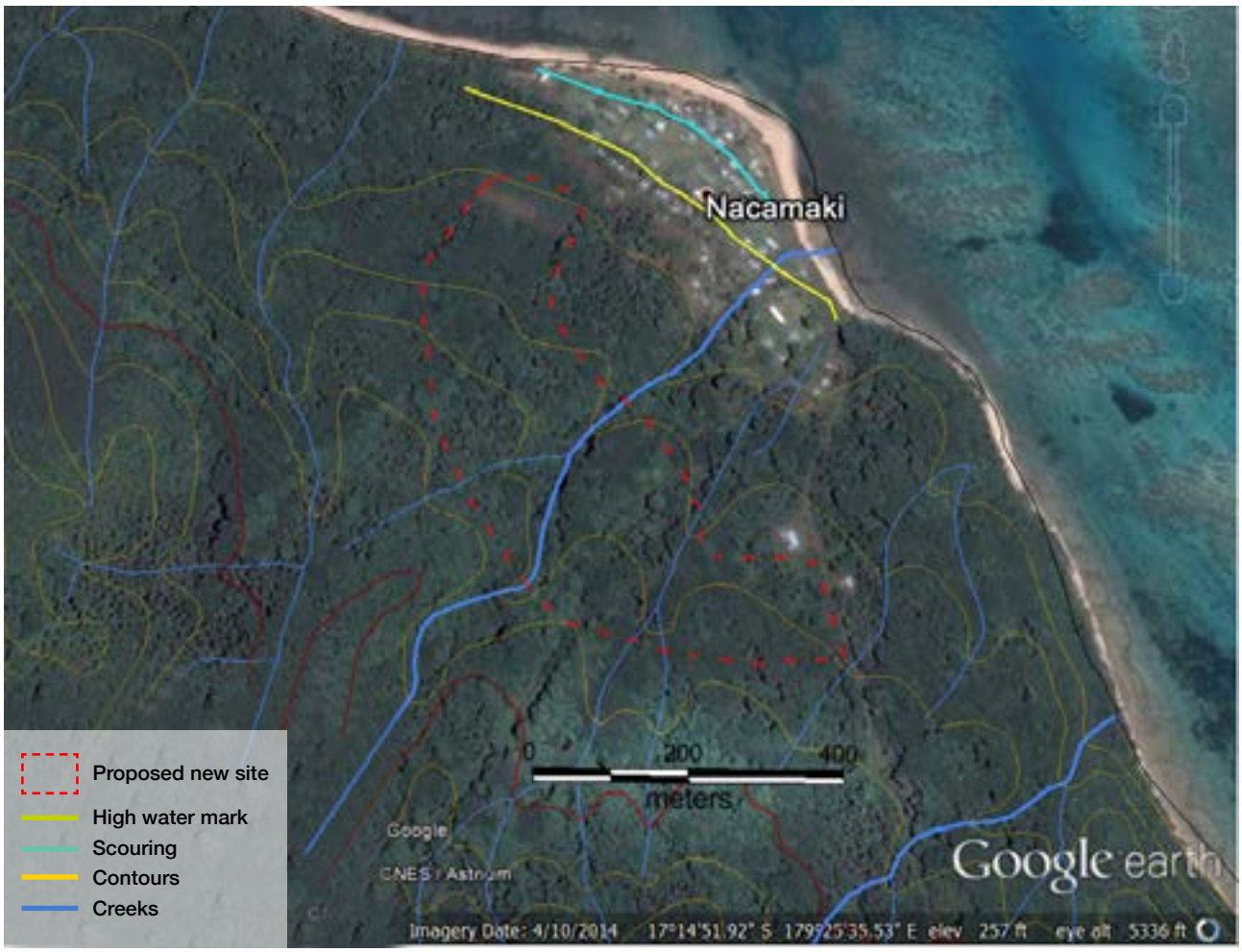


FIGURE 4.1 Nacamaki village TC Winston wave impact and proposed relocation site

4.1.2 Tuatua

Number of houses: 84

Pre-existing coastal vulnerabilities:

- Houses were built on low lying coastal flats with housing along the shoreline.
- Gradual coastal erosion was evident.
- There was minimal coastal vegetation cover and no artificial barriers to protect the coastline.
- Flooding was occurring due to inadequate drainage to manage the run-off from the hills behind the village and this was interacting with storm wave surges.

TC Winston impact:

- The storm surge covered most of the village well over house height.
- There was shoreline scouring into the village boundary.
- Most houses were completely destroyed.

Proposed site:

- No site is proposed and village access to suitable land is limited.

4.1.3 Nasau

Number of houses: 120

Pre-existing coastal vulnerabilities:

- Most houses were built on low lying coastal flats at the foot of a steep cliff.
- Gradual coastal erosion was evident.
- Land reclamation had occurred and there was a collapsed seawall.
- Houses and the village were built close to and along the shoreline (the location was previously thought as ideal due to being flat land close to the sea with a creek running through the site).

TC Winston impact:

- The storm surge was ~22.5 m above msl and covered the entire village.
- Shoreline scouring encroached several metres into the village boundary.
- The high water mark shifted 3 m behind the collapsed seawall.
- All houses were completely destroyed.
- Five people died.
- Cyclone debris created hazards.
- There was rock-fall from the cliff.

Proposed site:

- Elevated ground ~400 m in width (at the base of the slope) and 20 m in height with a gradual increase in elevation.
- ~500 m to 1 km inland south of the village.

FIGURE 4.2 Nasau village TC Winston wave impact and proposed relocation site

4.1.4 Naqaidamu

Number of houses: 71

Pre-existing coastal vulnerabilities:

- Most houses were on low lying coastal flats with some on gently sloping terrain inland.
- Some houses were close to hazards linked to the cliff walls and fractured rock.
- Gradual coastal erosion was evident.
- Most of the village houses were built away from the coastline, but a few houses were built closer to the beach and experienced coastal flooding during spring tides.
- There was minimal coastal vegetation cover and no artificial barriers to protect the coastline.

TC Winston impact:

- The storm surge was ~8 m above msl and covered approximately two thirds of the village.
- Shoreline scouring encroached into the village boundary.
- Most houses were completely destroyed.

Proposed site:

- Tenure has been secured for two areas:

  Option 1: A contiguous elevated slope overlooking the current village.

  Option 2: 1 km from the village boundary and ~700 m inland from the main road.

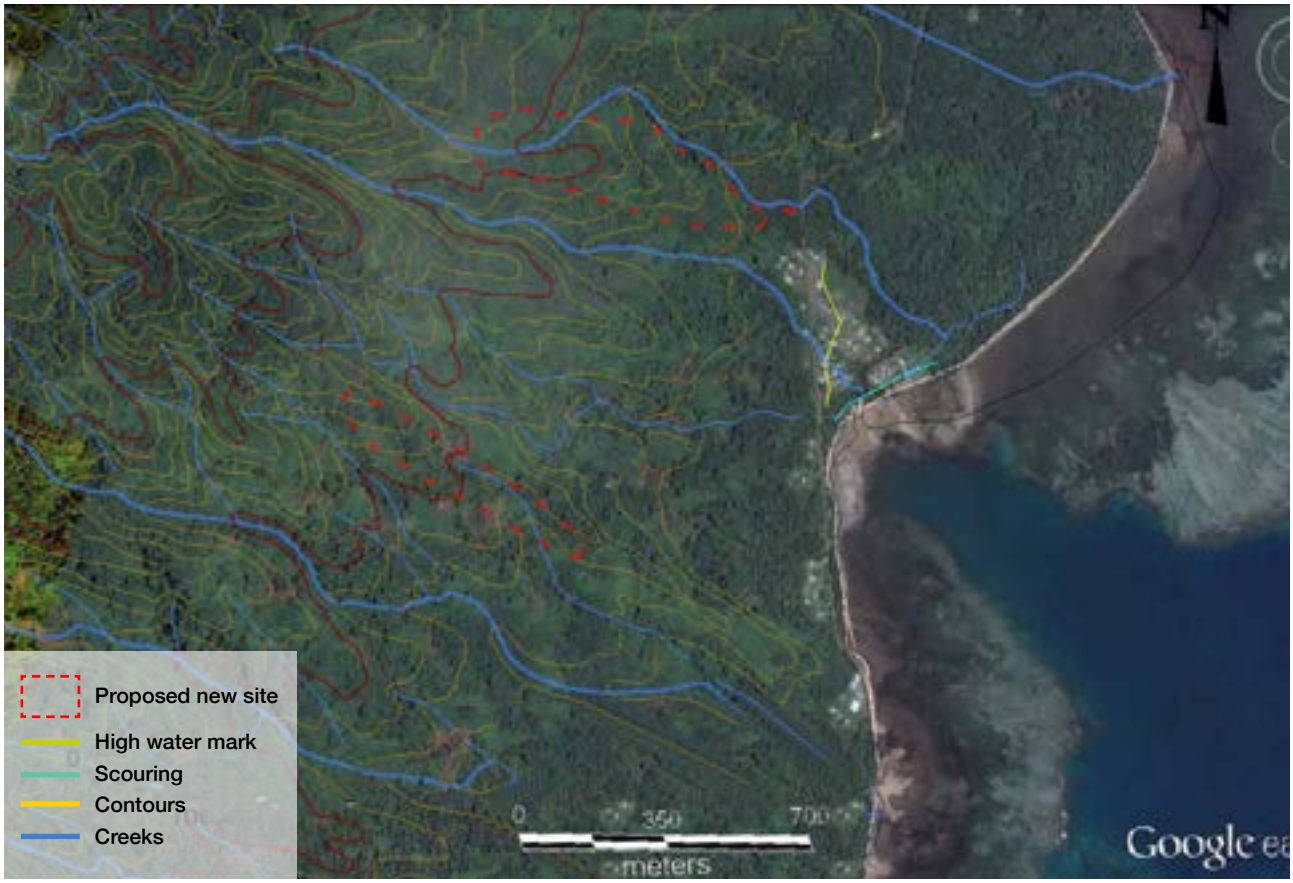


FIGURE 4.3 Naqaidamu village TC Winston wave impact and proposed relocation site

4.1.5 Sinuvaca

Number of houses: 41 (1 primary school located in an adjacent elevated area behind the village)

Pre-existing coastal vulnerabilities:

- Most houses were built on a low lying coastal flat at the foot of a slope.
- Gradual coastal erosion was evident.
- Houses and the village were built close to and along the shoreline.
- There was minimal coastal vegetation cover and no artificial barriers to protect the coastline.
- Flooding and erosion had occurred on streams located at each end of the village.

TC Winston impact:

- The storm surge was ~23–24 m above msl and covered the whole village.
- Shoreline scouring encroached into the village boundary and up to 3 m above the high water mark.
- All houses were completely destroyed.
- Two people died.

Proposed site:

- Tenure has been secured for a contiguous upslope area 50–100 m higher behind the existing village and most households have already moved there as the land was levelled during the relief period to accommodate community relocation needs.

FIGURE 4.4 Sinuvaca Village TC Winston wave impact and proposed relocation site

4.1.6 Namacu

Number of houses: 135–145

Pre-existing coastal vulnerabilities:

- Many houses were built on low lying coastal flats with housing expanding inland.
- Gradual coastal erosion was evident.
- There was relatively dense coastal vegetation, with ~30 m high trees protecting the village from wind and waves (since cleared by TC Winston).
- The area within the village boundary was relatively large with room for expansion inland.
- Most of the village houses were built away from the coastline.
- Flooding and erosion had occurred on the stream located at each end of the village.

TC Winston impact:

- The storm surge was ~9–16 m above msl and covered half of the village.
- Shoreline scouring occurred into the village boundary and up to 3 m above the high water mark.
- All houses were completely destroyed.
- Two people died.

Proposed site:

- Tenure has been secured for a contiguous upslope area behind the existing village (inland side of the road).

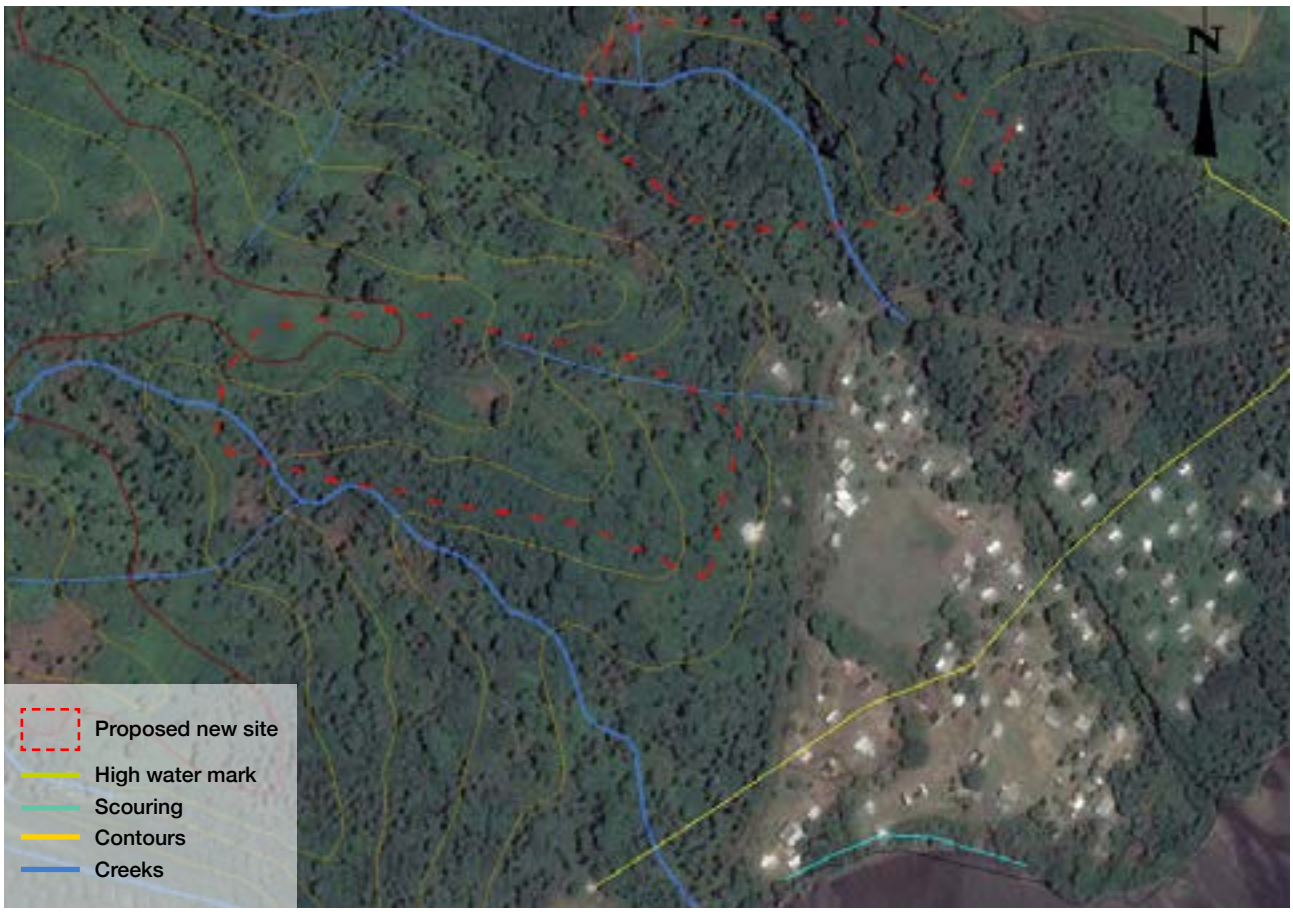


FIGURE 4.5 Namacu Village TC Winston wave impact and proposed relocation site

4.1.7 Nakodu

Number of houses: 60 (1 primary school)

Pre-existing coastal vulnerabilities:

- Houses were built on low lying coastal flat gently sloping inland with housing expansion along the shoreline.
- Gradual coastal erosion was evident.
- There was minimal coastal vegetation cover and no artificial barriers to protect the coastline.
- Heavy rain flooded areas near the creeks.

TC Winston impact:

- The storm surge was ~5–9 m above msl and covered most of the village.
- Scouring occurred and the shoreline retreated several metres into the village boundary.

Proposed site:

- Tenure was secured for land contiguous and upslope from the existing village and creeks have been buffered.

FIGURE 4.6 Nakodu Village TC Winston wave impact and proposed relocation site

4.1.8 Mudu

Number of houses: 63

Pre-existing coastal vulnerabilities:

- Houses are built on low lying coastal flats at the foot of a high cliff with relatively few houses built along the shoreline (housing was expanding inland).
- Gradual coastal erosion was evident.
- There was relatively moderate vegetation on the residential boundary and minimal along the playing field.
- There were no artificial coastal protection structures, although boulders are readily available.
- Heavy rain flooded areas near the creeks.
- There were risks from the highly fractured cliff and falling rocks.

TC Winston impact:

- The storm surge was ~7.20–19 m above msl and covered the entire village.
- Scouring and shoreline retreat of several metres occurred into the village boundary.

Proposed site:

- Tenure was secured for a contiguous site atop the cliff, ~6 acres and ~100 m above msl.

FIGURE 4.7 Mudu Village TC Winston wave impact and proposed relocation site

4.1.9 Vatulele

Number of houses: 56

Pre-existing coastal vulnerabilities:

- The village site was located on a coastal slope with a few houses on a low lying flat shoreline boundary.
- The shoreline has retreated by ~15 m in the last five decades and has pushed the village to retreat and expand on contiguous upslope land.
- There was relatively moderate vegetation on the shoreline but this was cleared by the cyclone.
- There were no artificial coastal protection structures although boulders are readily available.

TC Winston impact:

- The northern and upslope location of the village made it relatively protected from the cyclone storm surge from the east.
- Shoreline vegetation was cleared and scouring caused the shoreline to retreat into the village coastal boundary.
- Most houses were damaged.

Proposed site:

- Relocation was not applicable as the community had voluntarily mobilised to expand village boundaries and adopt a natural retreat approach for expansion.

FIGURE 4.8 Vatulele Village TC Winston wave impact, with no proposed relocation site

4.1.10 Nabuna

Number of houses: 60–70 (and school on elevated land behind village)

Pre-existing coastal vulnerabilities:

- Houses were built on low lying alluvium flat land extending ~50–70 m and rising on a gentle elevated slope.
- Gradual coastal erosion was evident.
- Relatively few houses were built on the shoreline with the village expanding inland.
- There was relatively moderate vegetation along the shoreline, but this was cleared by TC Winston.
- A seawall was in place, but cleared by TC Winston. Volcanic boulders were present nearby for reinforcement.
- Heavy rain flooded areas around two creeks running along both ends of the village.

TC Winston impact:

- The wave surge covered two thirds of the village.
- Scouring and shoreline retreat of several metres encroached into the village boundary.

Proposed site:

- Tenure was secured for adjacent land upslope.

FIGURE 4.9 Nabuna Village TC Winston wave impact and proposed relocation site

4.1.11 Nabasovi

Number of houses: 60 (and school)

Pre-existing coastal vulnerabilities:

- Houses were built on low lying all*uvi*um flat land extending up slope, with relatively few houses built along the shoreline.
- The shoreline was reported to have eroded about 50 m inland, although no houses have been damaged as a result of the slow-onset erosion.
- There was relatively moderate vegetation along the shoreline, but this was cleared by TC Winston.
- There were no artificial coastal protection structures in place.
- Heavy rain flooded areas around two creeks running along both ends of the village.

TC Winston impact:

- Half of the houses in the village were destroyed and the other half were damaged from cyclone winds.
- There was coastal vegetation loss.

Proposed site:

- Tenure was secured for adjacent upward sloping land enveloping the village and school.

FIGURE 4.10 Nabasovi Village TC Winston wave impact and proposed relocation site

4.1.12 Tavua

Number of houses: 35–40

Pre-existing coastal vulnerabilities:

- Houses were built on low lying coastal flats with most housing spread along the shoreline except for a few houses at the northern end of the village which are established inland.
- Gradual coastal erosion was evident.
- There was minimal shoreline vegetation for a majority of houses to the south while the few houses north of the village had good vegetation between them and the shore.
- There was a seawall in place with erosion occurring behind the structure.

TC Winston impact:

- All houses were destroyed or damaged.
- There was a loss of coastal vegetation.
- There was increased erosion behind the seawall.

Proposed sites:

- Tenure was secured for adjacent upslope land behind the village.

FIGURE 4.11 Tavua Village TC Winston wave impact and proposed relocation site

4.1.13 Navaga

Number of houses: 60

Pre-existing coastal vulnerabilities:

- Most houses were built on low lying coastal flats with about a quarter of houses located higher up on landward sloping land.
- Gradual coastal erosion was evident.
- There was some vegetation between the shoreline and nearby houses.
- There was a collapsed seawall covered by the retreating beach shoreline.
- Heavy rain flooded and eroded the area along the creek with nearby houses needing to relocate and establish a buffer zone.

TC Winston impact:

- All houses were destroyed or damaged.
- There was a loss of coastal vegetation.
- There was increased erosion behind the seawall.

Proposed sites:

- Tenure was secured for adjacent land in steep topography with very little flat land.

FIGURE 4.12 Navaga Village TC Winston wave impact and proposed relocation site

4.1.14 Kade

Number of houses: 64 (and a primary school)

Pre-existing coastal vulnerabilities:

- All houses were located on a thin strip of sloping rocky land between an eroding coastline and high raised cliff.
- The village was on a geological fault.
- Gradual coastal erosion was evident.
- There was limited to no coastal vegetation as rocks and the road separated the village from the shoreline.
- The seawall was partially collapsed and re-enforced by boulders.
- The raised cliff is highly fractured with risks from falling rocks.

TC Winston impact:

- All houses were destroyed or damaged.
- There was increased erosion behind the seawall.

Proposed site:

- The site is located on upslope coastal land on the southern tip of Koro Island.
- The land is ~3 km south of the current village site and linked by the main road to the rest of the island.
- Tenure had not been secured.

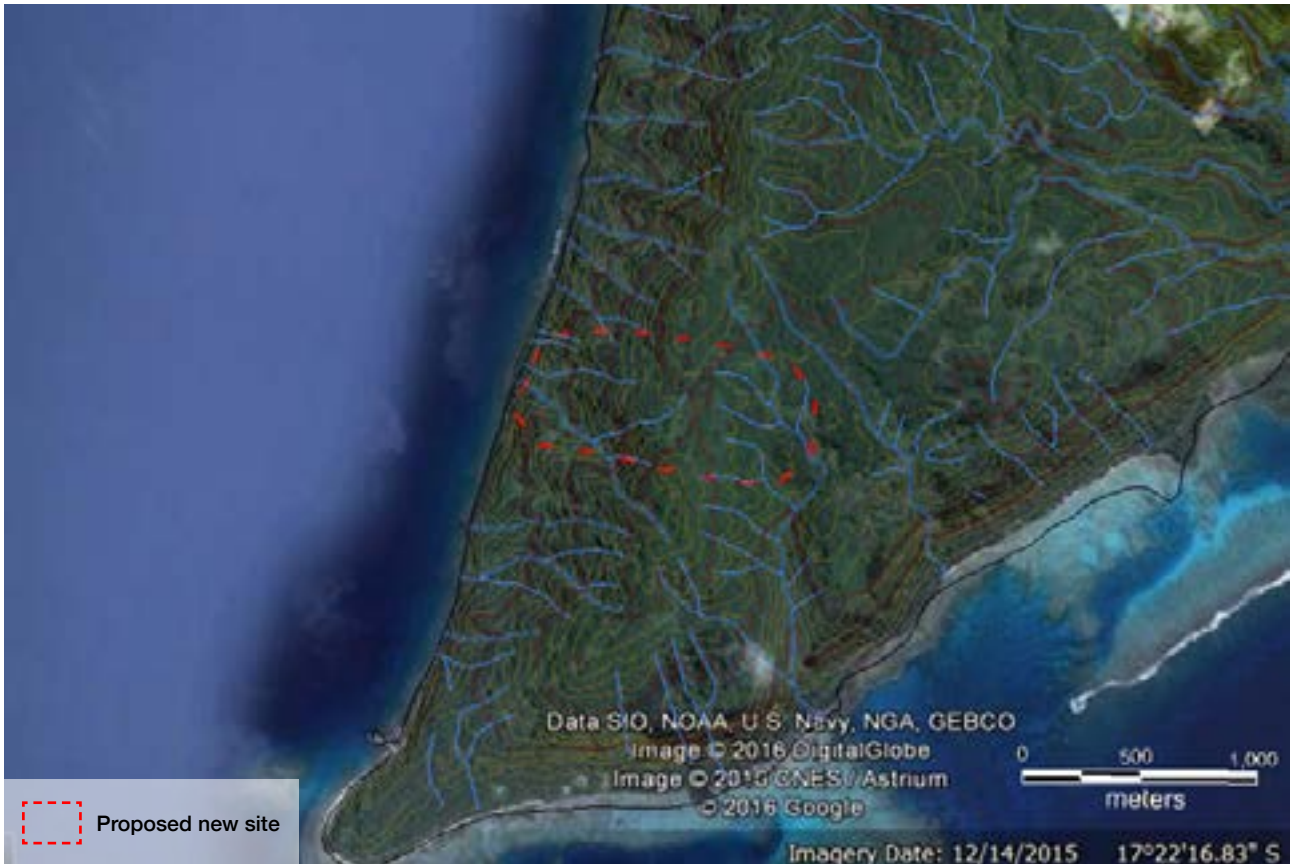


FIGURE 4.13 Kade Village TC Winston wave impact and proposed relocation site

4.2 Community vulnerability and resilience

Communities address their HSOs in culturally mediated ways whereby identity, values and aspirations shape the access, use and sharing of tangible (**n**, **i**, **h**, and **h**) and non-tangible (g) LAs. The tangible LAs reflect what people *have* to adapt while the non-tangibles represent what people *do* to adapt. For this study, vulnerability was determined by the changing capacities of the five LAs to support the seven HSOs in a changing environment as experienced and perceived by community respondents pre- and post-TC Winston. The total LA score post TC Winston was indicative of its vulnerability, with 2.4 being the total vulnerability for **n** (post TC Winston in Table 4.1).

TABLE 4.1 Koro Island vulnerability scorecard completed in June, 2016. TCW=Tropical Cyclone Winston, LA=Livelihood Asset, HSO=Human Security Objectives, 1=most resilient→7=least resilient

Koro Island IVA Scorecard June 2016	Natural resources (n)		Infrastructure and services (i)		Finance (f)		Human resources (h)		Institutions and governance (g)		Post-TCW aggregate HSO score	Post TCW Resilience Ranking
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post		
Ecosystem health (E)	4.3	1.5	4.0	1.6	3.9	1.6	3.6	3.1	3.9	1.6	1.9	7
Community health (H)	4.6	2	4.1	2.4	4.3	2.6	4.3	3.2	4.1	2.2	2.5	2
Security of place (P)	4.1	2.1	4.1	1.4	4.5	1.8	4.2	3.1	4.1	2.7	2.2	4
Water security (W)	4.4	3.4	3.6	2.1	4.1	2.4	4.3	3.1	4.3	3.1	2.8	1
Food security (F)	4.6	2.1	4.9	1.8	4.6	1.9	4.3	2.6	4.8	2.4	2.2	4
Income security (I)	4.5	1.9	3.9	1.9	4.8	1.9	4.2	2.8	4.5	1.8	2.1	6
Energy security (N)	4	4	4.1	1.4	4.4	2.3	3.9	3.1	4.4	1.6	2.5	2
Before and after TCW aggregate LA score	4.4	2.4	4.1	1.8	4.4	2.1	4.1	3	4.3	2.2		
Post-TCW vulnerability ranking	4		1		2		5		3		1=most vulnerable 5= least vulnerable	

1.0–1.8 Very problematic	1.9–2.6 Problematic	2.7–3.4 Satisfactory	3.5–4.2 Good	4.3–5.0 Very good

Respondents subjectively rated (1 to 5) each of the 35 LAHSO components and indicated why each rating was given. Projected increases in air surface temperature, sea levels and anticipated changes in rainfall and weather patterns are expected to exacerbate existing vulnerabilities. The score narratives were indicative of vulnerability drivers for each LAHSO component and how they relate to to address

each HSO. Projected increases in air surface temperature, sea levels and anticipated changes in rainfall and weather patterns is expected to exacerbate existing vulnerabilities. Hence, the nature and extent of current vulnerability drivers were recognised proxies for foreseeable vulnerabilities that would need to be addressed by appropriate adaptation measures. To this end, such measures would seek to enhance **n**, **i**, **f**, **h** or **g** capacity to enable communities to address their HSOs in normal and challenging times. In this schema, a community's resilience is reflected by their ability to address their HSOs at all times. That is, the entire combination of what communities do (via **g**) with available and accessible LAs (**n**, **i**, **f** and **h**) to address each HSO at varied times is indicative of their resilience.

4.2.1 Livelihood assets

4.2.1.1 Infrastructure and services capacity

The combined 14 village LAHSO assessment outcomes (Table 4.1), showed that infrastructure and services was the most vulnerable of the LAs. It had the lowest post-cyclone rating **i**1.8 and its support for all HSOs was rated below satisfactory (problematic or very problematic, see last row of Table 4.1). The concentration and exposure of infrastructure in low-lying coastal areas of the island and sensitivity to the pressure of the waves and winds during TC Winston meant that **i** was the most impacted in terms of combined value to support each community's 7 HSOs. Infrastructure vulnerability negatively impacted place (**Pi**) and energy resilience (**Ni**) most, both rated at 1.4 post TC Winston. Infrastructure support for ecosystem resilience was the third most negatively impacted (**Ei**1.6) followed by impact on food resilience (**Fi**1.8) income (**Ii**1.9), water (**Wi**2.1) and and health (**Hi**2.4) categories were also rated below satisfactory.

4.2.1.2 Financial capacity

Finance was considered the second most vulnerable (**f**2.1), in terms of the money households and communities had access to and were willing and able to contribute to each of the HSOs before and after the cyclone. Finance to support ecosystem health, both before and after TC Winston was rated the lowest (**Ef**1.6). Communities' willingness to spend already limited finances on the upkeep of ecosystem health such as investments in solid and liquid waste management facilities and equipment as well as foregoing fish harvests from marine protected areas was low due to the prioritisation of more immediate food, water, health and shelter related expenses. Finance to support health (**Hf**), place (**Pf**), water (**Wf**), food (**Ff**), income (**If**) and energy (**Nf**) needs were all considered 'problematic' after the cyclone (ranging from 1.8 to 2.6). The high reliance on resource-based commodities and the cyclone's damaging impacts on key income earning crops such as *yaqona*, *dalo*, *voivoi*, and coconuts (for coconut oil) was a key driver of vulnerability for all communities.

Additionally, inadequate access to banking (for savings) and micro-insurance services meant that households and communities had limited cash to draw from to pay for goods and services needed to rebuild homes and re-establish their HSOs. Significant increases in agricultural development in Koro also meant that the community had become more reliant on cash-based goods and services, especially related to place, food and energy as well as lifestyle needs and, hence, increasing their vulnerability to disasters and climate change. People also actively kept savings at home before TC Winston due to a lack of banking facilities in most villages. With the total destruction of homes during TC Winston most lost their savings stored in their respective homes that were destroyed by the cyclone wind and waves.

4.2.1.3 Institutional and governance capacity

Institutional capacity was considered the third most vulnerable (**g**2.2) of the five LAs with governance of ecosystem health (**Eg**1.6), energy (**Ng**1.6) and income generation (**Ig**1.8) considered very problematic. Pre-existing institutional practices and processes to communally address HSOs in normal times

(e.g. before the cyclone) were hampered by community leaders needing to address urgent damage and losses to basic services, particularly housing, food and income sources at household levels. Post-disaster trauma and the lack of counselling support services may have also had a negative impact on local leaders' capacities to mobilise their communities and resources to more effectively address HSOs during such a difficult time. The significant levels of out-migration from some villages immediately after the cyclone and logistical delays in acquiring building material for reconstruction seems to have also impeded the kind of collective action needed for more effective rehabilitation. Pre-existing structural issues such as the under-representation and participation of women in village committees tasked with addressing HSOs influenced **g** scores pre- and post-cyclone. The loss of communal structures such as churches and community halls also meant that communing was restricted. Community institutional support for security of place and water security was rated 'satisfactory' (**Pg**2.7 and **Pg**3.1) and this was generally reflective of the re-establishment of most water sources by respective village water committees and the leadership shown among land-owning units to provide land for the proposed new village sites.

4.2.1.4 Natural resource capacity

Natural resources were ranked the second least vulnerable (**n**24) of the five LAs post-cyclone. Communities described ecosystem health in general as 'very problematic' (**En**1.5). Natural resources' support for all HSOs, except for water security, were rated below satisfactory after the cyclone. Soil quality, supporting agricultural food (**Fn**2.1) and income sources (**In**1.9) were reported to have diminished due to increased salinity from sea spray and exposure from the loss of forest canopy resulting from TC Winston's winds and wave surge. Debris from fallen trees blocked roads and paths and restricted access to inland food gardens and wild plants. The environmental impacts together with infrastructure damage also contributed to increased direct pollution from poor solid waste disposal and damaged wastewater outlets. Vegetation loss also restricted community access to some traditional medicines (**Nh**2). Natural resource support for water security (**Nw**3.4) after the cyclone was the only HSO rated as 'satisfactory'. Surface water drawn from well-forested (albeit cyclone-damaged) watersheds was relatively unaffected by the cyclone and this may be due to pre-existing protection measures restricting encroachment of agriculture-driven clearing towards natural water sources.

Community resilience scores for LA support of ecosystem health were the lowest of the seven HSOs (**E**1.9) as highlighted in the two last columns of Table 4.1. However, future investments will need to be made in watershed protection to maintain or strengthen this aspect of community resilience given that an increasing rate of forest clearing for agriculture and settlements was identified to be a key driver of this vulnerability. Natural resource capacity for the other HSOs including **H**, **P**, **F** and I were also considered 'problematic' post-cyclone while support for E was unsurprisingly 'good' and unchanged (**Nn**4) before and after the cyclone given the water source provisions for hydroelectricity as well as wind, sun and wave availability for other renewable energy sources (although energy related equipment was severely damage [**Ni**1.4] as highlighted in section 4.1).

4.2.1.5 Human resource capacity

Communities rated their own skills capacity to support the seven HSOs relatively highly (**h**3) in comparison to the other four LAs (**n**, **i**, **f** and **g**). Respondents were generally 'satisfied' with the availability of local community members with the skills to address health (**Hh**3.2), ecosystems (**Eh**3.1), place (**Ph**3.1), energy (**Eh**3.1) and income (**Ih**2.8) needs after the cyclone. However, people with the skills to ensure post-disaster food security was considered problematic (**Fh**2.6). The key narrative supporting the relatively good ratings for h after the cyclone stemmed from positive perceptions of the post-disaster recovery efforts of village health workers who acted as a conduit between community and external relief workers, water committees who effectively re-established community water supply access, and the community youth who mobilised to remove debris and set up temporary shelters for vulnerable households.

4.2.2 Human security objectives

The LAHSO assessment outcomes showed that community resilience assessed as the ability to address HSOs under changing LA conditions) was lowest, post TC Winston, for ecosystem health (**E**1.9) followed by income security (**I** 2.1), place and food security (**P** and **F** 4.0), health and energy security (**H** and **N** 2.5) and water security (**W**2.8) as shown in Table 4.1. The following sections (4.2.2.1 to 4.2.2.7) explains how and why communities' vulnerabilities and resilience varied based on the changing conditions of LAs.

4.2.2.1 Ecosystem health

En: Ecosystem health and natural resources

En essentially refers to the health of ecosystem functions, including functions that do not directly serve food, water, place, energy, health or income needs of community. Communities' very good pre-cyclone rating for **En** (4.3) as shown in Table 4.1 was associated with what was considered to be a healthier forest, water, coastal and marine resources (Table 4.2). However, some villages also indicated that the increasing clearance of forest for commercial and subsistence farming before the cyclone had also been raising concerns. The very problematic **En** post-cyclone rating (1.5) related to the loss of forest cover, reduced natural water quality due to vegetation loss, cyclone debris and sea spray, a reduction in wastewater management standards (due to destroyed sanitation facilities) and the degradation of fish habitat due to storm surge. The MRD also raised concerns that on-site/on-island quarrying for post-disaster reconstruction was carried out in environmentally risky areas immediately after the cyclone.

TABLE 4.2 Ecosystem health vulnerability scorecard for the 14 villages pre- and post-TC Winston

ECOSYSTEM HEALTH (E)	En: Natural resources		Ei: Infrastructure and services		Ef: Finance		Eh: Human resources		Eg: Institutions and governance	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Nacamaki (M)	4	1	3	2	3	2	3	4	5	1
Tuatua (M)	5	1	5	1	5	1	4	3	3	2
Nasau (M)	4	1	4	2	3	1	4	2	5	2
Naqaidamu (M)	4	2	3	1	5	1	5	5	4	3
Sinuvaca (M)	3	2	5	1	3	1	4	2	3	1
Namacu (M)	4	1	4	1	5	1	4	4	4	4
Nakodu (M)	5	1	5	2	5	2	5	2	5	2
Mudu (M)	5	1	2	1	4	1	5	4	4	3
Vatulele (C)	5	2	4	2	4	2	5	2	5	1
Nabuna (C)	4	2	3	2	3	1	4	4	4	4
Nabasovi (C)	3	1	5	2	4	3	4	2	5	1
Tavua (C)	5	2	3	2	3	1	4	2	4	3
Navaga (C)	4	2	5	1	3	3	4	4	5	3
Kade (C)	5	2	5	2	4	3	5	5	1	1
AVERAGE	**4.3**	**1.5**	**4.0**	**1.6**	**3.9**	**1.6**	**4.3**	**3.2**	**4.1**	**2.2**

1.0–1.8 Very problematic	1.9–2.6 Problematic	2.7–3.4 Satisfactory	3.5–4.2 Good	4.3–5.0 Very good

Ei: Ecosystem health and infrastructure and services support

Ecosystem related infrastructure and services pre-cyclone was viewed by communities as generally good (4.0, Table 4.2) due to capacity building and technical support services provided by government extension officers and NGOs, particularly in the fisheries, forestry, water and sanitation, and waste management sectors. One village (Mudu) rated **Ei** as problematic (2) due to a lack of equipment and facilities for monitoring and enforcing restrictions on locally managed marine areas. Mudu village also indicated that the lack of facilities to properly manage solid waste on the island was a problematic issue before the cyclone. Communities' very problematic average rating of post-cyclone **Ei** (1.6) was related to the lack of support services for forest and coastal ecosystem rehabilitation and waste management. Nasau and Nabasovi village respondents reported severe destruction of the island's forest reserves and the need for extension services to train and engage the community in supporting ecosystem rehabilitation. Most of the communities communicated their appreciation of the relief support provided by the Australian Defence Force, the Fiji Military Forces, UNDP and various other agencies who assisted with clearing debris from villages in the weeks immediately after the cyclone, although longer-term waste management problems persisted. For example, Mudu and Kade villages reported the need to remove post-cyclone debris that was hazardously piled on the roadside months after the cyclone.

Ef: Ecosystem health and finance support

Community access to finance to support ecosystem health objectives **Ef** was rated as good (3.9) before the cyclone as they had sufficient income to pay for priority and needed environmental health and cleanliness activities. However, with damage to commercial crops and houses, and other rebuilding priorities, community capacity to pay for environmental health related activities was rated as very problematic (**Ef** 1.6).

Eh: Ecosystem health and skills support

The very good (4.3) pre-cyclone **Eh** rating was linked to the upskilling of the village environment (Yaubula) committees on ecosystem and marine management. Two villages (Naqaidamu and Nabasovi) gave **Eh** a difficult rating (Table 4.2) as they felt that environmental awareness and training activities did not lead to addressing communities' waste management problems. The overall satisfactory rating (3.2) for **Eh** *after* the cyclone was associated with the presence of village environment committees and contributions to their respective village's post-disaster clean-up and recovery and their enhanced knowledge and skills as a result of this experience. Respondents also reported that some young people who had left the island immediately after the cyclone had now returned to engage in debris clearing and village clean up as part of the UNDP's "cash for work" program.

Eg: Ecosystem health and institutional support

Communities generally rated **Eg** as good (4.1) before the cyclone and problematic (2.2) in the period following the cyclone. The positive pre-cyclone rating was associated with the establishment of *tabu* areas in their respective *qoliqoli*. Only Sinuvaca Village reported community natural resource governance issues before TC Winston as problematic due to continuous poaching in their *tabu* area and the inability of the Yaubula Committee and community to effectively enforce the *tabu*. The difficult post-cyclone **Eg** rating was associated mainly with the *tabu* management. The villages of Nacamaki, Navaga and Sinuvaca reported that community members were poaching from the *tabu* immediately after the cyclone, although the traditional leaders later called the community together to observe the fishing ban. Respondents also reported competing priorities in the post-cyclone period and households were faced with more immediate basic needs such as food and shelter, meaning less time and resources were available to commit to ecosystem health.

4.2.2.2 Community health

Hn: Community health and natural resource support

Table 4.3 shows that respondents mostly viewed **Hn** before the cyclone as very good (4.6) due to the fresh locally available land and marine resources and pristine environmental surroundings. After the cyclone, **Hn** was generally regarded as problematic (2.1) due to the following: most land-based cultivated and wild food sources on the island were completely destroyed by the cyclone winds; felled and uprooted trees blocked roads and paths leading to land-based food sources; contamination of natural water sources from fallen trees, debris and dead forest animals (such as toads and insects); and an increased presence of mosquitoes due to unmanaged cyclone debris.

TABLE 4.3. Community health vulnerability scores for the 14 villages pre- and post-TC Winston

COMMUNITY HEALTH (H)	Hn: Natural resources		Hi: Infrastructure and services		Hf: Finance		Hh: Human resources		Hg: Institutions and governance	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Nacamaki (M)	5	2	3	2	3	2	3	4	5	1
Tuatua (M)	4	2	4	1	3	2	4	3	3	2
Nasau (M)	5	1	4	2	5	3	4	2	5	2
Naqaidamu (M)	5	2	3	2	5	3	5	5	4	3
Sinuvaca (M)	5	2	5	1	5	3	4	2	3	1
Namacu (M)	4	2	4	3	4	1	4	4	4	4
Nakodu (M)	5	1	4	3	4	3	5	2	5	2
Mudu (M)	4	2	5	2	5	2	5	4	4	3
Vatulele (C)	5	2	5	4	4	3	5	2	5	1
Nabuna (C)	4	3	3	2	5	2	4	4	4	4
Nabasovi (C)	4	3	4	2	4	3	4	2	5	1
Tavua (C)	5	3	5	2	4	3	4	2	4	3
Navaga (C)	4	3	5	5	5	5	4	4	5	3
Kade (C)	5	2	4	2	4	2	5	5	1	1
AVERAGE	**4.6**	**2.1**	**4.1**	**2.4**	**4.3**	**2.6**	**4.3**	**3.2**	**4.1**	**2.2**

1.0–1.8 Very problematic	1.9–2.6 Problematic	2.7–3.4 Satisfactory	3.5–4.2 Good	4.3–5.0 Very good

Hi: Community health and infrastructure support

Respondents' generally good rating for pre-cyclone **Hi** (4.1) was reflective of the resources and facilities available from the main Nasau Health Centre and the two support dispensaries on each side of the island in Nacamaki village and Nabasovi village. The problematic post-cyclone **Hi** rating (2.1) was reflective of problems with transportation to health centres, damaged and/or poor toilet facilities, limited access to medicinal drugs, and the very limited, but much needed post-disaster counselling support services. It was also reported that up to 20–30 people were sharing one pit toilet and a significant portion of the population resorted to toileting in the bush. Septic tanks were damaged and leaking, some did not have lids and rivers were used for washing. Nevertheless, the Nasau Health Centre data showed that there were no outbreaks of typhoid or other severe communicable diseases associated with post-disaster circumstances and none were reported by the communities. Data provided by the Koro Health Centre suggests that in May 2016 the following lifestyle diseases were reported on the island: 34 cases of diabetes mellitus; 271 cases of hypertension; and 25 cases of rheumatic heart disease.

Hf: Community health and finance support

The pre-cyclone **Hf** rating (4.3/very good) was a reflection of the ability to pay for essential health related activities such as clean water and sanitation, as well as transportation to access basic health services on the island and maternity and dental services in Suva's main hospital. While the average post-cyclone **Hf** rating was, on average problematic (2.4), up to seven villages reported that they were still able to pay what was required to access basic health needs, which was transportation to the health centre (as the government provides free health services). However, with damage to commercial crops, households and other rebuilding priorities, community capacity to pay for transportation to health services (within Koro and to Suva) and other health related needs was much lower.

Hh: Community health and skills support

Human resources were the highest rated LA for community health for both pre- (4.3/very good) and post- (3.36/satisfactory) cyclone periods. The pre-cyclone rating reflected community views about the contribution of health workers, health committees and traditional healers to address village health related problems such as diabetes, high blood pressure, skin infections and water and sanitation. Views about **Hh** varied between villages after the cyclone. The more positive ratings reflected the responsiveness of the respective village health workers and committee members to village post-disaster health needs, in collaboration with health professionals on the island. Respondents also indicated challenges with addressing community attitudes and behaviour in relation to hygiene, solid waste and wastewater management and psycho-social support in the post-cyclone environment.

Hg: Community health and institutional support

The mean pre-cyclone rating for **Hg** (3.9/good) reflected respondents' views about the representation of women and youth in their respective health committees, regular reporting by the committee to the village meeting and the effective cooperation between the village nurses and soqosoqo vakamarama (village-based women's committees) to ensure that community health was maintained and monthly inspections carried out. However, one of the villages (Mudu) noted that they did not have women represented on their health committee and another (Kade) raised serious problems with access to an adequate waste disposal area given their location on a thin strip of rocky land between the shoreline road and high cliff. The mean post-cyclone assessment (2.1/difficult) reflected the inadequate time committed to communal work (*solesolevaki*) on some pressing health issues, such as improved toilet and wastewater management and one village in particular indicated that a water outlet in the new site inland where they retreated was very problematic. Villages that gave a good post-cyclone **Hg** rating had health committees and youth groups that effectively mobilised communal clean-up, established needed pit toilets immediately after the cyclone and were engaged with their respective Suva-based kin members to acquire water system materials (pipes and fixtures) and medical kits.

4.2.2.3 Security of place

Pn: Security of place and natural resources support

The very good pre-cyclone **Pn** rating (4.1), as shown in Table 4.4 was associated with community appreciation of their coastal locations, living space and surrounding natural resources that supported their livelihood needs. The problematic post-Winston **Pn** (2.1) rating was attributed to the cyclone wind and wave impact on settlement land, especially for the eastern coastal villages of Mudu where significant scouring and shoreline change occurred (see section 3.6). The recent experiential awareness of coastal destruction may have also contributed to the significantly reduced **Pn** score, before and after the cyclone for some villages (such as Nasau, Sinuvaca and Kade) more so than others. However, Kade's 'problematic' rating pre-Winston **Pn** reflected pre-existing vulnerabilities due to being located on a thin strip of land between an eroding shoreline and a high cliff with loose rocks.

TABLE 4.4 Security of place vulnerability scores for the 14 villages pre- and post-TC Winston.

SECURITY OF PLACE (P)	PN: Natural resources		Pi: Infrastructure and services		Pf: Finance		Ph: Human resources		Pg: Institutions and governance	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Nacamaki (M)	4	2	4	1	4	2	5	2	4	2
Tuatua (M)	4	2	4	1	5	1	5	4	3	3
Nasau (M)	4	1	4	1	5	2	4	2	5	3
Naqaidamu (M)	3	3	4	1	3	2	5	5	5	5
Sinuvaca (M)	5	1	3	2	5	2	4	2	4	1
Namacu (M)	4	2	4	1	4	1	4	3	5	5
Nakodu (M)	5	3	4	1	5	2	4	4	4	3
Mudu (M)	5	2	3	1	4	2	5	3	3	3
Vatulele (C)	5	3	5	3	5	2	4	4	5	4
Nabuna (C)	3	2	5	1	4	1	4	3	3	2
Nabasovi (C)	5	3	5	2	5	2	3	1	5	3
Tavua (C)	5	3	5	2	4	1	4	4	5	1
Navaga (C)	3	2	4	1	5	3	5	3	4	2
Kade (C)	2	1	4	1	5	2	3	3	2	1
AVERAGE	**4.1**	**2.1**	**4.1**	**1.4**	**4.5**	**1.8**	**4.2**	**3.1**	**4.1**	**2.7**
DIFFERENCE	**-2**		**-2.78**		**-2.71**		**-1.14**		**-1.36**	

1.0–1.8 Very problematic	1.9–2.6 Problematic	2.7–3.4 Satisfactory	3.5–4.2 Good	4.3–5.0 Very good

Pi: Security of place and infrastructure and services support

Pi (1.4) had the lowest capacity average score for the 14 villages. Most respondents indicated high levels of confidence in the capacity of their houses to withstand cyclones and after TC Winston they were shocked by the devastation. Almost all houses on the island were completely destroyed (949 houses) or partly damaged (44 houses), and delays in accessing relief building material impeded reconstruction, with a significant number of households continuing to live in temporary shelters years after the cyclone. The village schools were open weeks after the cyclone, but major repairs are still required and the time this research was conducted. Key place-related post-cyclone governmental support included: the provision of relief housing packages in the form of building materials amounting to FJ$3,000 to FJ$7,000 per household and post-Winston visits by the MRD and *iTaukei* Affairs Board to identify and facilitate customary land negotiation for community relocation.

Pf: Security of place and finance support

Pf (4.5) was the highest pre-Winston score and the second lowest after the cyclone at 1.79. Respondents reported that 'money for housing was not a problem' before the cyclone due to healthy earnings from agriculture-based crops such as *yaqona*, *dalo*, *voivoi* (weaving fibre) and coconuts (copra and virgin oil) as well as from small businesses (such as store-keeping) which helped pay for the materials for houses, community halls and church buildings as well as construction. However, access to finance to support housing and settlement needs reduced drastically after TC Winston due to poor levels of savings and limited access to recovery financing such as insurance and credit, coupled with losses of income due to the destruction of agricultural commodities.

Ph: Security of place and skills support

Ph community ratings were relatively good or satisfactory before and after TC Winston at 4.2 and 3.1 respectively. Respondents associated **Ph** ratings with the availability of trained village-based carpenters and house builders, most of whom may have remained to assist with house reconstruction after the cyclone. Respondents also referred to the number of young people who remained on the island and worked in groups to assist with the construction of temporary shelters immediately after the cyclone as well as in the reconstruction of more permanent homes. Respondents also indicated that the slow and/or insufficient support for house reconstruction and farm rehabilitation induced families to leave the island for major urban centres.

Pg: Security of place and institutional support

Pg ratings were relatively good or satisfactory before and after TC Winston, at 4.1 and 2.7 respectively. Community ratings of **Pg** were associated with community leadership and collective action around managing housing and settlement needs post-TC Winston, including the way village expansion and land tenure were managed, traditional processes supporting household and communal building construction (solesolevaki), ways in which the issue of relocation was approached and youth mobilisation around the construction of temporary shelters immediately following the cyclone.

4.2.2.4 Water Security

Wn: Water security and natural resource support

Pre- and post-TC Winston ratings for **Wn** were at or above satisfactory levels (4.3/very good and 3.4/satisfactory, respectively), reflecting community reported natural surface, spring and rainfall water abundance and resilience (see Table 4.5). Several communities reported significant reduction in water flows from established sources during the El Niño influenced prolonged dry spell preceding TC Winston, but also indicated other viable natural water sources that were accessible for development. Increasing village populations and water demand due to a rise in house water outlets over the years had also been increasing pressure on existing water sources. Communities viewed **Wn** after the cyclone (3.4) as satisfactory because they did not encounter issues with water flows at source. However, water quality at source was temporarily an issue immediately after the cyclone due to debris, dead fauna and silt from entering the water sources resulting from the heavy winds and rain.

TABLE 4.5 Water security vulnerability scores for the 14 villages pre- and post-Tropical Cyclone Winston

WATER SECURITY (W)	Wn: Natural resources		Wi: Infrastructure and services		Wf: Finance		Wh: Human resources		Wg: Institutions and governance	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Nacamaki (M)	4	3	4	2	4	2	4	3	4	3
Tuatua (M)	5	4	2	2	5	2	5	4	4	3
Nasau (M)	4	3	4	2	4	2	3	2	5	3
Naqaidamu (M)	4	3	3	1	3	2	5	3	5	5
Sinuvaca (M)	3	5	5	1	4	2	3	1	5	1
Namacu (M)	4	3	4	2	4	1	5	5	5	5
Nakodu (M)	5	2	5	2	4	2	5	1	4	1
Mudu (M)	5	2	2	3	3	1	4	4	4	3
Vatulele (C)	5	5	4	3	4	4	5	5	5	5
Nabuna (C)	4	5	4	3	4	4	5	5	5	5
Nabasovi (C)	3	3	4	3	5	4	4	2	5	3
Tavua (C)	5	4	3	2	4	1	4	3	3	3
Navaga (C)	4	2	2	1	5	5	4	2	3	2
Kade (C)	5	3	4	2	4	2	4	4	3	1
AVERAGE	**4.3**	**3.4**	**3.6**	**2.1**	**4.1**	**2.4**	**4.3**	**3.1**	**4.3**	**3.1**

1.0–1.8 Very problematic	1.9–2.6 Problematic	2.7–3.4 Satisfactory	3.5–4.2 Good	4.3–5.0 Very good

Wi: Water security and infrastructure and services support

Respondents' rating of **Wi** before and after the cyclone were on average, good (3.6) and problematic (2.1) respectively. For the pre-cyclone period, 11 villages regarded their water infrastructure and services capacity as satisfactory to very good with seven of these villages (Navaga, Nacamaki, Kade, Nabuna, Nakodu, Namacu, Nacamki and Nabasovi) reporting occasional water 'shut-downs' prior to the cyclone due to a combination of factors, including drought, leakage in the water supply system, and a general increase in water demand to cater for the increasing number of water outlets and flush toilets. The dam and tank capacities in Tuatua, Mudu and Navaga villages needed upgrading to meet demand. The difficult rating of **Wi** after the cyclone was for the following reasons: damaged piping and tanks, a small number of outlets (as few as 1 to 6), standpipes serving whole villages, and water supplies in several communities declared by health professionals as unsafe to drink due to cyclone debris and animals polluting the water system. Nabasovi and Vatulele were the only villages that were satisfied with their water supply before and after the cyclone. Sinuvaca Village, which had already retreated upslope did not have any water outlets at the time of the IVA visit and the community was sourcing water from the adjacent primary school. Running water was also available at the old village site 100–200 m downhill. Sinuvaca Village's water source was located at an elevation higher than the new village area so a pump would not have been necessary to connect houses on an operable outlet. The community responses may be cross-referenced with the report from a UNICEF sponsored Ministry of Health team visit conducted in May and June 2016 at the same time as this survey, which indicated that about 60% of households on the island had access to safe drinking water.

Wf: Water security and finance support

Community ratings of **Wf** for the pre-cyclone period (4.1/good) were associated with their ability to pay for the upkeep of their communities' water supply, amounting to FJ$2 per household per week. The problematic rating for **Wf** (2.4) after the cyclone was indicative of severe reductions in household income due to agricultural losses and the additional costs to rehabilitate damaged water infrastructure.

Wh: Water security and skills support

Human resource capacity to support island level water security objectives (**Wh**) was rated good (4.3) and satisfactory (3.1) before and after the cyclone, respectively. The pre-cyclone rating reflected the presence of community members who were skilled plumbers, carpenters and electricians who had previously worked for government or private companies in other parts of Fiji. Views about **Wh** varied between villages after the cyclone. Nasau, Sinuvaca, Nakodu, Nabasovi and Navaga reported a less than satisfactory rating for **Wh** to indicate that the magnitude of the post-disaster water problems was beyond the capacity of the water committee to address.

Wg: Water security and institutional support

Communities, on average, rated **Wg** as very good (4.3) and satisfactory (3.1) before and after the cyclone respectively. Positive ratings before the cyclone were associated with initiatives by the water committees to establish supplementary water sources to meet increasing demand (Nacamaki, Sinuvaca, Namacu and Nakodu), traditional leaders and Turaga ni Koro restricting activities near the water source (Nabasovi, Nacamaki, Tuatua and Tavua), effective water rationing to ensure predictable scheduling of water availability (Kade), regular inspection and maintenance of water systems (Naqaidamu and Tuatua), and the representation of women and men in the village water committees (Tuatua and Namacu). The four villages that gave problematic or very problematic ratings for **Wg** (Sinuvaca, Kade, Nakodu and Navaga) reported their respective water committees were either inactive or unable to address the extraordinary water needs in the post-disaster situation.

4.2.2.5 Food security

Fn: Food security and natural resources support

The very good (4.6) rating for **Fn** before the cyclone, as shown on Table 4.6, was associated with the abundance of locally sourced food including wild and cultivated crops such as *dalo*, tavioka (cassava), kumala (sweet potatoes), *uvi* (yams), coconuts, vegetables, fruit, livestock (beef, poultry and pork) and wild pigs, as well as marine and freshwater fish, seaweeds, prawns, mussels, crabs and other seafood. The problematic (2.1) post-cyclone rating took into account the following factors:

- Most of the land-based staple food sources were destroyed by the cyclone.
- Wild cyclone-resilient plants (such as yams) were still available, but difficult to access as fallen trees and debris blocked paths.
- There were unsuccessful attempts to plant *dalo* and *kumala* immediately after the cyclone due to reduced soil fertility.
- There was pest infestation of *dalo* and other crops due to drastic vegetation loss.
- Horses and pigs fed on wild yams as there were not enough greens for them to eat.
- There was a loss of soil fertility due to sea spray.
- There was vegetation destruction from the cyclone winds and storm surge.

Some respondents indicated that vegetable seeds sown immediately after the cyclone such as pumpkins and watermelons were being harvested and consumed at the time of the IVA and that their *dalo* would be ready for consumption in a few months. After cyclones or wild fires on Koro, it is normal for yams and vegetables to be the first plants that grow back. Vegetables and fruits including watermelon, cucumbers, cabbages (*namutara* variety), baby tomatoes, *tubua*, pawpaw and pumpkins grew back from dormant seedlings on the ground and were supplemented by seedlings sent over via cyclone relief efforts. Respondents reported that there was an increased availability of fish after the cyclone, possibly due to reef damage. Fishers reported they were now spending less time harvesting fish due to increased abundance. Edible seaweed and mussels were reported to have been lost or negatively affected by the strong currents and waves.

TABLE 4.6 Food security vulnerability scores for the 14 villages pre- and post-Tropical Cyclone Winston

FOOD SECURITY (F)	Fn: Natural resources		Fi: Infrastructure and services		Ff: Finance		Fh: Human resources		Fg: Institutions and governance	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Nacamaki (M)	5	1	5	2	3	2	5	2	4	1
Tuatua (M)	3	2	5	1	5	1	5	3	3	2
Nasau (M)	5	2	5	2	5	2	3	2	4	1
Naqaidamu (M)	5	2	5	1	5	1	3	3	4	1
Sinuvaca (M)	5	1	5	2	3	2	4	2	2	2
Namacu (M)	4	3	5	1	5	1	5	5	4	1
Nakodu (M)	5	1	5	2	5	3	5	1	4	3
Mudu (M)	5	2	5	1	5	2	3	3	3	1
Vatulele (C)	5	3	5	4	5	3	5	1	5	1
Nabuna (C)	4	2	5	1	5	1	4	3	3	2
Nabasovi (C)	4	3	5	2	5	2	4	2	5	3
Tavua (C)	5	3	3	3	4	1	5	3	5	1
Navaga (C)	4	2	5	1	4	3	4	4	3	2
Kade (C)	5	2	5	2	5	3	5	3	5	1
AVERAGE	**4.6**	**2.1**	**4.9**	**1.8**	**4.6**	**1.9**	**4.3**	**2.6**	**3.9**	**1.6**

1.0–1.8 Very problematic	1.9–2.6 Problematic	2.7–3.4 Satisfactory	3.5–4.2 Good	4.3–5.0 Very good

Fi: Food security and infrastructure and services support

The very good rating (4.9) of **Fi** before the cyclone was in relation to the standards of roads and paths that facilitated access to inland food gardens and wild crops, as well as the availability of fisheries and agricultural extension services. The post-cyclone **Fi** rating (1.8/very problematic) reflected community views about the state of infrastructure and extension services such as the condition of staple food seedlings that were distributed after the cyclone which withered and could not be successfully replanted, relief equipment provided was not sufficient to clear large trees and debris from roads and paths to food gardens or to adequately support farming and fishing activities (gardening tools and fishing gear), and rations provided by the government lacked nutritional value.

Ff: Food security and finance support

The community mean rating of pre-cyclone **Ff** was very good (4.6) and reflected respondents' retrospective views of their ability to pay for the equipment required to cultivate and prepare food and the availability of supplementary shop-based food (such as grains, sugar, salt, rice and other traded goods) to support a balanced diet. Post-cyclone **Ff** ratings were, on average, problematic (1.9) due to the loss of income from agricultural crops that were destroyed by the cyclone.

Fh: Food security and skills support

The very good average rating (4.3) for pre-cyclone **Fh** was a reflection of respondents' confidence in the availability of people with both traditional and modern skills required to cultivate, harvest and prepare locally, as well as externally sourced, food. In contrast, the problematic average rating (2.6) of post-cyclone **Fh** was largely due to limited knowledge and skills in cultivating a variety of unfamiliar disaster resilient crops and methods of cultivation. A significant portion of farmers left the island to seek livelihoods elsewhere or lacked motivation to re-establish their gardens in the midst of recovering from the trauma and chaos and the challenges related to accessing cultivation areas (due to debris-blocked roads and paths). Destroyed gardens were difficult to access due to cyclone-felled trees. It was also reported that most villagers had lost the traditional knowledge of cultivating sweet potatoes and that this led to residents from Cawa District approaching elderly men from the Lau Province to re-educate them on this form of cultivation

Fg: Food security and institutional support

Communities' rating for **Fg** was very good (3.9) and associated with the active nature of the village agriculture committees as well as contributions made to communal work by village members according to set monthly crop quantity targets for each productive age, male village member. Crop targets included the types and quantities of crops and were checked and revised at the weekly village meetings. The village agriculture committees are elected at the village meetings and nominations are open to all members regardless of gender. The mean **Fg** post-cyclone rating of 1.6 (very problematic) was associated with the inability of the communities to mobilise effectively towards post-disaster food production and the lack of disaster-resilient crops on the island. Communal food production was challenging due to individual needs to recover from the trauma brought about by the cyclone and the inaccessibility of plantations as large fallen trees had blocked inroads and footpaths to the gardens.

However, stories shared about communal food collection, cooking and sharing immediately after the cyclone and before the relief food arrived demonstrated the resilience and institutional capacity for the villages consulted. When relief food arrived, meals were prepared and consumed at the household level. Relief food was distributed up to four months after the cyclone. Respondents may also have under-reported the food security situation as a few key informants reported that their village normally keeps patches of wild cassava that can supply the community's food needs for months after disasters such as cyclones.

4.2.2.6 Income security

In: Income security and natural resources support

The very good rating (4.5) for pre-cyclone **In** was due to the availability of arable land to support key resource-based income sources such as copra and virgin coconut oil, *yaqona*, *dalo*, *voivoi* and woven mats, and seaweed and clam breeding (Table 4.7). The problematic post-cyclone **In** rating (1.9) was attributed to the destruction of commercial crops by the cyclone winds and waves, blocked pathways and roads to gardens hampering rehabilitation of commercial cultivation. In some villages, diving for, and collecting, marine invertebrates was a substitute for lost economic income from agricultural resources.

TABLE 4.7 Income security vulnerability scores for the 14 villages pre- and post-Tropical Cyclone Winston

INCOME SECURITY (I)	In: Natural resources		Ii: Infrastructure and services		If: Finance		Ih: Human resources		Ig: Institutions and governance	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Nacamaki (M)	5	1	4	2	4	2	4	4	4	1
Tuatua (M)	4	2	3	1	5	1	5	3	4	4
Nasau (M)	4	1	4	2	5	2	4	2	5	1
Naqaidamu (M)	5	2	4	3	5	2	5	5	5	3
Sinuvaca (M)	4	2	4	2	5	3	5	2	5	1
Namacu (M)	4	2	4	1	5	1	5	5	5	3
Nakodu (M)	5	1	4	1	5	2	4	2	5	1
Mudu (M)	5	1	3	1	5	1	5	2	5	3
Vatulele (C)	5	3	5	4	5	4	5	2	5	2
Nabuna (C)	4	2	3	1	4	1	3	3	2	2
Nabasovi (C)	4	3	5	1	5	2	5	2	5	1
Tavua (C)	5	2	4	3	4	1	3	2	5	1
Navaga (C)	4	2	3	1	5	2	2	2	3	1
Kade (C)	5	2	5	4	5	2	4	3	5	1
AVERAGE	**4.5**	**1.9**	**3.9**	**1.9**	**4.8**	**1.9**	**4.2**	**2.8**	**4.5**	**1.8**

1.0–1.8 Very problematic	1.9–2.6 Problematic	2.7–3.4 Satisfactory	3.5–4.2 Good	4.3–5.0 Very good

Ii: Income security and infrastructure and services support

The satisfactory rating (3.9) for pre-cyclone **Ii** is associated with community views about access to one flight and two ferry services per week to Suva, facilitating access to markets as well as enabling "middlemen" to travel to Koro and buy directly from producers on the island. Respondents identified the lack of adequate banking services on the island as an issue which hindered saving and resulted in surplus cash being stored in individual houses. The problematic ratings for post-cyclone (1.9) **Ii** were attributed to losses to agriculture, fishing, aquaculture and coconut oil production equipment and income as most were completely destroyed by the cyclone, loss and severe damage to mobile telecommunications structures and services, blocked roads and paths to inland farms and limited access to commodity rehabilitation support such as coconut, taro and commercial crop seedlings.

If: Income security and finance support

The very good pre-cyclone **If** mean rating (4.8) was attributed to the communities' retrospective view about the availability of income from economic production activities, equipment and services. The loss of income due to agricultural losses was linked to a lower post-cyclone **If** rating of 1.9 (problematic). Savings and surplus cash kept in houses were also lost during the cyclone.

Ih: Income security and skills support

The average community rating of pre-cyclone **Ih** was good (4.2) because the productive segment of the population had been trained informally and formally on various methods (traditional and modern) of cultivating and marketing *yaqona*, *dalo*, copra, coconut oil, seaweed (*lumi*), woven mats, and mat-weaving fibre (processed *voivoi*). Community members, including the youth, had also received training on how to run small businesses (such as canteens), some of which were in operation. Respondents viewed post-cyclone **Ih** as satisfactory (2.8) as a significant percentage of the population had moved to Suva to access education and income earning activities. Some respondents also indicated that although skilled people remained on the island after TC Winston, this capacity was under-utilised due to the absence or minimally available raw materials for production (such as *voivoi*) and poor access to inland gardens.

Ig: Income security and institutional support

The pre-cyclone very good rating for **Ig** (4.5) was attributed to: leaders effectively supporting the economic activities of village members via the respective development committees and projects, communal work to support the achievement of individual agricultural production targets and periodic monitoring of achievements and challenges, the support of village development committees to assist producers with managing farming and a village way of life, and exploiting a diversity of non-agricultural products such as seaweed and clam farms. The very problematic post-cyclone rating (1.8) given by respondents was associated with the lack of alternative non-agricultural based commodities or disaster resilient crops for income. Community emphasis on addressing post-disaster needs at the household level also meant that there was less time available to regenerate income security and to restore village-based commercial activities.

4.2.2.7 Energy Security

Nn: Energy security and natural resources support

Good ratings (3.5) for pre- and post-cyclone **Nn** were given by default as Koro has the natural energy sources required to support community disaster resilient energy security, which includes biofuels from coconut and firewood, sunshine, wind, waves and surface water sources to power a hydro dam although this was damaged by the cyclone (see Table 4.8).

TABLE 4.8 Energy security vulnerability scores for the 14 villages pre- and post-Tropical Cyclone Winston

ENERGY SECURITY (E)	Nn: Natural Resources		Ni: Infrastructure and services		Nf: Finance		Nh: Human Resources		Ng: Institutions and Governance	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Nacamaki (M)	4	4	3	1	3	2	3	3	5	2
Tuatua (M)	4	4	5	1	5	5	5	3	2	2
Nasau (M)	4	4	4	1	4	2	4	2	5	1
Naqaidamu (M)	4	4	4	1	5	1	5	5	5	3
Sinuvaca (M)	4	4	5	1	5	1	5	3	5	1
Namacu (M)	4	4	2	1	2	1	4	4	5	1
Nakodu (M)	4	4	4	1	4	1	5	2	5	1
Mudu (M)	4	4	5	1	5	1	5	4	4	2
Vatulele (C)	4	4	4	4	5	4	4	4	5	3
Nabuna (C)	4	4	3	1	4	2	3	3	3	1
Nabasovi (C)	4	4	5	1	5	3	3	2	5	1
Tavua (C)	4	4	4	3	4	1	1	1	3	2
Navaga (C)	4	4	4	1	5	5	4	4	4	2
Kade (C)	4	4	5	2	5	3	4	3	5	1
AVERAGE	4	4	4.1	1.4	4.4	2.3	3.9	3.1	4.4	1.6

1.0–1.8 Very problematic	1.9–2.6 Problematic	2.7–3.4 Satisfactory	3.5–4.2 Good	4.3–5.0 Very good

Ni: Energy security and infrastructure support

Respondents' mean rating for pre-cyclone **Ni** was good (4.1) due to: having access to power from 6pm to 10pm daily with some households utilising gas stoves; a biofuel production project initiated in Nacamaki village and management training provided to community members; some households having access to generators and solar lighting; and the training on energy technology and management at community level provided by the Fiji Electricity Authority, Ministry of Energy and Fiji National University. However, some respondents indicated that the daily provision of 3–4 hours of power was insufficient. The average very problematic post-cyclone rating (1.4) of **Ni** reflected community views about power from operating generators could only be provided in communal areas as wiring to individual households was destroyed. With the disruptions to community sourced power supplies, household access to energy varied within and between villages. Some households managed to purchase their own generators and diesel, while others had access to small solar units and kerosene lanterns. Several village generators and wiring to houses were damaged or completely destroyed by the cyclone storm surge and winds, and solar lights were now providing power for many villages. The Nasau Village communal solar powered generator was completely destroyed by the cyclone and the damaged equipment had been returned to the supplier. For many houses, kerosene and gas stoves used mainly for cooking were lost to the cyclone and so most meals were being prepared via open fires. Solar torches and lights were recently distributed by relief agencies.

Nf: Energy security and finance support

The average pre-cyclone **Nf** rating of very good (4.4) was due to affordable communal energy fees of FJ$2–5/week per family to cover power provisions from 6–10pm each day and a fee of FJ$10 was charged for each additional hour requested for activities such as funerals or weddings. Several villages also indicated that the community was able to collect enough money to pay for the maintenance of the generator when required. Households were also able to afford their own solar lights. After the cyclone **Nf** was rated by the community as problematic (2.3) because a loss of income from cyclone impacts on agriculture and other resource-based commodities meant communities could not repair or replace damaged or destroyed communal generators and wiring.

Nh: Energy security and skills support

The good mean rating (3.9) for pre-cyclone **Nh** was associated with: the availability of about two to four electricians in each village who knew how to repair and operate the generators and wiring to individual houses; the knowledge and skill of community members of villages that were part of the Department of Energy Koro Island electricity committee and had received training on running and managing the community generator which operated well pre-cyclone; some community members had been trained in solar energy by the Department of Energy and Fiji National University; and some community members had also been part of solar energy training by visiting agencies. A similar satisfactory mean rating (3.1) for post-cyclone **Nh** was attributed to most of the villages' electricians and people trained by the Department's Rural Electrification Unit and visiting agencies remained in the villages, although some village electricians and trained community members were unable to repair or recover engines that had been destroyed by the cyclone. Some respondents also indicated that there was a need for community members to be trained on more affordable renewable energy technology.

Ng: Energy security and institutional support

The average community very good rating of (4.4) for pre-cyclone **Ng** was linked to: the efficient operation (from 6–10 pm daily) and maintenance of the community generator by the respective village development or energy committees with support from the Rural Electrification Unit; the ability of the respective committees to regularly fundraise to pay for the generators and fuel (which cost about FJ$2 per week per family or FJ$20 per family per month); and achievements by several villages in securing energy projects and partners (such as the Namacu mini-hydro, Nasau solar and Nacamaki bio fuel generator fuelled by virgin coconut oil). The very problematic post-cyclone **Ng** rating (1.6) was attributed to the damage to and loss of village generators which had yet to be repaired and energy/development committees becoming inactive as other household disaster recovery priorities took precedent. Where generators were still operational or recovered, power was generally provided for communal areas as wiring to most households had been destroyed and families were still residing in temporary shelters.

4.3 Lessons from a retreating village

Vatulele, the only village not considered for post-Winston relocation was much less impacted than the others by the Category 5 cyclone winds and wave surge. Located on the northern coast of Koro Island, Vatulele's location is relatively elevated and wind-protected (see 3.6.9). Moreover, the study also found that the Vatulele community had retreated from the shoreline and up the adjacent slope in a gradual way within a span of at least five decades. Traditional leaders informed the IVA assessors that the flat area adjacent to the village shoreline had eroded by up to 15–20 m over the past 50 years. Several household *yavu* (traditional house mounds), including that of the village chiefly family, had been encroached by the sea and became submerged. Initially, individual households retreated up slope while in the last five years,

clan leaders internally negotiated an extension of the village boundary by at least a kilometre inland. This was done to cater for an expanding village population and to facilitate a continuous community retreat in the longer-term future as well as the establishment of a new cemetery, to replace the old one closer to the shoreline.

An aggregation of LAHSO scores for the 13 villages was compared with that of Vatulele to determine differences in community perceived vulnerability before and after the cyclone. As shown in Tables 4.9 and accompanying Figures 4.14, Vatulele respondents considered their LA capacity pre and post TC Winston as 'very good' and 'satisfactory' respectively while the average ratings for all 13 villages were generally 'good' before the cyclone and 'problematic' or 'very problematic' after. As shown in Table 4.9, the most significant difference in perceived vulnerability between Vatulele and the 13 villages related to water security (**W**1.9), energy security (**N**1.4) and place and food security (**P**&**F**1.2).

TABLE 4.9 Human secuirty score differences between Vatulele versus the 13 other villages identified for relocation on Koro Island

PRIORITY VULNERABILITY HS	Pre-cyclone (Vatulele)	Pre-cyclone (13 villages)	Pre-cyclone Difference	Post-cyclone (Vatulele)	Post-Cyclone (13 villages)	Post-cyclone Difference
Ecosystems (E)	4.6	3.6	1	2	1.7	0.3
Health (H)	4.8	3.9	0.9	2.4	2.3	0.1
Place (P)	4.8	3.8	1	3.2	2	1.2
Water (W)	4.6	3.8	0.8	4.4	2.5	1.9
Food (F)	5	4.2	0.8	2.8	2	0.8
Income (I)	5	4	1	3	1.8	1.2
Energy (E)	4.4	3.8	0.6	3.6	2.2	1.4

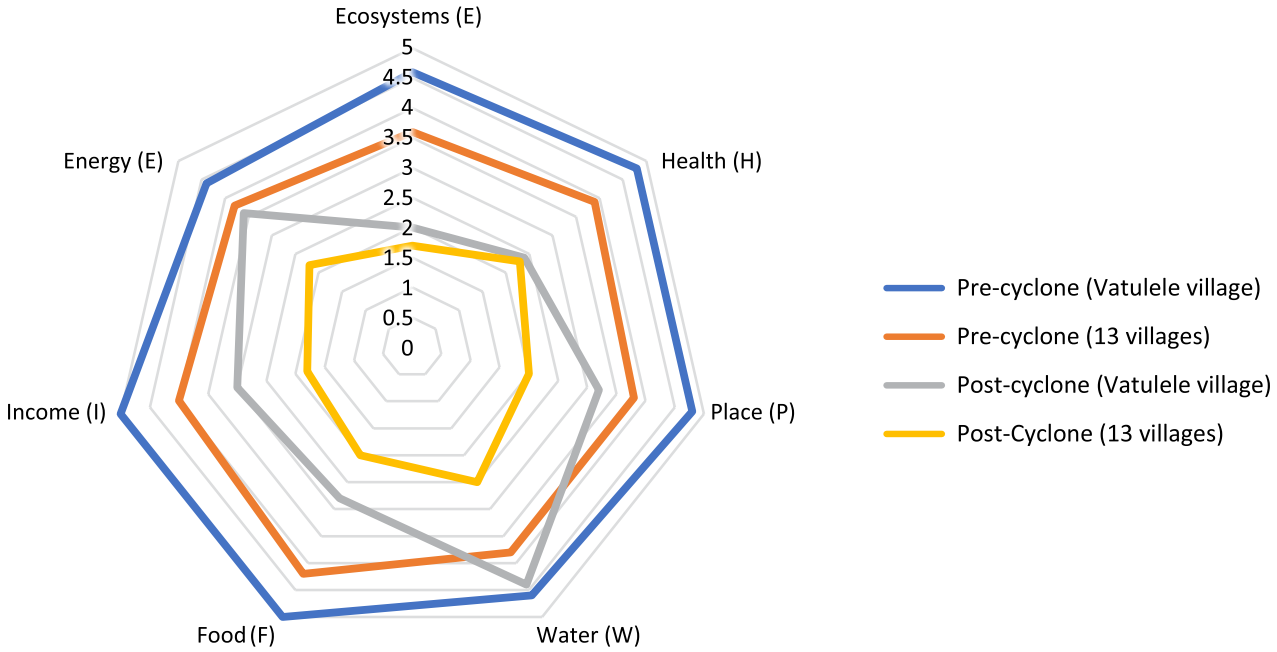


FIGURE 4.14 Human security difference between Vatulele and the 13 villages pre- and post-cyclone

These differences in outcomes may be due to the higher level of impact of the cyclone on infrastructure capacity (**i** by 1.9) and finance and governance capacity (**f**&**g** by 1.3) as demonstrated in Table 4.10 and corresponding Figure 4.15. The impacts of the cyclone on infrastructure in the 13 villages were largely characterised by damage and loss of homes, community buildings and facilities (church and village halls), energy equipment (solar panels and equipment, generators, lighting equipment), agriculture and fishing tools and other equipment. These impacts may have also contributed to reduced access to finance as Vatulele Village still had access to the infrastructural assets needed to be relatively more economically productive and, therefore, had the time and resources to advance community rebuilding and development. The difference in cyclone impact on skills, in terms of the availability of people and their respective capacities with skills, seemed negligible at 0.2 between Vatulele and the 13 villages (see Table 4.10). This may reflect the outward mobility of the productive population and the kind of skills available relative to the demands of the post-disaster reconstruction context.

TABLE 4.10 Pre-Winston Livelihood Asset (LA) capacity score differences between Vatulele and the 13 villages identified for relocation

LA capacity development priorities for resilience building	Natural resources (n)	Infrastructure and services (i)	Finance (f)	Human resources (h)	Institutions and governance (g)
Pre-cyclone (Vatulele)	4.9	4.6	4.6	4.7	5
Pre-cyclone (13 villages)	4	3.8	4	3.8	4
Pre-cyclone Difference	0.9	0.8	0.6	0.9	1
Post-cyclone (Vatulele)	3.1	3.4	3.1	3	2.7
Post-cyclone (13 villages)	2.2	1.5	1.8	2.8	1.4
Post-cyclone Difference	0.9	1.9	1.3	0.2	1.3

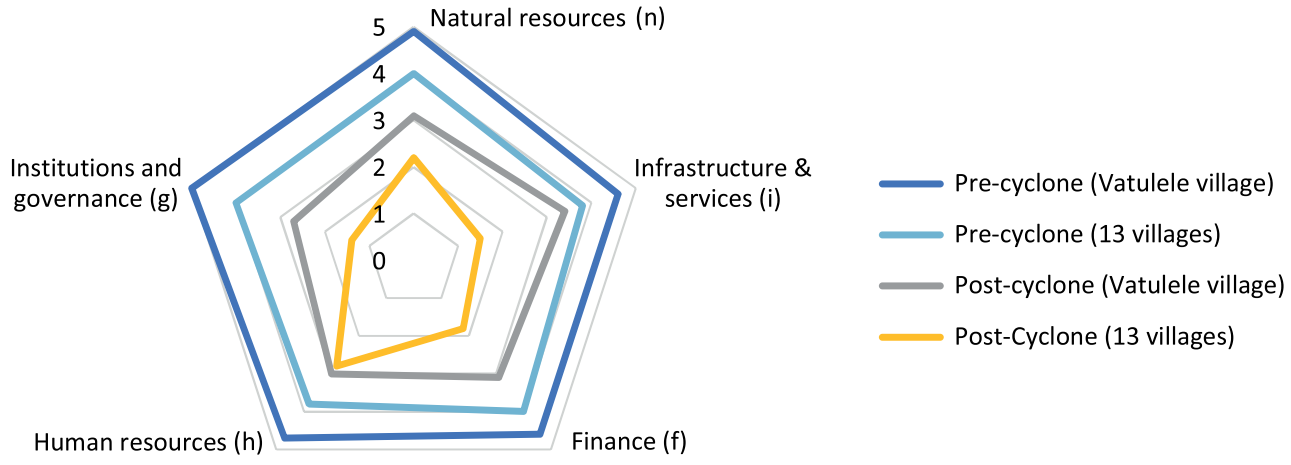


FIGURE 4.15 Livelihoods assets capacity difference between Vatulele and the 13 villages pre- and post-cyclone

It is interesting to note that Vatulele Village respondents' retrospective view of their human security and LA pre cyclone was relatively higher than the 13-village average, although both groups regarded this to be 'very good' and 'good' overall. This may be a circumstantially influenced bias on the part of all respondents, given that they may have been assessing the conditions of their assets and situation of the pre-cyclone 'normal' relative to the post-cyclone 'disaster' they were experiencing at the time of the assessment.

The above finding highlights the significance of infrastructure and services to human security under normal and extenuating conditions and the importance of retreat to coastal resilience on Koro Island. The LAHSO comparative analysis of Vatulele Village and the 13 other villages clearly demonstrates the benefits of retreating to higher ground in the context of coastal hazards and specifically to a uniquely intense and sudden-onset extreme event such as TC Winston.

However, other pre-existing internal and external factors were also key contributors to such demonstrated resilience. First, Vatulele community had tenure access to immediately adjacent upward sloping land that enabled an elevated retreat on contiguous land. Second, Vatulele Village's community leaders collectively decided and implemented an extension to the village boundary to accommodate future retreat as well as cater for an expanding village population. This study clearly demonstrates the importance of geography (see section 3.6), land tenure and community leadership to climate resilient mobility at local community levels.

4.4 Community views about relocating

A detailed investigation of the **Pg** (security of place and institutional and governance capacity) component of the LAHSO assessment matrix was carried out for a more in-depth understanding of how respondents viewed and responded to the proposed relocation of their village and related context-specific factors. This part of thecommunity's *talanoa* was related to: past migration and settlement on the island; current valued objectives for security of place; coastal hazards in relation to relocation; processes related to community relocation decision-making and gender considerations; relocation in terms of where, when and how; and the kinds of relocation that were already in action or intended. This *talanoa* was conducted on an individual as well as collective basis.

4.4.1 Past migration and settlement

Koro Island's current 14 villages are a result of evolving interactions between Indigenous, colonial and post-colonial government processes over the last three or more centuries. Indigenous migration on Koro island largely involved six waves originating from the eastern part of Fiji's main island, Viti Levu, as well as neighboring island of Ovalau. These migrations were influenced by warfare and geopolitical contests that were active in central Fiji around pre-18th century.

The first and second migration wave arrived from the respective *vanua* of Wailevu and Verata in the Tailevu Province. The third and fourth migration wave came from the vanua of Levuka on the neighbouring island of Ovalau (Lomaiviti Province) and later from Bau Island (also now part of the Tailevu Province). The fifth migration wave came from the neighbouring island of Batiki Island (Lomaiviti Province), followed by another final wave from Bau Island. Today, the *mataqali* and *yavusa* of the 14 villages can be traced to these migrations.

Mobility and settlement patterns driven by these waves of migration were generally fluid and ridge-ward, relative to the coastward establishments of the current village settlements. Tribal warfare generally drove people to fortify and settle inland. The respective totems, rituals and names of each *mataqali* and *yavusa* link present generations to the migration wave they descend from and kinship ties can be mapped within the island as well as with relatives outside the island, including that of the vanua from which the first settlers came from. These relationships are usually remembered or mentioned via traditional sevusevu ceremonies that mark weddings, funerals, births, receiving and farewelling visitors, and others. The

varied Indigenous migration has shaped the egalitarian nature of power-sharing in customary governance processes, such that there is no one paramount chief for the whole island.

Two significant events shaped mobility within Koro Island in the pre-colonial European/British contact period. The advent of Christianity and cessation of tribal warfare occurring about two centuries ago triggered the move to the coast and was further incentivised by access to marine food, European goods and trade as well as transportation services.[47] This period includes the arrival of European and Tongan missionary migrants. In the 1930s, decades after colonisation, a government policy to amalgamate small settlements into bigger villages was introduced to operationalise the cooperative movements in Fiji. For example, Navaga village on the west coast absorbed two former smaller and neighbouring villages of Vovo and Nadraladamanu in 1932.[48] The other villages on Koro Island are also an outcome of such village amalgamation processes and the *yavu* of some of these smaller, older villages are still known today.

Decision-making for village relocation in the 1930s often lay with the *yavusa* chief and the rest of the community would follow in the belief of the respective leaders' *mana*, and such decisions would not be questioned. Usually, villages would move and reside in their chief's *mataqali* land. There was less emphasis on the chiefly *mataqali* having access to agricultural land as the understanding was that crops and land for cultivation would be provided by other *mataqali* of the village. Today, modern Christianity and the commercially driven global economy has influenced the ways in which *mataqali* value and use land which is now negotiated and decided via a hybrid customary and modern land tenure regime.

4.4.2 Current valued objectives for security of place

A prioritisation of security of place objectives was conducted via a listing and ranking process. Groups of men, women and youth were interviewed separately in each village and asked to discuss and list what they considered to be the 20 most important elements of 'Place', then asked to rank each with '1' being 'most important'. The 'top 5' P valued features by each gender and age disaggregated *talanoa* group (men, women, youth, mixed) from the various villages were marked as 'T5' while the remaining were identified as 'OP' to mean 'other priorities'. All T5 features were then clustered into common codes as shown in the first column of Table 4.11. The top five priorities gathered from the *talanoa* with individuals were grouped according to the group *talanoa* outcome feature codes. Valued objectives that were 'not mentioned' in the individual *talanoa* process were marked NM. The ranking of valued objectives for security of place was then ranked (as per Table 4.11) according to a combination of being highly and widely valued by the varied gender and age disaggregated groups and the frequency in which these were mentioned via the individual *talanoa* process.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[47] Details can be sought from "I Tukutuku Raraba" for each village with the office of the *iTaukei* Lands and Fisheries Commission in Suva.

[48] Personal communications with Mr. Timoci Macuinavosa of Navaga Village.

TABLE 4.11 Top 5 Valued objectives for security of place across 14 villages on Koro Island

Valued Objectives	Groups Interviewed N=28 *9 men 9 women 6 youth 4 mixed*				Individual survey N=103 *48 men 56 women Frequency issue was mentioned via individual survey*	
	Men	Women	Youth	Mixed	Men	Women
1. Basic services: Access to basic services including water, energy, disaster resilient houses, roads, schools, food gardens and health centres, proper toilets and sanitation	T5	T5	T5	T5	94	120
2. Communal buildings: Village church and hall	T5	T5	T5	T5	17	22
3. Identity: Communal and cultural identity and functionality (*vanua* and Christian spirituality, values and practices and sub-village cohesion at clan level); good village governance (regular meetings and active and responsible sub-committees, communal work); revival of traditional dances and craft	T5	T5	T5	T5	3	5
4. Housing layout: Village spatial layout (houses clustered by clan; regulated, levelled land)	T5	T5	T5	T5	NM	NM
5. Safety from hazards (safe from waves and falling rocks, elevated, safe for children, village dispensary, footpath, women's common/safe house)/ Evacuation centre	OP	T5	T5	T5	5	4
6. Vicinity to income source: Engagement in income sourcing activities (e.g. VCO, pandanus, agriculture, small business)	T5	T5	T5	OP	NM	NM
7. Access to economically enabling infrastructure: Telecommunications, transportation and shops and other economically enabling infrastructure	OP	T5	OP	T5	2	6
8. Lifestyle: Vicinity and access to the beach and fisheries	T5	OP	OP	T5	NM	NM
9. *Yavu*: Maintaining attachment to history and *yavu* (house foundation)	T5	OP	OP	OP	NM	NM
10. Environmental health: Having healthy coastline (coastal protection structures, coastal reforestation and improved waste management facilities)		OP	OP	OP	2	NM
11. Recreation: Sports facilities (playground and gym)	OP	NM	OP	NM	NM	NM
12. Chiefly house: House for traditional chief	OP	OP	NM	NM	NM	NM
13. Cemetery	OP	NM	OP	NM	NM	NM
14. Village by-law	NM	OP	NM	NM	NM	NM

T5 = Mentioned as one of the 'Top 5' Place feature by combined gender-disaggregated group

OP = Other priority features mentioned by combined gender-disaggregated groups

NM = No mention of feature

The above prioritised security of place valued objectives unsurprisingly re-emphasised the importance and value of basic infrastructure and services (i) such as water, sanitation, energy, housing, food, and education and health services. The importance of communal structures where the village gathers for spiritual, cultural and social communing such as a church or community hall was also highly ranked. The importance of these essential elements of Place was particularly felt by respondents as much of it was destroyed by the cyclone and location-related risks associated with reconstruction were being considered.

Village spatial and housing layout was considered to be highly important by all groups, although not mentioned by any of the individuals surveyed. The group *talanoa* highlighted that villages were becoming crowded due to increasing household numbers and limited areas of flat land within the village vicinity. Hence, an ad hoc approach was adopted in deciding who built where leading to a departure from a *mataqali*-clustered *yavu* (family house foundations) arrangement within the village boundaries. Some respondents, especially the youth, indicated that retreating may allow for spatial planning that would support a more traditional *mataqali*-clustered housing lay-out.

Safety from coastal hazards and attachment to *yavu*, often the focus of relocation studies[49,50], were also considered important although ranked fifth and ninth respectively and these are examined further in the next section (4.4.3). However, it is also important to note that these *talanoa* were conducted under extraordinary circumstances and so the trauma and loss experienced from a cyclone of such unprecedented intensity may have weakened or severed such attachment to a particular physical place (e.g. at *yavu* scale) in the immediate term (see 4.4.3). Other key priorities for security of place included safety from coastal hazards, access to economically enabling resources (fisheries and gardens) and infrastructure (shops and telecommunications), health of coastlines, access to leisure facilities and sufficient space for a burial ground.

4.4.3 Perceptions of coastal risks and relocation

The study found a positive correlation between houses directly impacted by TC Winston's storm surge and the desire to retreat. As shown in Figure 4.16, 57% of respondents indicated that they did not feel safe rebuilding in their old house foundation. The majority of the respondents that wanted to retreat had experienced inundation by the storm surge to varying degrees (Figure 4.4). Respondents who preferred to rebuild on their old house foundations were less likely to have been impacted by the storm surge (see Figure 4.4). Ten respondents whose houses were struck by the storm surge stated a preference to rebuild on their old house foundations due to place attachment, access to the beach and sea breeze as well as due to land tenure concerns about the proposed new village site.

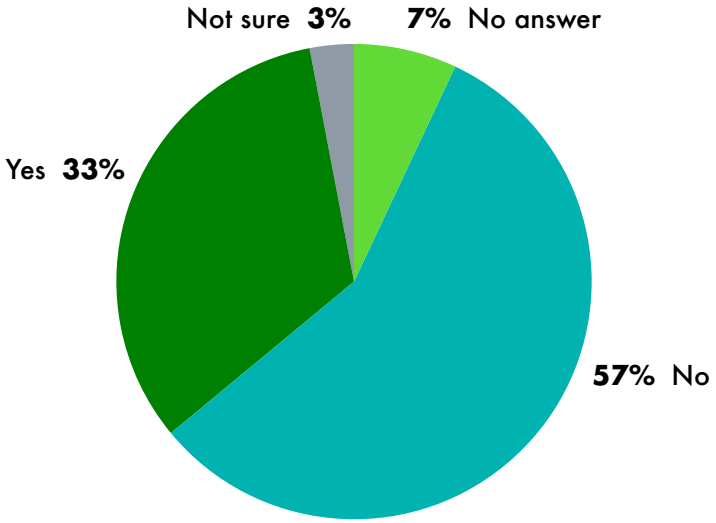

FIGURE 4.16 Do you feel safe rebuilding on your old house foundation?

[49] Cagilaba, V. (2005). *Fight or flight? Resilience and vulnerability in rural Fiji.* University of Waikato.

[50] Campbell, J. (2005). *Community relocation as an option for adaptation to climate change and climate variability in Pacific Island Countris (PICs).* Kobe, Japan.

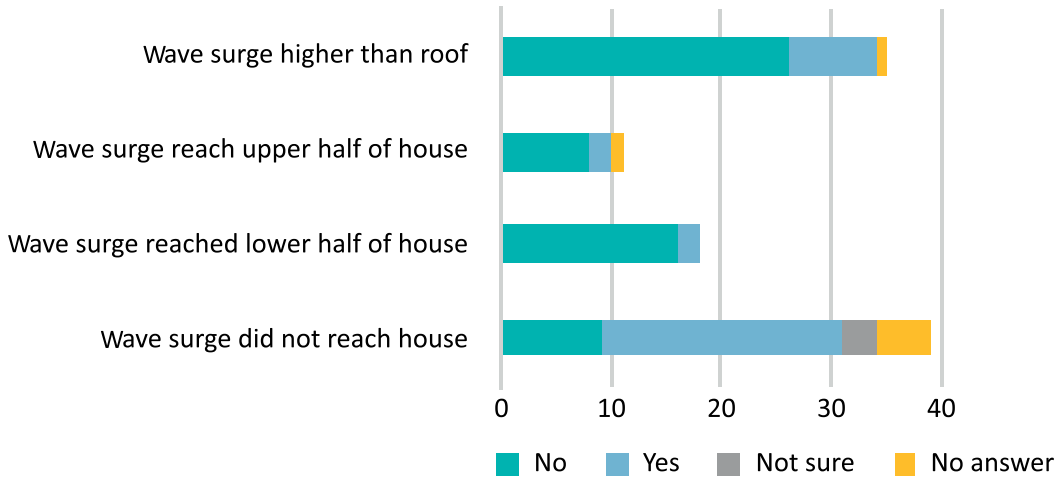

FIGURE 4.17 Influence on cyclone storm inundation on desire to relocate house

Most respondents who did not feel safe rebuilding in the old village site indicated that they expected living close to the shoreline was too risky and that rebuilding inland will likely ensure lives and property are protected from future coastal disasters. Those who desired to relocate were also motivated by perceived future impacts of rising sea levels and climate change and did so out of concern for future generations (Figure 4.5). Over three quarters of respondents who did not feel safe rebuilding on their old house foundations indicated that they were aware of climate change and sea level rise. In comparison, less than half of those who felt safe in the old village location were also aware of climate change.

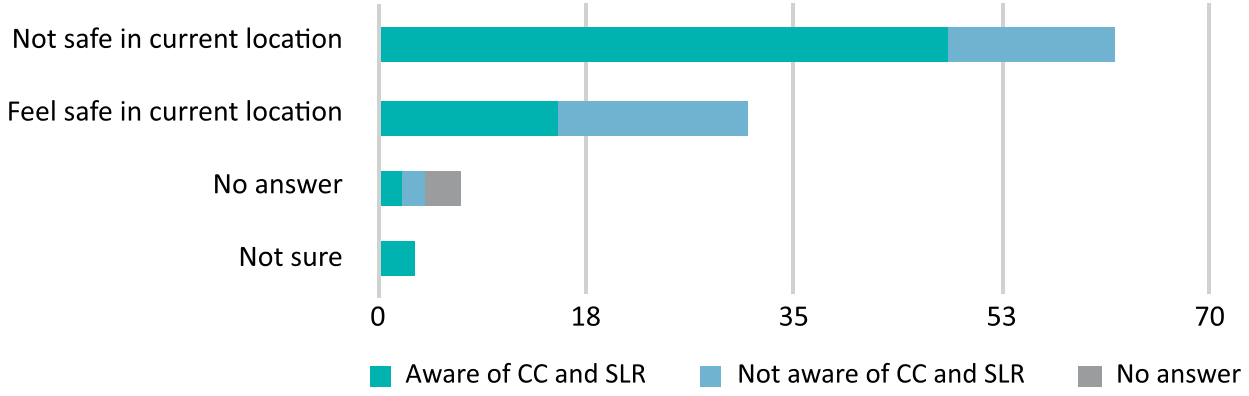

FIGURE 4.18 Climate change awareness and views of safety in current location

The outcomes of this survey suggest that up to 60% of respondents may be classified as internally displaced persons[51] given that the motivation to relocate was driven by fear of serious harm and the relocation considered is within national borders (Figure 4.19).

[51] Heslin A., Deckard N.D., Oakes R., Montero-Colbert A. (2019) Displacement and Resettlement: Understanding the Role of Climate Change in Contemporary Migration. In: Mechler R., Bouwer L., Schinko T., Surminski S., Linnerooth-Bayer J. (eds) Loss and Damage from Climate Change. Climate Risk Management, Policy and Governance. Springer, Cham

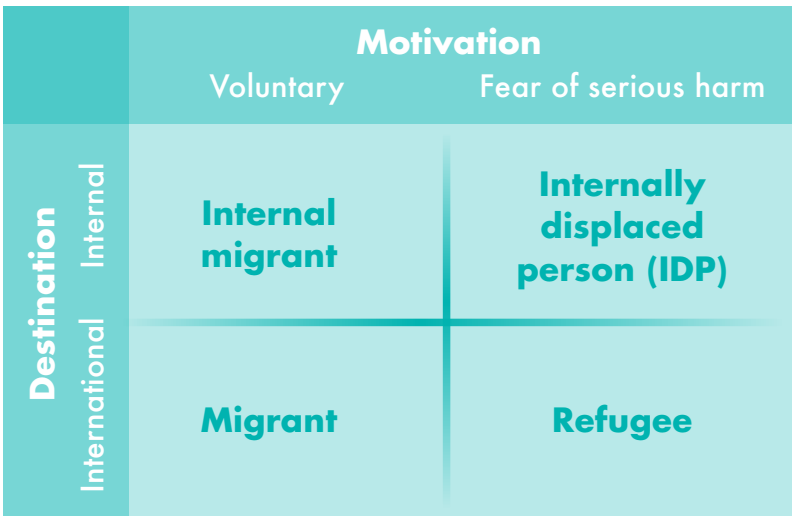

FIGURE 4.19 United Nations migration related terminology by destination and motivation

4.4.4 Relocation decision-making, gender and youth

A majority 79% of respondents indicated that they agreed with the proposed relocation of their village (Figure 4.20). Most (86%) of those who agreed with the proposed relocation were motivated primarily by the need to move away from the coastal hazards (Figure 4.21). About 7% of respondents indicated that it was not possible to rebuild on the old house spot as it was covered by sediments and became part of the beach or was underwater as a result of the cyclone. A few respondents (2%) indicated that their house was completely destroyed, and they preferred to rebuild elsewhere while others indicated that they were compelled to move because the government and community leaders had decided on it.

There were generally more positive and opportunistic views about the proposed retreat from the youth group *talanoa* compared to that of the men and women's groups. The young people shared their desire to build in safer places and where there would be space to re-create *mataqali*-based housing allotments within village boundaries. The youth were of the view that retreating would create space to develop needed sports grounds, revive cultural practices and ecotourism activities along the shoreline. For example, the youth of Nacamaki village (among the worst affected) indicated retreating would free up space for the revival of traditional turtle calling practices and masi (*tapa*) production previously practiced on the island. These aspirations emerged from the significant material losses experienced and the desire to build back in a more spiritual and culturally purposeful way.

The 15% that did not agree with the proposed relocation mostly felt safe and preferred to rebuild from the existing house foundation (Figure 4.22). Other reasons for staying related to place attachment, access to livelihoods, proximity to friends and tenure access.

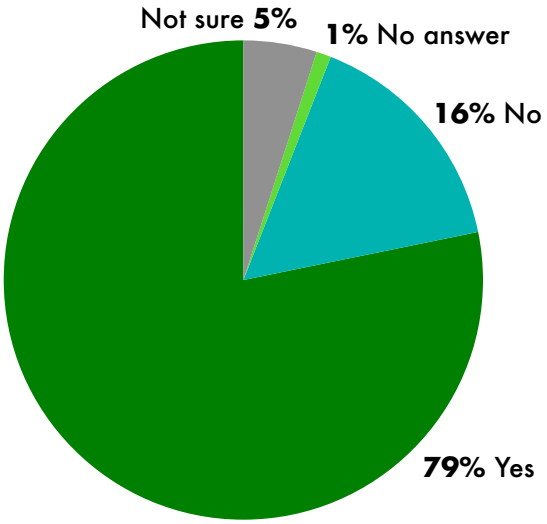

FIGURE 4.20 Do you agree with the decision to relocate your village

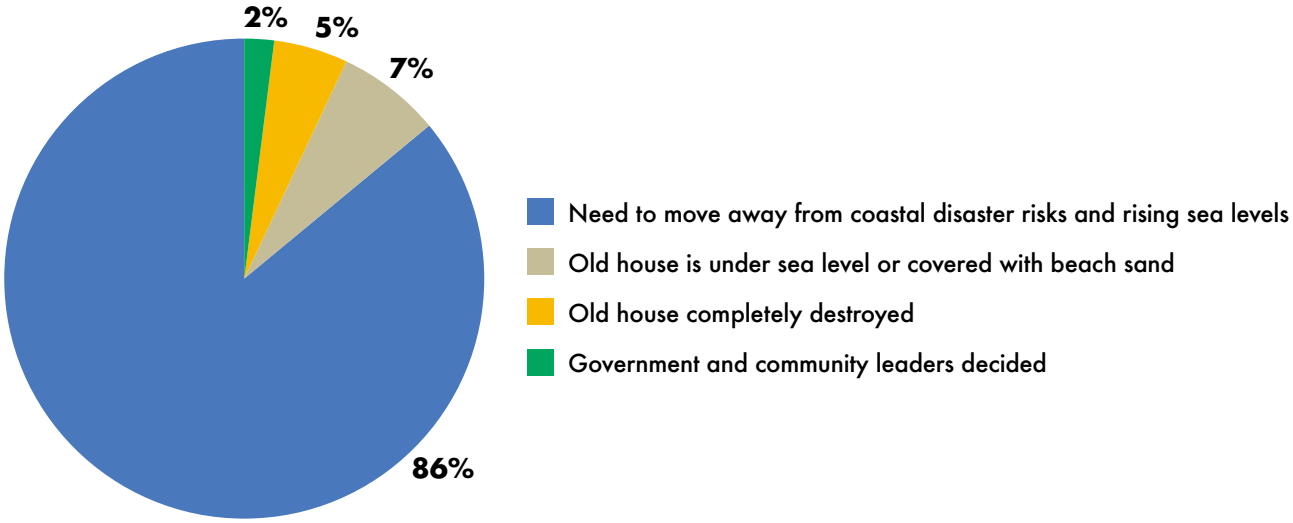

FIGURE 4.21 Reasons for supporting proposed relocation

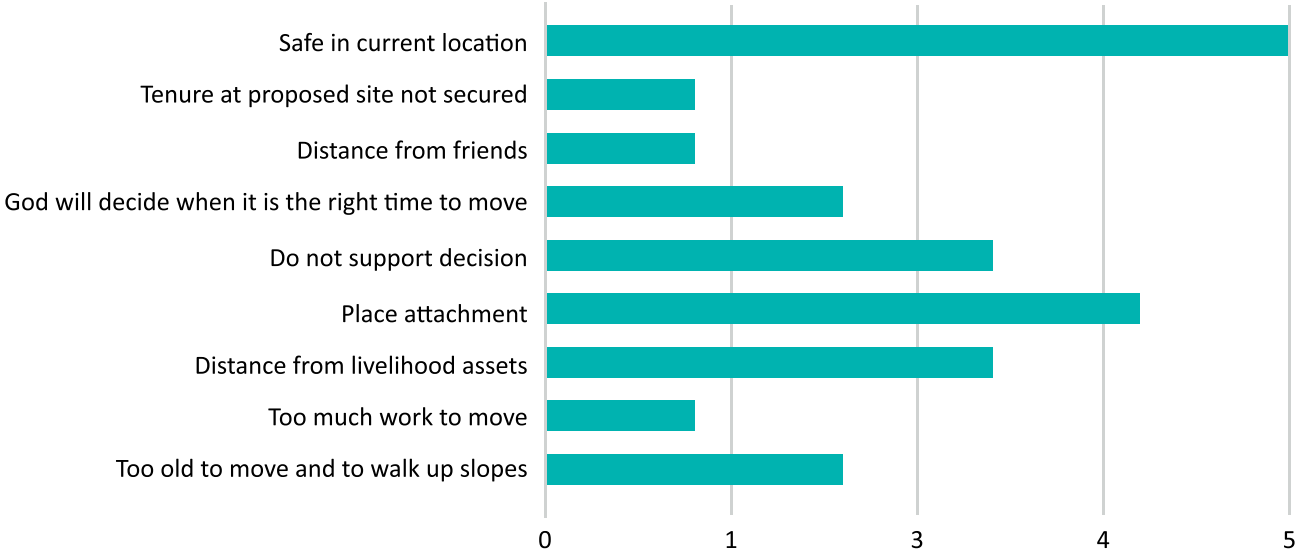

FIGURE 4.22 Reasons for disagreeing with the relocation decision

Men and women experience differing needs and priorities in development decision-making and planning. Understanding the difference in women's and men's decision-making capacity in various contexts reveals how gender specific needs and priorities are governed. The Koro IVA questionnaire included questions on the level of influence men and women felt they had in decisions made at the household, *mataqali* and village levels. The results showed important gender differences. Women were almost seven times as likely as men to say that they had 'no influence at all' in *mataqali* decision-making, and four times as likely as men to say that they had 'no influence at all' in village decision-making (Figure 4.23). With regard to household decisions, 59% of women and 84% of men indicated they had 'a lot of influence'. However, with regards to *mataqali* and village level decisions, only 24% and 26% of women reported having 'a lot of influence', compared to 51% and 56% of men.

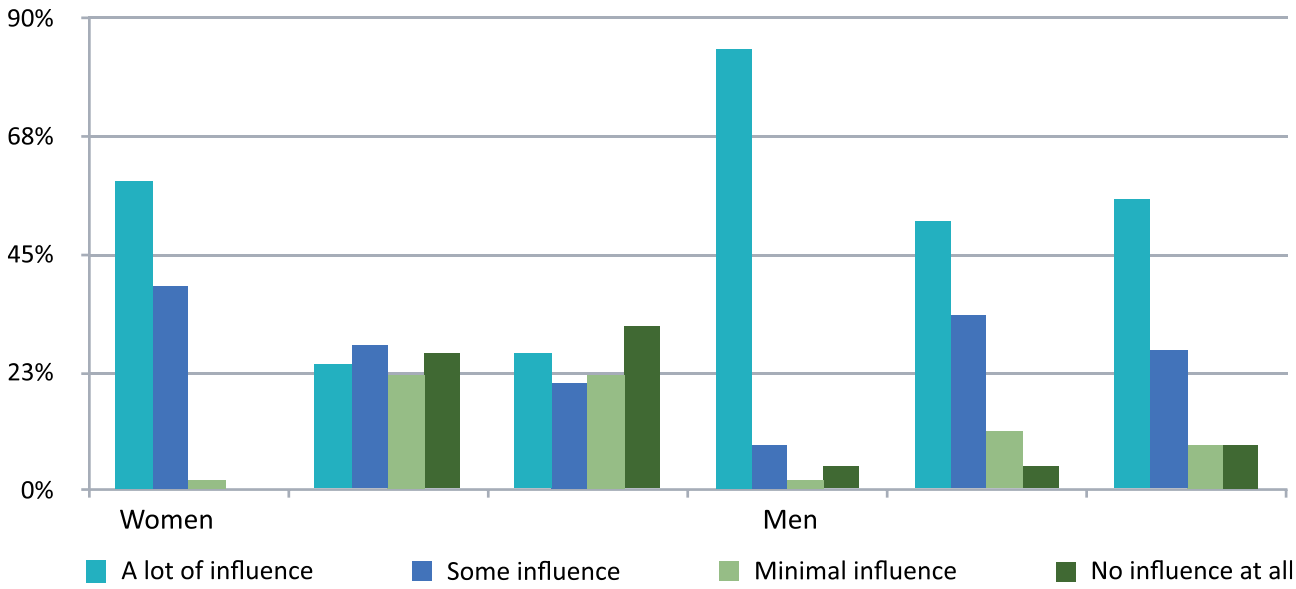

FIGURE 4.23 Decision-making influence of men and women in Koro Island

About half of the individually surveyed respondents indicated that they had some influence in the decision to relocate their village inland (Figure 4.24). However, a higher proportion of men (31 men: 19 women) participated in the decision-making process while a majority of those that were not engaged in the process were women (17 men: 33 women). These outcomes are reflective of current customary norms and practices associated with land negotiations and transfer whereby clan chiefs and elders (of patrilineal hereditary) are the primary decision-makers. Women who are not in clan leadership positions but who are hereditarily from the clan may influence land related decisions indirectly at the household or clan level, depending on the nature of the social unit, in terms of how much consideration is provided to their respective daughters and sisters, and how they operate and make decisions.

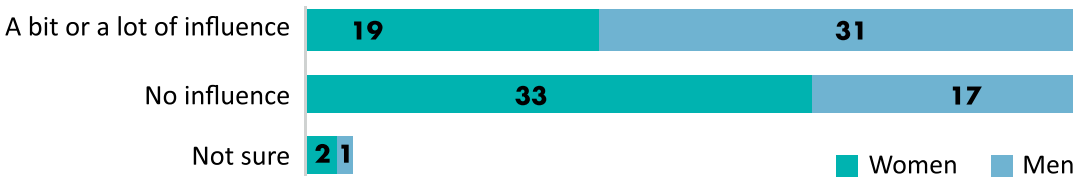

FIGURE 4.24 Men and women's participation in the decision-making on the proposed retreat

4.4.5 Where, when and how to relocate

About 70% of respondents indicated that they were aware of the proposed site for the new village (Figure 4.25). A few respondents indicated a preference to an alternative site that was closer to roads, water sources and plantations or further uphill and away from the sea.

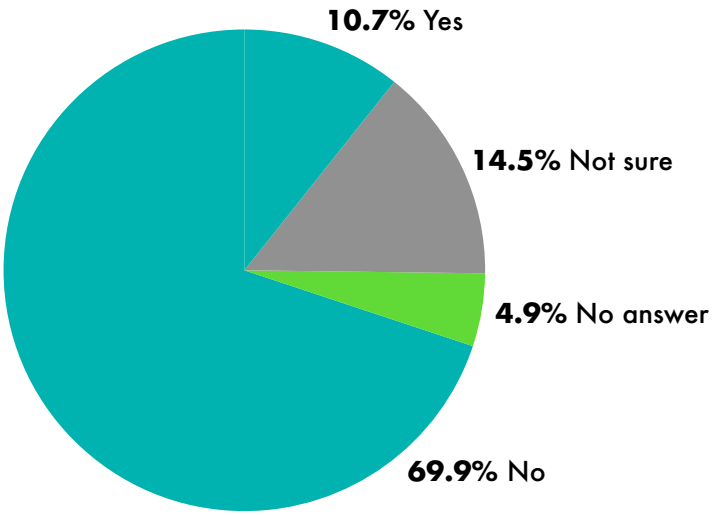

FIGURE 4.25 Respondent views about location of new village site in percentage

The *talanoa* groups generally felt that the *Turaga ni Koro*, in close consultation with the customary *mataqali* leaders should lead the community relocation planning and implementation process in collaboration with interested government departments and non-government organisations. Some respondents also suggested that villages should establish a relocation committee (or assign responsibility to an existing committee) to act as the focal coordination group for the community relocation process under the leadership of the Turaga ni Koro. Suggested roles for the proposed relocation committee included organising awareness-raising about climate change and relocation and ensuring community views and concerns about each step of the relocation process were incorporated into relevant decision-making processes.

Most respondents indicated that the relocation should be conducted gradually, prioritising vulnerable houses that are located in the more exposed parts of the village, such as those sitting closer to the shoreline. Others thought that newly married couples should start building in the proposed new village site. Some older members suggested a staggered approach to relocation whereby the younger generation (who are more likely to be building new houses) start moving up slope while the older generation remained in the current (old) village. Most of the youth consulted via group interviews were relatively more supportive of relocation.

Most group respondents indicated that the communities' contribution to the relocation process could be to secure the land transfer for the new site with the village *mataqali a*s well as supplying local building materials (such as timber and aggregates) and the manual labour required to construct houses. There was a general reliance on the government and donors to financially support earthworks to level and prepare the land for housing construction and connect new settlements to accessible basic infrastructure and services such as water, energy, education, health, communications and transport. Communities also indicated that they would require the government to financially assist the purchasing of building materials for housing, churches and community halls. Group responses to the time required for the relocation processes varied from one month to ten years. Such variation is likely due to differing expectations related to externally sourced resource support and awareness and understanding of the complexity of relocating a community.

4.4.6 Retreat intentions and actions

The study also found a variety of pre-existing autonomous relocation intentions and actions on the island linked to slow-onset coastal erosion and rapid-onset storm surge impacts. These pre-existing processes occurred in a more organic way within customary practices, occurring over generations. A *talanoa* on the settlement history of Koro Island with a key community informant indicated varied waves of migration from various parts of Fiji (and Tonga) as well as intra-island mobility over at least three to four centuries had shaped current settlement patterns, land tenure, customary relationships and kinship structures. Credited to its advantageous physical, tenure and leadership characteristics, the positive autonomous and gradual retreat occurring in Vatulele village is rooted in such customary tenure and mobility processes.

Similarly implemented and intended mobility processes were evident in other villages on Koro Island, induced by both slow and sudden onset coastal change. Kade and Nacamaki villages had previously discussed retreating inland due to eroding shorelines that intensified during extreme events, but had not done so due to issues related to land tenure, community will and resources. According to Kade's traditional leaders, talks to relocate the village were first raised in the mid-1990s with the local district authorities and the NDMO. The Government through the District Officer for Lau/Lomaiviti based in Levuka at that time had arranged a deal to identify the land to move to and that the government would move them and build their homes under the rural housing scheme. However, the Tui Kade at the time refused the offer at the village meeting with the relevant authorities. Community members consulted for the IVA were generally not committed to relocating to the proposed new site (Figure 4.25) with distance from the school, number of uncertainties and lack of land tenure clarity communicated as reasons for this.

In Nacamaki, the women reported that a parcel of land on an elevated area behind the village was cleared and levelled for the village to relocate to after the 2010 Cyclone Thomas wave surge washed away three houses near the shoreline. However, none of the houses moved there and the land is currently being reserved to accommodate a sportsground. Its distance from the main road may have been a disincentive for households to move. A second proposed village site demarcated by the iTaukei Land Commission and MRD with customary landowners after TC Winston has enabled more households to retreat. This is likely due to the land being contiguous to the village as well as alongside the road. About a third of the village established new homes in the contiguous area. These households were previously located on the shoreward part of the old village and were severely impacted by TC Winston as well as Thomas in 2010. Households that retreated post-Winston also expressed other positive outcomes such as better access to food gardens as well as the opportunity for the younger generation to build their home alongside other *mataqali* members.

All but a few remaining houses in Sinuvaca relocated to the contiguous land upslope from the village during the post-cyclone reconstruction phase. This move was enabled by the Australian Defence Force (deployed to the Koro for post-disaster response work) providing the available machinery on-site to clear the land for house building. Again, the land was alongside the road, which also facilitated machine access to prepare the land for settlement.

In Nakodi, households that were located on the shorefront manually cleared a piece of the land that was demarcated for relocation by the post TC Winston assessment team and a significant portion of the households that were previously located shoreward relocated. Household members that had retreated indicated that their new location was particularly advantageous due to closer proximity to their farms as well as better access to roads and health centres.

In Namacu, a household reported that younger members of their *mataqali* were planning to rebuild their own hamlet on *mataqali* land about two kilometers inland and close to their semi-commercial garden. Retreating that way meant that they would be establishing themselves outside the village boundary but within customary land. This form of living beyond the village boundary and hence, not bound by its rules

and regulations but, nevertheless, socially committed by supporting and attending to various cultural obligations is referred to in *iTaukei* as *tiko vagalala.* In such cases, several *mataqali* members still reside within the village and are the social focal point of clan members who have established *tiko vagalala* hamlets on *mataqali* customary land. The advantage of such settlement pathways is that clan members can live closer to food and commodity gardens as well as access more or preferable residential space whilst maintaining their place and relationship to the village.

Numerous households in various villages on Koro retreated, but within their village boundary. In some cases, the safety of these new housing spots was questionable. For example, in one village, several houses moved from the shoreline to the bank of a flood prone stream that ran through the village.

4.4.7 Land tenure, relocation and the diaspora

The Koro Island diaspora living in Suva were also consulted about the proposed village relocations via *talanoa* after the community IVA field assessment. The concerns raised during this *talanoa* related mainly to the geophysical and financial feasibility of the proposed move and the legitimacy of the 'land giving' process that was facilitated by the Ministry of iTaukei Affairs following TC Winston. While members of the Koro diaspora were generally supportive of the proposed relocation from a hazard reduction perspective, they were nonetheless aware of the restrictive geophysical terrain of the land surrounding their respective villages. They indicated that the earthworks needed to prepare the proposed land relocation would require a substantial level of resourcing and time, of which the diaspora is usually a key contributor. Informants indicated villages experiencing such geophysical and financial restrictions would have to rebuild on the current site in the immediate term while a longer-term village development plan would involve relocation to the proposed demarcated site.

Other diaspora members were concerned about the longer term implications of the customary land giving process that took place during the post-Winston disaster response and questioned its legitimacy given the unresolved status of certain land boundaries, the limited consultations with the wider community including diaspora landowners, and if the concerned traditional leaders were legitimately entitled to authorize the respective customary land transfers that took place. The provision of land for village settlement is usually granted by one of the several *mataqali* (LOU) that make up a village. Usually, the village resides on the chiefly LOU land although contemporary factors, particularly relating to infrastructure access, may now determine the viability of a village's location. The evolving development context on Koro Island in recent decades, particularly the expansion of agricultural activities, has also influenced the way in which customary land is valued and used.

There was a view from diaspora informants that the giving of land by a LOU for village relocation (or retreat) should be more sensitive to the values and interests of wider LOU. For example, informants suggested that an arrangement similar to formal land leasing arrangements be followed whereby 90% of LOU members' consent is required before land can be transferred for village relocation. Such a process would ensure a more inclusive approach to customary land transfer for village relocation as the consent of both female and male LOU members would be assured as well as that of the diaspora who may not be physically present on the island when such decisions are made. While such a procedure may prove ineffective in more immediate and urgent demands of post-disaster situations, it would nevertheless ensure the risk of fractured relations within the LOU giving land as well as between various LOUs that make up the village is minimised in the longer term. Ensuring the participation of diaspora members in LOU land transfer and land-use decision-making also nurtures the resource sharing inter-dependencies between LOU members on the island and the diaspora. Generally, the former's presence on the island is important for the upkeep of the *vanua* as well as for the production and provision of crops and fish and customary goods such as mats and oil in exchange for cash, material goods and accommodation that the diaspora can provide in urban centers on a needs basis, including that of post-disaster periods.

While the customary land demarcation and transfer process facilitated by the MiT and TLTB enabled an upslope retreat by villages such as Nacamaki and Nasau in a post-disaster context, it may not have been as successful in others. The hesitancy by some villages to relocate or a preference by some households to retreat to their own *mataqali* land, beyond the village boundary could have been a reflection of the doubts or perceived inadequacies of the land giving process for relocation after the cyclone. For example, there was a strongly held view that a customary ceremony of *Vakalutu Ni Qele*, a traditional feast made by the land receiving members of the village to the land giving *mataqali* should have preceded the formal land demarcation and transfer performed by the Ministry of iTaukei Affairs and TLTB and not after, as was the case.

These reflections highlight the opportunities and risks associated with asking, giving and receiving land for village relocation or retreat in a post-disaster context and its implications on climate vulnerability in the longer-term. It also highlights the significant overlaps between risks, impacts and response measures under sudden disaster and slow onset climate change hazards (including rising sea levels). A post-disaster relocation may be an opportunity to implement a climate-driven planned relocation process. Alternatively, a planned relocation master plan that is already in place may better guide where villagers could move to (temporarily or permanently) post-disaster and, hence, reduce or avoid the social risks or tensions that may arise from a post-disaster relocation based on the doctrine of necessity or in the context of emergencies.

4.4.8 How the villages retreated after TC Winston

The above findings demonstrated the complex factors surrounding the relocation of communities in the context of post-disaster as well as planned relocation. In any case, more than four years following the cyclone a retreat of 8 of the 13 villages is evident. These retreat were demonstrably triggered by the TC Winston and shaped by the geographic and socio-cultural factors described above. In most cases, villages' retreat were less defined by the boundaries demarcated by the Ministry of iTaukei Affairs and TLTB but more by tenure access and geography whereby a spill into contiguous upslope or inland areas were favored. Retreat was also more likely for those villages on the island's east coast that were directly impacted by the storm surge and particularly households that were severely impacted.


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5 Discussion: Options for coastal resilience building

This study illustrates the extent to which 14 coastal communities on Koro Island were able to utilise a combination of available and accessible livelihood assets to address their human security needs before and (four months) after experiencing the impact of a Category 5 cyclone using the IVA-LAHSO methodology and analysis matrix. In doing this, the study demonstrated the (IVA-LAHSO) tool's functionality as a medium for gathering information, analysing and comparing community vulnerability and resilience across sectors (e.g. food, water, health) and scales (village and island level), using multiple sources of knowledge (technical and scientific as well as local and Indigenous). This standardised yet context-sensitive way of assessing community vulnerability and resilience enables assessors and planners to determine appropriate approaches and measures for supporting climate-resilient mobility at a particular place and time. In applying the IVA methodology and LAHSO analysis matrix the study generated the kind of knowledge that may help decision-makers decide if climate change related relocation should be supported, who is to relocate, and when and how such a response could be carried out in an equitable way, and without undermining community resilience.

5.1 To stay or to move: a continuum of options

The study highlighted that moving communities away from coastal hazards needs to be guided by communities' valued objectives of place, livelihoods access, culture, inclusivity and environmental sustainability. The study showed that most of the communities' views about moving were influenced by the magnitude of experienced disaster impacts and perceptions of future coastal hazard risk. Individuals whose homes were impacted by the storm surge were significantly more likely to want to move compared to those who were not reached by the cyclone waves. So, the desire to move may have been driven by recently experienced trauma and fear following an unusual and extreme disaster. The thinking that '*if we are going to rebuild our entire house then we may as well rebuild in a safe place*' resonated with the motive to move mainly for those respondents whose homes were destroyed by the wave surge. An awareness of climate change and rising sea levels also influenced people's views about moving, and younger community members were keener (than the older generation) to rebuild or start their adult lives in less exposed uphill areas. However, the impact of an inland retreat of all of Koro Island's communities should also be carefully considered in light of changing demography, development and land-use patterns influencing what people do and what resources they can access to address their human securities at different times.

The study also showed that while a majority of respondents wanted to relocate to safer and more elevated areas, doing so was challenged by geography, land tenure and the lack of LAs immediately available to support communities' human security in the proposed sites. For example, some proposed new village sites needed to be prepared for settlement, requiring clearing and earth works which are extremely expensive for outer islands such as Koro. The new sites, to varying degrees, also did not have the much needed infrastructure and services (**i**) to support most of the communities' human security needs (e.g. **Wi**, **Ii**, **Ni**) identified as priority valued objectives for place (T5, Table 4.11). Moreover, the increasing conversion of forested land for agricultural purposes suggests a need for spatial planning that ensures water sources and watershed health are protected in the process of land clearing and levelling for residential purposes. Indeed the existing layout, conditions and resilience of existing and intended infrastructure for all HSOs would need to be factored into such planning.

It was evident that rebuilding or moving contiguously over adjacent land, by extending the village boundary, seemed a far more enabling retreat strategy but afforded to only two communities (due to geography and tenure). Not all villages have equal access to contiguous land suited for retreat due to sharp cliff terrain (Kade and Nasau), tenure issues (Tuatua and Kade) or a combination of both. These factors may explain why respondents' views varied on how and when retreat (section 4.4.5) should occur and how decisions related to land giving and relocation should be made. Moreover, community knowledge and views about past and recent migrations to and within Koro Island as well as communicated future retreat intentions suggests that various ways of addressing the difficult issues related to relocation exist within customary institutional structures and processes of which the Indigenous language is a critical tool of mediation. These options vary along a continuum of stay, contiguous and non-contiguous retreat strategies within the island of Koro.

5.1.1 When communities opt to stay

About a fifth of respondents indicated a preference to stay and to rebuild on their existing *yavu.* More households may have opted to stay if a similar assessment was carried out under 'normal' circumstances and pre-existing problems relating to geography, tenure and access to infrastructure and livelihoods may explain a large part of this. Sufficient evidence to support a 'stay' option, particularly in the immediate term, was evident in the LAHSO assessment outcomes as land in newer village sites had yet to be prepared for settlement.

The LAHSO assessment also provided important information to support decision-making on what the resilience building investments might need to be and how long for. For example, this study has clearly demonstrated the importance of disaster resilient infrastructure and the critical support functions of ecosystems to human security in the near future. Therefore, families that prefer to stay indefinitely may consider adapting their house design and standards as well as income, water and food sources, technologies and systems to better protect themselves from or accommodate the impact of sudden and slow onset coastal hazards.

A stay option will also require communities to prioritise the establishment of an effective coastal protection strategy and investment plan, which may end up costing lives and assets in the longer term if not implemented adequately. Either way, community access to services to support multi-hazard disaster preparedness, response and recovery (DPRR) with effective early warning and evacuation systems, adequate and safe evacuation centres and, where possible, prepared land for future post-disaster settlement options (temporary or permanent) will be critical for communities opting to 'stay' (see 6.1). Less frequent, but more intense cyclones are expected in the future and other warming effects including rising sea levels are expected to exacerbate current levels of coastal hazards. If customary land is available, communities that opt to 'stay' should consider securing an alternative village site that future generations may wish to retreat to as the coastal risks and conditions at the existing site become less tolerable and/or uninhabitable. A 'stay' approach may also include temporary post-disaster labour migration to aid recovery or retreat at home.

5.1.2 Contiguous retreat within the island

The Koro IVA team recommended a **contiguous retreat strategy** to the National Disaster Management Committee as an intermediary relocation measure for the island and this was later applied to other affected coastal villages that were severely impacted by TC Winston nation-wide. A contiguous retreat strategy may involve the retreat of shoreward houses inland within the established village boundary, space allowing. Such retreat may not be viable with limited space relative to village population expansion. A contiguous retreat requires accessible adjacent land that caters for village expansion as well. Such a retreat strategy ensures that the village is still physically connected to basic infrastructure and communing structures (church and community halls) as well as to their respective traditional fishing grounds and culturally significant resources that supports community identity an notion of *vanua*.

In a rapid-onset climatic event such as TC Winston, a contiguous retreat allows communities to continue to access existing critical and restorable infrastructure such as water systems, potentially repairable communal structures (churches and community halls) and social support systems. In a slow-onset coastal event context, a contiguous retreat strategy may be the most effective option for building resilience in a way that is sensitive to place attachment. Vatulele Village (section 4.3) provides a good example of how contiguous retreat may be successfully applied to cases of incremental slow-onset sea level rise and coastal erosion.

The study also showed, via the experiences of Kade and Nasau villages, how geography and land tenure restricts certain communities from adopting a contiguous retreat strategy as a long-term resilience option. These restriction mean that the communities would be forced to expand towards and along the low flat shoreline (tenure permitting). In the context of place security, Kade was the most vulnerable of the 14 villages as they were physically squeezed between a high cliff with loose rocks and an eroding shoreline and had 'unresolved' customary tenure access to nearby land. In Nasau, an adjacent parcel of coastal land belonging to a clan of the village was not made available. Where the physical geographical barriers are less restrictive for a contiguous retreat, the financial cost of earthworks and benching to prepare land for settlement may be too high and, hence, reliant on state support.

Where contiguous retreat is restrictive, communities may consider staying at the existing site and adopt a protect and/or accommodate coastal resilience option or consider a non-contiguous retreat option.

5.1.3 Non-contiguous retreat within the island

Non-contiguous retreat refers to localised relocation (e.g. within an island, district or land tenure jurisdiction) to a disjointed or nonadjacent site. The strategy may be pursued in a variety of ways and this study observed and identified three types including, clustered, gradual and all-at-once retreat.

Clustered retreat may be considered as a form of relocation whereby certain members of a *mataqali,* move to their own customary land outside the village boundary to form hamlets. A clustered retreat may be an important option for climate related relocation in the future for customary landowning communities, especially in the rural and outer islands of Fiji. This is where land preparation machinery, to clear and level large parcels of land for village re-settlement, is hard to access and expensive coastal protection infrastructure may be hard to justify, particularly for rural outer islands in a Pacific Small Island Developing States context. A clustered retreat has the fluidity needed to address the restrictions of geography, land tenure and exorbitant contiguous retreat costs. It reduces the demand for land clearing and (landscape) benching to accommodate the re-establishment of relatively large settlement units such as a whole and expanding village. Smaller, terraced hamlets may be considered a more nature-based adaptive alternative in the longer-term future. It is important to note that households that adopt a *mataqali*-clustered retreat can maintain social ties and obligations to the original village via the continued residence and presence of certain members of their own *mataqali* in the existing village.

A **staggered retreat** is when a new site inland has been secured and prepared for village retreat but via a gradual relocation process. This may be conveniently tailored inter-generationally, whereby those who build their first or new house are the first to settle in the new site. The time period between the first group moving to the new site and last group abandoning the original village would support resilience, equity and sustainability if based on participatory community decision-making processes. Such retreat may be triggered by rapid and slow onset by climate change and extreme events as well as development driven pressures and opportunities occurring near the original or new village site.

It is important to note that the above continuum of retreat options need not be adopted separately and that a combination of options may be fused to suit each village's vulnerability context (shaped by the extent of hazards, exposure and sensitivity, physical geography, tenure access, finance and livelihoods status and

options) and future resilience-building aspirations. Moreover, given the numerous and varied vulnerable coastal communities that exist in Fiji, the government may need to be strategic with the nature of its role to support and/or manage climate and disaster related mobility. As demonstrated in this study, the villages of Koro Island have varied levels of access to customary institutional processes that have the capacity to autonomously facilitate a retreat process with varied levels of state support, particularly from the *iTaukei* Affairs Board. While few communities on Koro Island share the advantages that Vatulele village has relating to geography, tenure and leadership, they nevertheless have access to varied levels customary land and processes as well as varied support networks upon which state support services can efficiently support and build on in terms of developing, implementing and adaptively managing a resilience building (including mobility) plan for Koro Island.

5.1.4 Can retreating reduce climate and disaster driven island depopulation?

The study also revealed the importance of sustainably managing 'within island' climate related mobility in order to avoid 'out of island' disaster-induced displacement and depopulation, especially where development driven rural-urban migration issues pre-exist. Tropical cyclones can have a depopulating effect on outer island communities due to livelihood losses and distance from key education, health and market facilities. Koro Island's population reduced by an estimated 26% from January 2016 (pre cyclone) to September 2017 after having experienced a slight but steady increase from 1996 (Table 3.3). The island's thriving agricultural industry and relatively accessible transportation links to Suva had contributed to maintaining a reasonably healthy outer island population at a time when the proportion of Fiji's rural population reduced from about 60% three decades ago to around 40% where it currently stands. Higher island out-migration was experienced on the wave-impacted east coastal villages of Mudu District which collectively reduced by 37% from January 2016 (pre cyclone) to September 2017 (Table 3.3). In comparison, village populations in western Cawa District, on the more sheltered side of the island reduced by 12% for the same period. The Fiji Red Cross records show that up to 100 residents of Nasau village, which suffered the greatest loss of life and property, left the island immediately after the cyclone for livelihood reasons (income and education mainly) and of that, only about 40 residents had returned within the next two years (Goering 2018).

Place vulnerability could further be linked to community members emigrating out of Koro Island for income and education. During the survey, most villages reported that a significant number of village members had left the island immediately after the cyclone, mainly for alternative employment (as commercial farms and infrastructure had been destroyed) as well as for education and health reasons although some later returned to the island as the situation improved. For example, the UNDP 'work for cash' program lured some of the island's youth back to the island to clear debris and assist with reconstructionNevertheless, the 2017 (unofficial) census outcomes for Koro Island indicated a population count of 2830 in 2017 (19 months after the cyclone), which was similar to October, 2016 (9 months after the cyclone) at 2824 (Table 3.3). This means that a 26% population reduction from the pre-cyclone count of 3838 people was maintained over one and half years after the cyclone, with the greatest losses experienced by the more severely impacted east coast villages. Hence, the island lost about a third of its population after TC Winston. The eight villages of Mudu District, comprising settlements along the eastern coast of the island that were directly affected by the storm surge, lost up to 34% of its population while the Cawa villages on the relatively protected west coast lost 12% combined.

The above findings highlight a variation of mobility factors at play in Koro Island that relate to climate change and disasters but also linked to rural-urban development drivers. Climate change is often regarded as a 'threat multiplier' of pre-existing development problems. This study showed that the threat of rural-urban migration to island depopulation was multiplied by the impacts of TC Winston, whereby infrastructure and finance LAs were demonstrably the most vulnerable. This study further highlights that investing in better infrastructure and services to meet the pre-existing development needs of

outer islands will be futile and wasteful if its design and plans are not resilient to the effects of extreme weather and climate change.

These findings reveal key limitations to current responses to climate and disaster related mobility policies and programming in Fiji which is largely limited to moving people away from the hazards of sudden-onset coastal disasters. Climate related mobility cannot be treated separately from pre-existing development related mobility as they share similar drivers which, in the case of Koro Island, relate to access to basic and economically enabling infrastructure and finance, such as education and health services and paid work. These limitations may be addressed via three broad strategies: (1) ensuring that climate-related mobility processes are participatory; (2) integrating climate related mobility policy and programming within the resilient development processes and at all levels; and (3) creating a nature-based coastal protection orientation for resilient development.

5.2 Adaptively managing climate resilience and mobility in a participatory way

The process and outcomes of this study highlight the need to embed climate related community relocation decision-making and planning within community-based adaptation (CBA) processes. Planning and implementing adaptation measures based on local community institutions and participation is fundamental to CBA. The study showed that while local customary institutional and land tenure transfer processes were duly observed in the relocation decision-making process facilitated by MRD and the *iTaukei* Affairs Board, a more comprehensive consultation process (see 5.4) that involved a wider cross-section of the community was important for identifying pre-existing livelihoods vulnerability and mobility issues and challenges that need to be factored for enduring resilient development outcomes.

5.2.1 Participatory resilient mobility planning and monitoring and evaluation

Past CBA initiatives in a variety of communities in Fiji have involved vulnerability assessment and adaptation planning, implementation and appraisal processes based on the co-production of knowledge and solutions between communities and technical experts via a 'bottom up' participatory process. Approaching climate related community relocation in this way is likely to ensure that the decision to relocate is an outcome of a participatory adaptation process that ensures gender and social inclusivity principles. Moreover, coastal communities should be considered more resilient if the CBA process integrates multi-hazard disaster risk reduction and management (DRRM) measures that include effective early warning and evacuation systems and identified build-back better retreat options (see 6.1) should such a need arise post-disaster.

An integrated CCA and DRRM approach would be appropriate with gender and social inclusivity considerations addressed within community institutional processes for resilient development planning, implementation and monitoring and evaluation (M&E). The application of the IVA methodology using LAHSO matrix is an example of a systematic and standardised process of assessing community vulnerability to climate and disasters in a way that is also participatory and context-sensitive. Practitioners working in community development and resilience may build on the multiple-sourced knowledge yielded via this study to develop, monitor and evaluate resilient community development plans and processes.

A key benefit of the IVA-LAHSO tool, as applied to the 14 villages of Koro Island, is that it sets the foundational baseline narrative required for the kind of resilient development M&E that can guide and adaptively manage climate and disaster related mobility. The 35 LAHSO scores and narratives may be used as qualitative baseline data and indicators that may be monitored repetitively to explain how climate and disaster response activities or interventions carried out at community level (process indicators) affect vulnerability and resilience (outcome indicators) and how these, in turn, affect the achievement

of longer-term sustainable development goals (impact indicators) at island as well as national scales.[52] This study has demonstrated that the factors shaping the community vulnerability and resilience also determine poverty and so aligning resilient and sustainable development M&E is essential.

Another important advantage of the IVA is that varied groups within a community (men, women and youth) were able to share their perceived and experienced vulnerability at a particular place and time of the assessment. Identifying communities' perceptions of risk and resilience in this way and is also important for enabling the kind of feedback loop needed for enabling participatory and climate-resilient community relocation or retreat. Also, gender and age disaggregated approaches to conducting the IVA helps ensure gender and socially inclusive relocation decision-making may occur within customary institutional processes.

5.3 Making way for coastal protection, blue carbon and recreation

This study showed, in section 3.6, the communities' high level of exposure to coastal hazards was due to housing-building patterns that favoured clear and sparsely vegetated shorelines. This highly vulnerable settlement pattern is further supported by the location of the island's coastal ring road linking villages to key basic services, such as the schools, health centres, shops, jetty and airports located along the coast. This highlights the need for climate-resilient spatial planning and investments on Koro Island that responds to opportunities identified by communities and resilience interventions promoted by global institutions such as the UNFCCC. These include the development of blue carbon sequestration and ecosystem-based coastal protection measures.

5.3.1 Building resilience via coastal protection and blue carbon

The importance of ocean-related measures to climate change adaptation and mitigation is a clear message from this study, especially in terms of how ocean health and coastal community resilience interact and influence each other. The growing demand for blue carbon, which is the carbon captured by the coastal ocean ecosystems, mostly mangroves and seagrass in the Pacific context and salt marshes in other parts of the world, requires that countries invest in efforts for its protection and restoration under the UNFCCC. Past studies in the region conclude that natural defences including healthy beaches, reef flats, coral reefs, mangroves, wetlands and swamp forests and watersheds are the most effective coastal protection measures for high outer island communities such as Koro Island, especially when considering longer term sea level rise projections.[53] A World Bank study found that mangroves may reduce the coastal areas impacted by storm surge by up to 50%.[54]

The 13 villages identified for relocation are situated on low lying areas along relatively unsheltered shoreline that is highly exposed to coastal hazards such as large swell events, cyclone storm surge and tsunami as well as high tide flooding. These hazards are expected to intensify in the future with climate change related rising sea levels and increased cyclone intensity. A commonly mentioned alternative to relocation provided by some community members was to re-establish collapsed seawalls or invest in new hard engineered coastal protection structures. This approach may likely be uneconomical to maintain in Koro's context, especially in view of the climate change effects anticipated in the next 20 to 50 years. Moreover, the adoption of a retreat strategy by the 13 villages could have a positive effect on overall coastal resilience on the island as shown in Table 5.1.

[52] Secretariat of the Pacific Community, 2020, *M&E Strategy for the Framework for Resilient Development of the Pacific Islands*. SPC, Suva, Fiji

[53] Mcleod, E., Bruton-Adams, M., Förster, J., Franco, C., Gaines, G., Gorong, B., ... & Terk, E. (2019). Lessons from the Pacific islands–adapting to climate change by supporting social and ecological resilience. *Frontiers in Marine Science*, *6*, 289.

[54] Blankespoor, Brian; Dasgupta, Susmita; Lange, Glenn-Marie-000351319. 2016. *Mangroves as protection from storm surges in a changing climate (English)*. Policy Research working paper; no. WPS 7596. Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/703121468000269119/Mangroves-as-protection-from-storm-surges-in-a-changing-climate

TABLE 5.1 Benefits of a retreat strategy on Koro Island

Coastal ecosystem	Potential benefits of adopting a retreat strategy for coastal resilience on Koro Island (based on LAHSO narratives)
Coral reef, reef flats and seagrass	▪ Increased distance between village and shoreline may reduce unsustainable fishing practices such as overfishing, and poisoning. ▪ A reduction in direct wastewater flows from pig pans, sub-standard septic tanks, soak pits and toilets located too close to the shoreline or streams.
Beach and backshore	▪ The abandonment of existing village or old house foundations could create the space to encourage coastal vegetation to thrive as well as reduce human disturbance. ▪ A natural defence strategy creates disincentives for future coastal clearing for development and residential expansion.
Mangroves and coastal wetland areas	▪ A natural defence strategy creates disincentives for land filling and mangrove reclamation. Koro mangrove cover is currently very limited with only about 13 hectares, mainly on the west coast.

5.3.2 Building resilience via recreation

A desire to redefine the shoreline area within terms of its function to community life and cultural identity emerged strongly among the younger generation who were more supportive of the proposed retreat. Young people were vocal about repurposing the abandoned village space for the development of playgrounds and recreation. Other suggestions included building backpack accommodation on the vacated beach at the village front and the revival and integration of past traditional turtle calling and *tapa* production practices with the management of Marine Protected Areas. While these views were largely sourced from the youth, it nevertheless indicated possible pathways for intergenerational retreat strategies for Koro Island and the redefining of coastal spaces in the not so distant future environment and climate.

These multiple interlinked emphases on ocean recreation, cultural revival, ecotourism and ecosystem protection and blue carbon capture support recent studies arguing that climate change and other stressors are forcing a shift from protected area management towards integrated management of larger landscapes that comprise communities' health and well-being, transport systems, parks, watershed, agriculture and economically sustainable initiatives.[55]

5.4 Situating climate resilience and mobility in sustainable development

This study has shown how climate change and disasters can dangerously undermine sustainable development efforts in Koro Island as well as other islands in the Pacific. Therefore, framing resilient development efforts within an environmental, social and economic sustainability agenda will be critical to ensuring the 'multiplier effects' of climate and disaster impacts on development are effectively addressed over time as depicted in Figure 5.1. By anchoring the assessment of resilience according to the 35 intersecting LAHSO components before and after TC Winston, the study was able to identify the drivers of pre-existing development problems that are particularly sensitive to sudden-onset coastal disasters and potentially to slow-onset climate change induced coastal hazards.

[55] Jarvis, J. B. (2020). Designing climate resilience for people and nature at the landscape scale. In *Parks Stewardship Forum* (Vol. 36, No. 1).

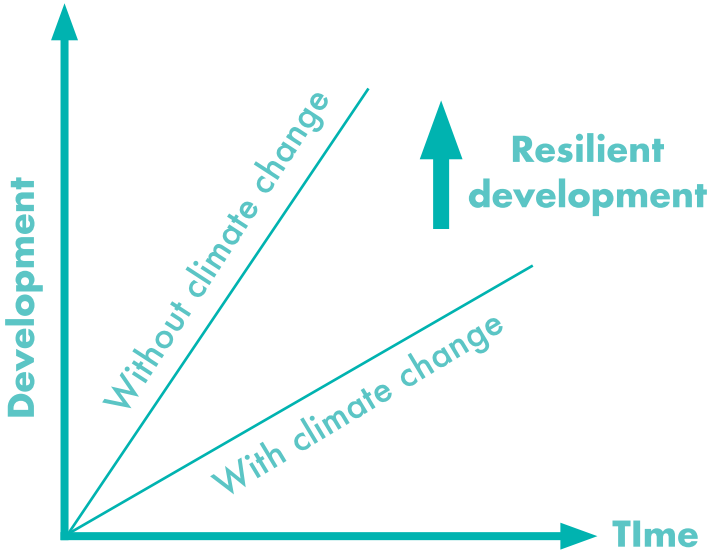

FIGURE 5.1: What resilient development M&E should measure[56]

Moreover, LAHSO assessment outcomes for the 14 villages could be aggregated to highlight how pursuit of each HSO could be either mutually supportive and warrant investment or conflicting and requiring trade-offs to be made in the relevant resilient development investment decision-making process. For example, contextualising village-based coastal hazards related relocation at island scale is able to show the converse relationship between **Pi** (safer dwelling) and **If** (closer to commercial farms) as well as the inverse relationship between **Pi** (safer dwelling) and **Wi** (poor access to water infrastructure). Also, the study shows how the proposed wholesale retreat leading to **Pi** (safer dwelling) could potentially increase risks to **En** (watershed health) at island scale. Given these place and time specific vulnerabilities interact with and across scales (*mataqali*, village, island) integrating community resilient development and mobility plans and M&E systems within island, provincial and national sustainable development processes seems imperative and this study demonstrates how the IVA-LAHSO tool may be used to support inclusive and vertically integrated resilient development planning and M&E processes.

The UNFCCC requests that Parties create institutional links between the national and sub-national levels throughout the planning, implementation and M&E dimensions of resilient development processes as a means to "respect, promote and consider the rights of Indigenous peoples, local communities and people in vulnerable situations" under the Paris Agreement.[57] Vertical integration is fundamental to resilient development because it enables participation, transparency, gender sensitivity and considerations towards vulnerable groups, communities and ecosystems. Currently, Fiji does not have the institutional apparatus to support the vertical integration of resilient development at community, island, provincial and national level and the outcomes of this study provide an opportunity to trial a process of linking the development of a Koro Island Resilient Development Plan, informed by the LAHSO analysis outcomes of this study (among others) as well as aligned with the Fiji NAP, Low Emission Development Strategy and the National Development Plan.

[56] Brooks, N., Rai, N., & Anderson, S. (2018). How integrated monitoring and evaluation systems can help countries address climate impacts. IIED Briefing. IIED, London.

[57] Dazé, A., Price-Kelly, H. and Rass, N., 2016. *Vertical Integration in National Adaptation Plan (NAP) Processes: A guidance note for linking national and sub-national adaptation processes.* International Institute for Sustainable Development. Winnipeg, Canada. Available online at: www.napglobalnetwork.org

6 Conclusion and recommendations: Managing Climate Resilient Mobility on Koro Island

This study used the IVA-LAHSO assessment tool to determine how the proposed relocation of 13 coastal communities on Koro Island following TC Winston might affect their vulnerability and resilience to climate change in the longer term. The study systematically demonstrated how each village's livelihood assets (natural, human, infrastructure, finance and institutional) was affected by TC Winston in a combination of ways that lead to impacts on human security (in terms of environment, health, water, place, food, income and energy). Via a deeper examination of community perceptions of coastal hazards and relocation the study identified a continuum of retreat options that might avoid or minimise risks to accessing livelihoods in the longer term. Lessons from this study highlighted the important role of customary institutions and the indigenous language in supporting climate-related mobility in Fiji and the need to incorporate participatory gender and socially inclusive approach to relocation decision-making. The study concludes with the importance of linking community level relocation decision-making processes to overarching sub-national, national and regional resilient development policy and institutional frameworks for planning and monitoring and evaluation. The following recommendations are proposed as next steps towards informing decision-making related to the proposed relocation away from coastal hazards of the 13 villages of Koro Island.

Recommendation 1: Identify or establish a climate resilient and mobility (CRM) team to coordinate the development and adaptive management of the *Koro Island Climate Resilient Development and Mobility (CRD&M) Plan.* The team will manage the implementation of the recommendations that follow as well as ensure the vertical integration of the Koro Island CRD&M Plan within that of the corresponding village-based planning and M&E process and its alignment and integration with the Fiji NAP, Low Emission Development Strategy, National Development Plan and their respective M&E processes. The proposed CRM team roles and responsibilities may be a sub-group of an existing Koro Island Development Committee.

Recommendation 2: Create a Digital Elevation Model of Koro Island using the Lidar[58] remote sensing survey method to map areas on the island suited for community settlement based on the slope.

Recommendation 3: Initiate the CRD&M planning and M&E process for the 14 villages on Koro Island. The process would include the following:

- Undertake introduction and awareness raising of what is climate resilient development and mobility with an emphasis on the following concepts: participation; modern and customary institutions and land tenure; gender and social inclusivity; and iterative learning and adaptive management.
- Review all past, existing and planned village development plans and projects.
- Review and update of each community's respective LAHSO scorecard and narrative (as at June 2016).
- Report the outcomes of the Koro Island IVA.
- Review, verify, enhance and interpret into the *iTaukei* language the IVA identified resilient mobility continuum observed on the island that includes protect, accommodate, retreat (contiguous, clustered, staggered, altogether) and out of island emigration.

[58] Lidar (/ˈlaɪdɑːr/, also LIDAR, LiDAR, and LADAR) is a method for measuring distances (ranging) by illuminating the target with laser light and measuring the reflection with a sensor. Differences in laser return times and wavelengths can then be used to make digital 3-D representations of the target.

- Undertake resource mapping of livelihoods and security of place that is informed by local and island scale hazards maps and Digital Elevation Model.
- Assess past and a anticipated shoreline changes (e.e. shoreline change detection and sea level modelling)
- Develop village CRD&M plans.
- Establish village CRD&M committees and terms of reference.
- Develop and operationalise a village CRD&M adaptive management process.

Recommendation 4: Initiate the CRD&M planning and M&E process for the whole of Koro island including villages and other communities. The process will be similar to the recommended steps in Recommendation 3 and managed by the Koro Island CRD&M Team.

Recommendation 5: Development of a M&E system for Koro to be operationalised by the island's CRD&M Team.

Recommendation 6: Conduct appropriate research into the Indigenous and customary understandings and language in relation to land tenure, mobility and spatial planning as well as the associated gender considerations.

ANNEX 1 Project team members

Solomone Vubaya	Assistant Roko Tui Koro	Lomaiviti Provincial Office, iTaukei Affairs Board
Vinaisi Dilik	CCA Officer	Climate Change Division, Ministry of Economy
Talei Kocovanu	CCA Officer	Climate Change Division, Ministry of Economy
Katalaini Waibuta	IHRDP Project Manager – Eastern Division	Divisional Commissioner Eastern's Office, Ministry of Rural and Maritime Development and National Disaster Management
Mesake Mataitoga	Senior project Officer Eastern, Disaster Risk Reduction and Climate Change	Office of the Commissioner Eastern Division, Ministry of Rural and Maritime Development and National Disaster Management
Saiasi Buluta	CO Coordinator	iTaukei Affairs Board
Rusiate Valenitabua	Conservation Officer	Lomaiviti Provincial Office
Matereti Mateiwai	Conservation Officer	Serua Provincial Office
Alifereti Bulivou	Project Manager – TC Winston	UNDP
Akanisi Caginitoba	Community Engagement Officer	Wildlife Conservation Society
Isoa Koroiwaqa	Community Engagement Officer	Wildlife Conservation Society
Mesake Draniatu	Lomaiviti Representative	Fiji Locally Managed Marine Areas Network
Sairusi Bosenaqali	Project Officer	Pacific Centre for Sustainable Development (PACE-SD), USP
Patrina Dumaru	Team Leader – USP EUGCCA Project	Pacific Centre for Sustainable Development (PACE-SD), USP

ANNEX 2 Koro IVA community consultation programme

Time	Activity	Description	Who	Expected Output	Preparation details
8:30	Welcome, Prayer and introductions	The traditional *I Sevusevu* for each village would have been conducted by 2 (male) members of the IVA team the night prior to the workshop. The *Turaga ni Koro* (TK) will lead this session by arranging the devotion and giving a brief overview of the purpose of the workshop to participants. The Lead Facilitator (LF) will then build on the TK's introduction and get facilitators and participants to introduce each other	TK, Roko Koro/DO, Talatala LF	Participants and facilitators are familiar with each other Participants are aware of the overall purpose of the workshop	Prior workshop briefing with Turaga ni Koro, Roko Koro and DO
9:00	Overview of workshop aims and objectives	i. Background information on why CCD proposed that an IVA be carried out in Koro and the policy implications of this (CCD). CCD to give an overview on some lessons from previous relocation projects in Fiji (factors that enable and challenge the relocation process) What government is trying to do to enable better community relocation practices ii. Overview of governmental response to the community relocation request (iTAB/MRD to report outcomes of the MRD Geophysical Assessment Report (April, 2016) highlighting: ▪ identified 'no-build'/*tabu* zone; ▪ demarcated land for community to relocate to (for the 10 villages that have done this) iii. Lead facilitator to facilitate participant feedback to: ▪ how lessons from past community relocation in Fiji may relate to their own situation ▪ proposed 'no-build' area (where storm surge reach) ▪ the proposed site (for the 10 village that have demarcated relocation site)	CCD & iTAB	Participants are aware of the factors that enable and challenge community relocation projects in Fiji Participants are able to link community relocation issues and lessons to their own situation. Participants understand the key recommendations of the MRD Geophysical Assessment Report and have expressed their views on the outcomes of the report	CCD presentation and support material (Vina and Talei) iTAB/MRD presentation and support materials (Saiasi and Matereti) Lead faciliatator's guiding questions (Cagi and Isoa)

Time	Activity	Description	Who	Expected Output	Preparation details
9:45	Overview of the IVA framework and the community adaptive capacity assessment method	i. Overview of ▪ the Koro IVA aim, objectives and method ▪ how the fieldwork methods (community workshop, individual surveys, Suva focus group *talanoa*) ▪ workshop programme ▪ IVA framework and how the community adaptive assessment will be conducted which will be done via 5 groups of 3–5 people and 1 facilitator. ii. Participants and facilitators to be divided into their respective groups and provided their respective community adaptive capacity assessment tasks	CCD or iTAB	Participants are aware of the following: purpose and aims of the Koro IVA methods used to gather information information that will be solicited from them during the workshop how the information will be used 5 livelihood assets and how the capacity of these will be assessed against the 7 human security objectives IVA group allocation	IVA presentation chart (Patrina and Siu) IVA resource maps and QGIS data template (for environment and infrastructure groups) Template of group work presentations (on charts)
10:00	MORNING TEA				
10:15	Group work 1: Community adaptive capacity assessment	Each group (mixed by gender and age) will be tasked to assess one of the following livelihood assets according to the respective methods: ▪ Natural resources (resource mapping and focus group *talanoa*) ▪ Infrastructure and services (resource mapping and focus group *talanoa*) ▪ Human resources (focus group *talanoa*) ▪ Finance (focus group *talanoa*) ▪ Institutions and governance (focus group *talanoa*)	All 5 facilitators	Group to consolidate scores, justifications and response action for their respective livelihood asset.	Camera for resource mapping and focus group discussion photos as well as group work outcome photos Charts, pens
11:30	Group work 1 report back	Each group to report on the outcomes of their findings and discussions to the workshop Q&A Consolidation of community adaptive capacity assessment scores, justification and response	Grp rep	Participants and facilitators collectively consolidate the whole community adaptive capacity assessment scores, justification and response action	Full community adaptive capacity chart to enter the 5 groups' scores to sticky tape/ tacking pins and stands to hold up group work charts
12:30	LUNCH				

Time	Activity	Description	Who	Expected Output	Preparation details
2:00	Group work 2: Place of settlement needs and values	Participants will be divided into groups of 5 and asked to discuss, agree to and note down the following (groups to be divided according to gender and age): What they valued about their village prior to Cyclone Winston What they did not like about their village before Winston (what needed to change) Other important things to have or consider in a place of settlement	All facilitators	Participants discuss and consolidate a list of important features/ considerations of a place of settlement in order of importance within their own groups	Facilitator's guiding questions Charts, pens
2:45	Workshop Game	3 Facilitators to organise a workshop game While 2–3 facilitators synthesise group work outcomes into a common (clustered list of factors) set of criteria for building-back-safer/ relocation housing and settlement options	All facilitators	A collectively agreed community defined criteria for assessing building-back-safer (BBS) housing and settlement options.	Lead facilitator to have a community workshop game prepared that is community envisioning related (Cagi and Isoa)
3:00	AFTERNOON TEA				
3:15	Group work 3: Ranking of key settlement features	Each group is to be provided with the common consolidated list (as per group work session 2 outcomes) and asked to rank each feature in order of importance (1 being most important). Outcomes of ranking to be provided to the facilitator for input into a combined group ranking matrix	All facilitators	A score matrix showing the ranking the above criteria for BBS housing and settlement options	Facilitator's guiding questions Charts, pens
3:30	Group work 3 report back	The lead facilitator to present the combined group ranking and explain commonalities and differences in ranking by gender and age.	LF	A consolidated score matrix reflecting the criteria scores by each group	sticky tape/ tacking pins and stands to hold up group work charts

Time	Activity	Description	Who	Expected Output	Preparation details
3:45	Group work 4: Options and approaches for building back safer housing and village	Participants will be divided into their previous grouping and tasked with the following: Reflect on the MRD report (in particular the 'no-build' zone and proposed demarcated area for relocation) and discuss if there are other options that should be considered for building back better, in addition to the demarcated sites [for example: 1. contiguous/ natural retreat whereby only houses ina 'no-build' zone to rebuild in contiguous area inland; build on own *mataqali* land (i.e. village to divide into clan-based hamlets; other options?] Using their own identified criteria for resettlement (as per Group Work 3 outcomes), each group is to give a likert score of 1–5 for each identified resettlement options from (i) above. A score of 1=not suitable and 5=highly suitable.	All facilitators	Each group tasked with coming up with a matrix showing various options for BBS housing and settlement and scores for each option.	Facilitator's guiding questions Charts, pens
4:30	Group work 4 report back	Presentation of relocation/BBS option analysis Q&A	LF	A consolidated matrix showing various options for BBS housing and settlement and scores for each option.	sticky tape/ tacking pins and stands to hold up group work charts
4:45	General discussion on next steps	Discuss and recommend on the best way to approach rebuilding of their respective village such as: how it should be done (bit by bit or all at once); who should be in charge and what should be the responsibility of households and *mataqali* in the resettlement process; what can the community do themselves and what outside assistance will be required; when should it start and how long should it take?	LF	A list of 'next steps' for village rebuilding indicating: how it should be done; how it is to be resourced; when it should happen; and who should be involved and lead the process.	
6:00	Conclude workshop	Recap on the days' activities and achievements in relation to the purpose and aims of the project. Collectively agree to 'next steps' Conclude workshop (*I Tatau* and prayer)	LF	List of 'next steps' that the community has agreed to	

ANNEX 3 Example of an LA-HSO group interview questionnaire

Eh: Ecosystem Health and Human Resource

This refers to both traditional and modern (formal and informal education and training) skills of community members related to sustainable environmental management including community forest or fisheries wardens, environmental committees, and/or community members who have been trained or had experience working for environmental projects.

(1=very difficult; 2=difficult; 3=ok; 4=good; 5=very good)

Factors	Reason for response:	If 1 or 2, what action is needed to improve this score?
Eh(A): How would you rate the knowledge and skill capacity within the community to sustainably manage the environment before TC Winston? **SCORE:**		
Eh(B): How would you rate the knowledge and skill capacity within the community to sustainably manage the environment now? **SCORE:**		

ANNEX 4 Koro Island IVA questionnaire

Assessor's name: **Time:** **Date:** **Place:**

1.0 Background information of respondent

1.1 Name: **1.2** Sex: **1.3** Age:

1.4 Village: **1.4** Mataqali:

1.5 Denomination: **1.6** Occupation:

2.0 Pre and post Winston household information

2.1 How long have you lived on Koro Island for?

2.2 Which village did you live in before TC Winston?

2.3 Please indicate the number of people that were part of your household before TC Winston and provide their respective details in the box below:

Person	Sex	Age	Occupation	Did this person leave the Island after Winston?	If yes, why?	If yes, where is this person living now?
1						
2						
3						
4						
5						
6						
7						

2.4 What kind of house did you live in (pre-Winston)?

2.5 What form of shelter are you living in now?

2.6 Please indicate the status of your house after cyclone Winston *(circle the appropriate answer):*

a. Completely destroyed b. Mostly damaged c. Partly damaged d. Minor damages

2.7 Please provide a general list of household assets that your household lost to TC Winston (e.g. boat, furniture, electrical appliances, etc):

2.8 How much influence do you feel you have over household, *mataqali* and village level decisions?

Influence at household level	**Influence at *mataqali* level**	**Influence at village level**
N-*no influence at all;*	N-*no influence at all;*	N-*no influence at all;*
M-*minimal influence;*	M-*minimal influence;*	M-*minimal influence;*
S-*some influence;*	S-*some influence;*	S-*some influence;*
A-*a lot of influence*	A-*a lot of influence*	A-*a lot of influence*

3.0 Coastal vulnerability of homes

3.1 How far and high (elevation) from the highest-tide (including moon tide) reach was your pre-Winston house located?

Distance (meters): Elevation (meters):

How close has the tide/waves ever reached your house before TC Winston? (due to moon tide, inundation or storm surge):

3.3 Did the TC Winston storm surge reach your house? *(Circle the number of the correct answer)*

a. Yes b. No

3.4 If yes, how high was the TC storm surge wave relative to your house? *(Circle the number of the correct answer)*

a. Covered my roof b. Half the height of my house (or above)

c. Just below half the height of my house d. Just the house foundations and floor

3.5 Do you feel that it should be safe to rebuild your house on your existing *yavu*?

a. Yes b. No c. Not sure d. No answer

3.6 If no or not sure, please explain why:

3.7 Are you aware of climate change and rising sea levels?

a. Yes b. No c. Not sure d. No answer

4.0 Building back safer and resettlement (for the 13 villages requesting relocation)

4.1 Are you aware that your village has requested for government support to relocate?
(Circle the number of the correct answer)

a. Yes b. No c. Not sure d. No answer

4.2 If yes, do you know how the decision was made and by whom? Please explain.

4.3. How much influence did you have over the decision to relocate the community?

a. Alot b. None c. A little bit d. Not sure e. Other

4.4 Do you agree with the proposal to relocate your community?

a. Yes b. No c. A little bit d. Not sure e. Other

4.5 Please explain why:

4.6 Are you aware of a place that has been proposed for your community to relocate to?

a. Yes b. No c. Not sure d. Other

4.7 If yes, do you agree with the proposed site for your community to relocate to?

a. Yes b. No c. A little bit d. Not sure e. Other

4.8 Please explain your answer:

4.9 What did you value (or like) most about where you lived before TC Winston?

4.10 What were some things that needed to change in the place where you lived (pre-Winston)?

4.11 What are the important things to have in the place you rebuild?

4.12 Of all the things suggested above (in **4.8**, **4.9** & **4.10**), what are the five most important and indicate how accessible these things will be in the existing village site and proposed relocation site?

What is important to have for my village settlement	Is this possible to have in the existing village site *Please write your answer as:* **Y**-*Yes;* **N**-*No;* **Y&N**-*Yes&No;* **DK**- *don't know;* **NA**-*No answer*	Will this be possible to have at the proposed relocation site
a		
b		
c		
d		
e		

4.13 Are there other places that you think should be considered as possible relocation options other than the above 2?

a. Yes b. No c. Not sure d. Other

4.14 If yes, please explain where and why:

4.15 Please share some of your views on how your village should be rebuilt in terms of:

How should the rebuilding/resettlement process be lead (e.g. gradually or otherwise)

What should the households and *mataqali* be responsible for?

How should the rebuilding be planned and resourced? (what outside assistance will be needed and what can the community do themselves?)

How long should it take?


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