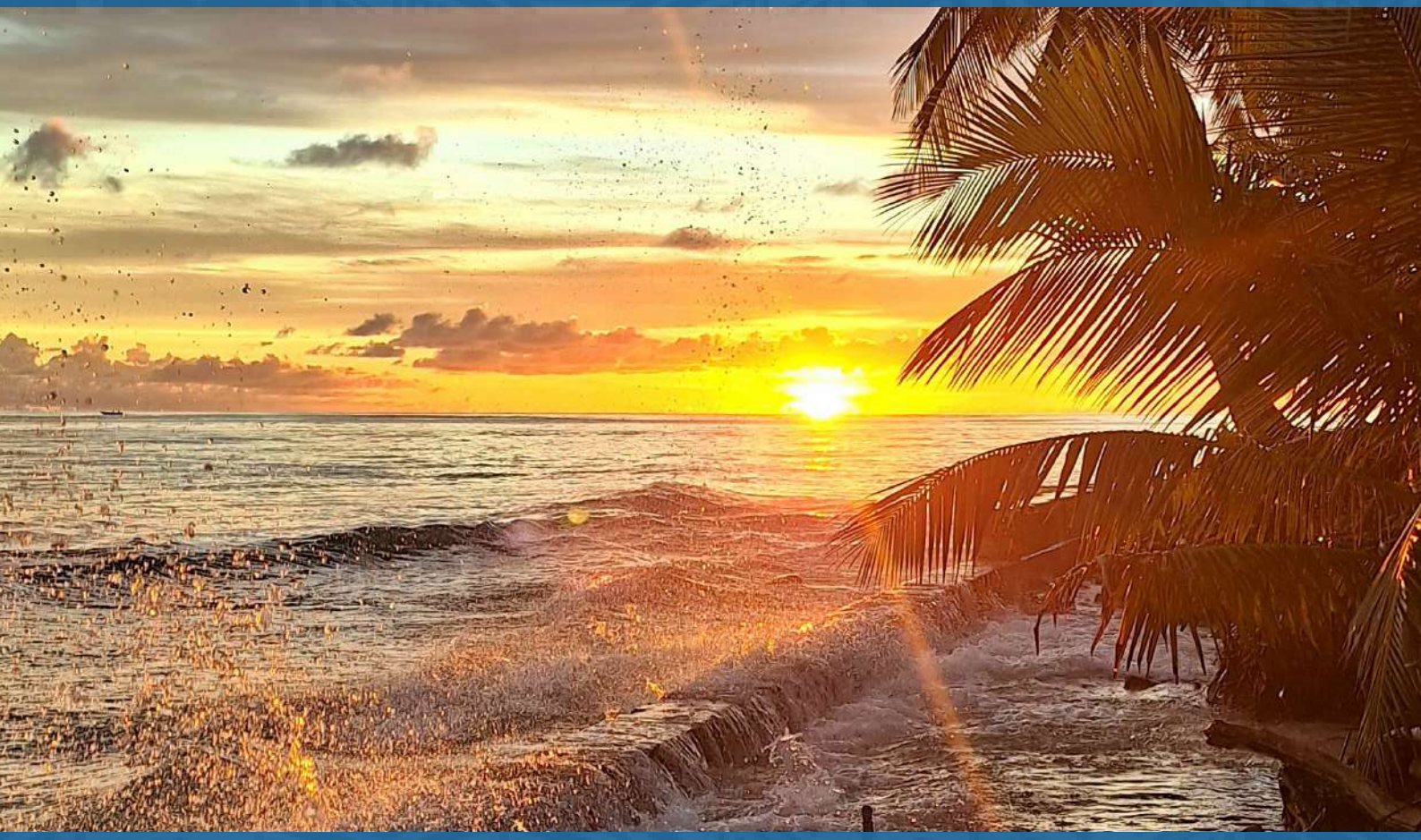
Voices of the Pacific

Climate Crisis, Adaptation and Resilience

Pacific Ocean and Climate Crisis Assessment Report

Volume 1



UC UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

USP THE UNIVERSITY OF THE SOUTH PACIFIC

POCCA
Pacific Ocean and Climate Crisis Assessment

This research was funded by Aotearoa New Zealand's International Development Cooperation Programme — Ngā Hoe Tuputupu-mai-tawhiti. The views expressed in this research and associated publication are those of the authors and are independent of the New Zealand government.

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Climate Crisis, Adaptation and Resilience

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Front cover photo: A seawall in Abaokoro, Kiribati, does little to protect from inundation as higher than normal swell crash over it (Photo: POCCA Team, 2023).

Preface

This monumental undertaking is the result of the hard work of innovative minds and empathetic hearts, driven by their shared desire to help make the Pacific, their oceanic home continent, respond effectively to the devastating effects of the climate crisis. While the science of global warming is well-established, what matters most are its actual impacts on communities and the ways in which people have adapted and built resilience through local innovation and other survival mechanisms. As descendants of great navigators, explorers and oceanic settlers who traversed the world's largest ocean for millennia, Pacific peoples have long developed cultural ingenuity and sophisticated adaptive capacities. Despite living in some of the planet's smallest, most environmentally challenging places, they have been responding to climate change in locally relevant innovative ways for centuries.

This raises important questions: What are the cultural, economic, behavioural, political, and environmental foundations of these Indigenous innovations? How can they be connected with mainstream science and social science? This is, in essence, what the Pacific Ocean and Climate Crisis Assessment (POCCA) project seeks to explore.

In a way, this is what this project is about. The Pacific Ocean and Climate Crisis Assessment (POCCA) project provides a epistemic, methodological, and cultural approach that weaves together diverse knowledge paradigms across the broad interdisciplinary areas of Indigenous knowledge, natural science, social science and humanities. The project brought together, in an enriching way, the largest group of Pacific scholars ever assembled, representing universities and research institutions from the Pacific, New Zealand, Australia and the United States. It provided an intellectually and culturally enriching experience that has significantly transformed the Pacific research eco-system, strengthened regional research networks and deepened inter-institutional partnerships.

The diversity of the scholars was reflected in the impressive range of disciplines represented: meteorology, oceanography, biology, physics, geography, environmental studies, sociology, political science, Indigenous studies and many more. This interdisciplinary diversity mirrors the complex nature of climate change itself, which affects virtually every aspect of our environmental, social, cultural, economic, and political life. The report engages with this multifaceted reality using empirical field data, evidence-based analysis, and critical discourse.

The project's findings are presented in two volumes: Volume I addresses thematic issues, while Volume II presents individual country reports. Both volumes are closely interconnected and inform one another. Together, these volumes represent the most comprehensive analysis of climate change in the Pacific by Pacific Island scholars. It is hoped that this work will inform perceptions of climate change and influence future policy-making, strategies, thinking and narratives by governments, regional organisations, international agencies, civil society and the general public.

The report encapsulates scientific research, social science analysis and Indigenous knowledge in a holistic way, while amplifying the voices of grassroots communities whose wisdom and experiences are often overlooked in climate policy discourses.

Another important output of the project is the creation of a digital climate change database consisting of about 1,000 publications, an interactive climate policy map of the Pacific and community stories in the form of videos and other visual medium.

The POCCA project not only seeks to answer pressing questions about the present but also raises critical questions about the future. A future that some fear may be overwhelmingly disastrous – yet one that could also offer hope if we change our thinking, behaviours, and practices to save our planet and humanity.

Distinguished Professor Steven Ratuva (University of Canterbury)
Associate Professor Awnesh Singh (The University of the South Pacific)
POCCA Project Co-Leads

Acknowledgment

This project could not have been completed without the invaluable contributions of many individuals and organisations. The chapter authors, under the leadership of the lead author, worked tirelessly to produce and fine-tune each chapter. Their names are listed in the contributing authors section. The editors and proofreaders, both external and those drawn from the pool of project authors, provided professional feedback and guidance, which helped improve the various chapter drafts.

Of utmost importance are the contributions of government officials, community leaders and members of the community from the 16 countries studied.

In as far as the Cook Islands is concerned, we acknowledge the support of the Cook Islands Research Council for granting the research permit, which enabled us to conduct talanoa with elders from the Tupapa village community on Rarotonga. We also appreciate the contributions of the Cooks Islands Youth Council, the Office for Climate Change, and the Ministry of Environment, along with Chloe Ane Wragg for her invaluable coordination on the ground. Meitaki Ma'ata.

In the case of Fiji, we are grateful to the EU-SUPA project (USP) and the Ministry of iTaukei Affairs for approving the research permit for field work in eight selected sites. We extend our appreciation to the Lomaiviti, Cakaudrove and Ba Provincial Councils for their tremendous support, in delegating for the community visit and traditional protocols, as well as the conservation officers from these provincial councils who were part of the community field work. We especially thank the communities of Vunidogoloa, Vunisavisavi, and Karoko in Cakaudrove, Malawai, Sawaieke and Nawaikama on Gau Island, Abaca and Tukuraki in Ba for their warm welcome and participation in interviews. The selected students from PACE-SD, who transcribed the field data also deserve special thanks for their diligent work.

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For Marshall Islands, we are deeply grateful to Jo-Jikum for their continued support throughout our visit and for allowing us to shadow their activities. We appreciate the communities of Eijit and Laura, for sharing their insights. Our utmost appreciation is extended to the Honourable John Silk, Minister for Natural Resources and Commerce, for hosting us for a memorable talanoa.

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Executive summary

1.0 Introducing the Pacific Ocean Climate Change Assessment (POCCA) Project

1.1 The Pacific Ocean Climate Crisis Assessment project (POCCA) conducted an interdisciplinary, and evidence-based research study of the diverse range of impacts, community experiences, adaptation strategies, community innovations and Indigenous knowledge systems relating to climate change in the Pacific Island Countries and Territories (PICTs). The PICTs covered in the study are Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of the Marshall Islands, Samoa, Solomon Islands, Timor-Leste, Tokelau, Tonga, Tuvalu, and Vanuatu.

1.2 Led by the University of Canterbury and the University of the South Pacific, it was a rare case of interdisciplinary and trans-national collaboration between the largest group of Pacific Island experts ever assembled for a research project, in the areas of physical science, social science and Indigenous knowledge. It showcased the depth and breadth of Pacific Island-based and Pacific diaspora expertise drawn from universities, research institutions, government agencies and community groups from across the Pacific, New Zealand, Australia, United States and beyond. The project was funded by Aotearoa New Zealand's International Development Cooperation Programme, administered by the Ministry of Foreign Affairs and Trade.

1.3 It is a multi-country, multicultural and multimethodological analysis of critical issues in the Pacific with regards to climate change. These areas covered included regional meteorological and oceanic science, climate governance, policies and strategies stock-take, community resilience, climate change perception, ocean-climate interface, biodiversity, water security, social protection, health, food security, geopolitics and international crime, loss and damage, socio-economic impact, cultural heritage, mobility, and climate finance.

1.4 The project was in response to a number of interrelated factors including the call by Pacific leaders from more robust research into climate change in the region; the increase in the existential threats of climate emergency in the Pacific and the destructive impact on communities; the lack of evidence-based data on community resilience and response mechanisms; the lack of reliable data on how Indigenous knowledge and cultural resilience can work together with science-based approach to inform climate and oceans policy in an integrated and interdisciplinary way; the absence of Pacific-based expertise, research and voices leading climate research and wider discourses, and the need to strengthen and deepen the interface between research and policy of climate and ocean in the Pacific to advance the wellbeing of Pacific peoples as well as contribute to the global climate research agenda.

1.5 The POCCA project feeds into and supports the 2050 Strategy for the Blue Pacific Continent endorsed by the Pacific Islands Forum leaders in July 2022, in particular its call for 'Pacific relevant and participatory science, cultural and traditional knowledge and innovative research' to address the worsening impacts of the climate crisis (PIFS, 2022, p. 27). It also supports the suggestions by the Paris Agreement in 2015 for more Indigenous knowledge-based study of climate change, as well as the various Pacific Islands Forum leaders' calls for urgent action to address the existential threat of climate change.

1.6 The study critiques the deficit and disempowering notion of 'vulnerability' perspective used by many external donors and experts to frame the Pacific and argues for a more empowering resilience approach. Despite the climate challenges, Pacific peoples are descendants of great navigators, explorers, and oceanic settlers who for millennia, traversed the world's largest ocean and settled in some of the smallest, most inhospitable and environmentally challenging places on the planet. They developed social systems, cultural norms, community resilience and technological innovations which enabled them to adapt to and thrive under the most extreme climatic conditions including cyclones, sea-level rise, droughts and extreme heat.

2.0 Framing Climate Science in the Pacific Islands (Chapter 2)

2.1 The region's climate variability and exposure to climate extremes is due to the geographical isolation and diverse topography of the different countries but this varies from country to country. While climate science research is extensive, data relating to the Pacific region is limited, it is nevertheless growing, especially in terms of informing mitigation and adaptation strategies. Chapter 2 highlights case studies of climate extremes for giant clams, tuna fisheries and sea grass emphasising the significance of integrating traditional knowledge with modern scientific understanding to address challenges in the region.

2.2 Geologically, the Pacific Ocean emerged approximately 250 million years ago because of the fragmentation of the Pangea supercontinent, arising from the Panthalassa Ocean surrounding the Pangaea landmass. Of the over 1,700 Pacific Islands, the majority of the islands are located in the southwest quadrant, while the fewest are found in the northeast quadrant. The distribution is dominated by small islands, with 67% (44) being less than 10 km^2 (1 km^2) in area and a mere six percent are classified as large islands, those with an area greater than 100 km^2 (Nunn et al. 2016). The five key lithology types that compose Pacific Islands are: volcanic, reef, limestone, composite, and continental. Volcanic islands are the most common, comprising 39% of the islands, followed by reef islands at 36%, limestone islands account (17%), composite islands (7%), continental lithologies (1%). Based on elevation, 45% of the islands are lower than 30 meters, with 27% less than five meters and 26% higher than 100 meters.

2.3 The climate of the Pacific region is very dynamic as it is influenced by various climatic modes of variability on different spatial and temporal scales. On intra-seasonal timescales, the dominant mode of variability in the tropical Pacific region is the Madden-Julian Oscillation while on inter-annual timescales, the dominant mode of variability is the El Niño Southern Oscillation (ENSO) phenomenon. Other climatic features include the South Pacific Convergence Zone (SPCZ) and the Intertropical Convergence Zone (ITCZ).

2.4 Climate change presents several physical and ecological threats to the ocean ecology including threatened species such as giant clams, which are sensitive to changes in their marine environment. The primary threats caused by rising sea temperatures includes loss of zooxanthellae leading to bleaching, ocean acidification, thermal stress, decrease shell calcification for shellfish, disruption of biological functions, altered spawning and larvae distribution, destruction of reef habitat, restricted habitat range and unpredictable shifts in marine eco-systems, reduced growth of sea life, reproductive, failure, and increased mortality. These have direct impact on the Pacific people's food security.

2.5 Integration of traditional wisdom and modern adaptation strategies is crucial for addressing the dynamic and often unpredictable nature of climate change. Climate-associated shifts, such as changes in fisheries, marine heatwaves, and variations in ENSO, underscore the need for adaptive and integrated approaches. By leveraging both traditional and modern knowledge systems, Pacific Island communities can better navigate the uncertainties of a changing climate while preserving their cultural heritage and ensuring a sustainable future.

2.6 Integrating traditional practices with modern science is not only about improving weather forecasting, but also about enhancing resilience. Pacific communities can implement proactive measures to minimise socioeconomic disruption caused by climate change, strengthening resilience.

2.7 Due to varied topographies and environmental conditions in the Pacific region, different islands face unique challenges, often requiring localised adaptation strategies. There is a critical need for increased data collection, monitoring, and international cooperation to improve climate research and decision-making in the Pacific region.

3.0 Climate Change and Ocean Governance in the Pacific: Challenges of Sovereignty and Political Agency (Chapter 3)

3.1 This chapter focuses on PICTs as global norm entrepreneurs in international and regional frameworks to successfully manage the threats to their sovereign rights at the time of climate crisis.

It examines the governance of the climate/ocean nexus in the Pacific region, highlighting the influential role of Pacific Island Countries and Territories (PICTs) in shaping global and regional frameworks to address climate threats. It explores the integral role of PICTs as regional political agents in international law, focusing their efforts on the protection of state sovereignty and management of marine resources amid the climate crisis. It also highlights the innovative approaches taken by individual countries and the Pacific Islands Forum in navigating global governance mechanisms to protect the region's interests.

3.2 Through multiple multilateral groups and alliances (e.g.,AOSIS, G77, LDC), PICTs have been able to influence international norms and policies at different frameworks of global governance in the international organisations. There are also significant capacity limitations that cannot be ignored when thinking about the role of small states in influencing the international climate and ocean laws and policies and these have been covered in relevant literature.

3.3 PICTs have been instrumental in developing the international norms of climate change and ocean governance, and below we will highlight four such instances, showcasing PSIDS as global norm entrepreneurs.

3.4 While UNCLOS brought significant changes into ways in which the Pacific traditionally approached the ocean as vast and open, it also provided important 'maritime sovereignty' through territorialisation at sea. The maritime zones recognised by UNCLOS, providing for territorial sovereignty at sea, transformed SIDS into significant political actors.

3.5 In 1991, when the United Nations Framework Convention on Climate Change was still being negotiated, Vanuatu on behalf of AOSIS proposed an article on permanent and irreversible loss and damage to be introduced to the new climate treaty (United Nations 1991). It took 20 more years before Article 8 on loss and damage was codified in the Paris Agreement in 2015.

3.6 In addition to loss and damage, the significant contribution of PICTs to the Paris Agreement was the inclusion of 1.5°C ('to stay alive') into Article 2. The goals for PICTs regarding the Paris climate conference were outlined in the Suva Declaration, adopted by the Pacific Islands Development Forum in September 2015. The Suva Declaration called for limiting the global average temperature increase to 1.5°C and demanded anchoring loss and damage as a standalone article, distinguished from adaptation measures.

3.7 Pacific Island Countries, through the PSIDS grouping at the UN, were instrumental in the inclusion of Sustainable Development Goals 13 (climate action) and 14 (life below water) in the 2030 Agenda for Sustainable Development. They used their national and regional experience in ocean governance to lobby a stand-alone sustainable development goal on the oceans, positioning Large Ocean States as their global guardians.

3.8 Through PICTs lobbying, the United Nations General Assembly adopted, by consensus, in March 2023, resolution 77/276 requesting an advisory opinion from the International Court of Justice (ICJ) on obligations of states in respect of climate change (United Nations, 2023a). The resolution asks the ICJ to answer two questions regarding the relationship of climate change and human rights.

3.9 To secure their sovereignty, PICTs have taken some bold steps to guarantee their maritime boundaries regardless of sea level rise and changes in baselines. In 2021, the Pacific Islands Forum adopted the Declaration on Preserving Maritime Zones in the Face of Climate Change-Related Sea-Level Rise. A great concern for many PICTs is that climate change will irreversibly affect their legal entitlements regarding maritime territories.

3.10 In 2022, a group of Pacific parliamentarians united under the Pacific Parliamentarians Alliance on Deep Sea Mining, called for a moratorium. Recalling the high seas as the common heritage of humankind, the parliamentarians asked the Pacific leaders to join the more cautious ranks opposing such activities, as well as to provide support for those Pacific governments that have decided to explore this alternative.

3.11 The regional efforts to decarbonise the shipping industry have also been relevant, with sustainable transportation being a key focus area for the PICTs. At the IMO, Tuvalu, Kiribati, Vanuatu, and the Solomon Islands have all actively participated in developing the strategy for decarbonization of the shipping industry.

4.0 Regional Climate and Ocean Strategies, Policies and Frameworks – A Stocktake of Current Status (Chapter 4)

4.1 This chapter provides an analysis of climate-ocean frameworks, policies, and strategies in the Pacific region, covering initiatives at regional, national, and community levels. The analysis considers both internally developed strategies and those formed through external partnerships, like the United Nations Framework Convention on Climate Change (UNFCCC) and the Sendai Framework for Disaster Risk Reduction. A detailed overview of existing frameworks, policies, and strategies related to climate and ocean management across the Pacific region is provided, highlighting both regional and externally influenced initiatives.

4.2 There has been a mushrooming of declarations and projects on climate in the Pacific, which reflects the different levels and contexts of competition, collaboration, and consensus and how these have shaped climate-ocean agenda in terms of policy development and implementation.

4.3 The types and level of effectiveness of these climate initiatives vary - some are for mobilising public opinions, some are geared towards policy and strategy impact, some are focused on social and behavioural, and some tend to facilitate the explicit and implicit political interests of the external funders. Identifying these differences is crucial in understanding the Pacific climate action, strategy and policy space.

4.4 The institutional arrangements of the various organisations differ considerably across the different horizontal types of organisations as well as the different vertical tiers at the sub-national, national, regional, and international levels. Some of these tiers are connected while are some are not in addressing issues of adaptation and resilience.

4.5 There needs to be democratisation of vertical alignment of community and sub-national action strategies with national, regional, and global frameworks and there is a need to emphasise the bottom-up approaches to ensure meaningful community participation.

4.6 The Pacific climate frameworks should maintain a sense of autonomy and not used as Trojan horse by external institutions and powers. For instance, climate finance must be depoliticised and focused on survival and well-being of Pacific communities, rather than being driven by economic and political interests.

4.7 For effectiveness of climate strategies, sustainable use of local expertise is needed to provide more robust voices for Pacific people. Where local expertise is lacking, there should be mechanisms for training and capacity building.

5.0 'We are the Moana': Climate Risks, Narratives of Vulnerability and Indigenous Pacific Resilience (Chapter 5)

5.1 Recognising the Pacific Ocean as both a physical and cultural home for Pacific people is critical to understanding climate risks, narratives of vulnerability and Indigenous resilience. The ocean influences weather patterns and plays a pivotal role in shaping Oceanic cultures and people's social habitat.

5.2 There is a notable ambiguity in disaster risk resilience and climate change adaptation strategies, underscoring the need for Pacific-Indigenous perspectives. Concepts like 'kinship resilience' rooted in family and community reliance, are not fully recognised or integrated into resilience frameworks.

5.3 There are opportunities to integrate Indigenous knowledge and science into contemporary climate hazard models. These new techniques can produce more inclusive and reliable evidence to inform adaptation and resilience strategies.

5.4 There are international instruments which support Indigenous resilience approaches and there is a need to align these with local initiatives. These include the Indigenous rights declarations, human rights frameworks, SDGs and others.

5.5 Understanding and 'measuring' resilience should involve both quantitative and qualitative indicators and evidence from communities, resilience practitioners, and contemporary scientific experts, while respecting the multilingual nature of Pacific communities.

5.6 Ancestral knowledge in relation to resilience is culturally embedded and sustaining it requires understanding of what it is and how modern-day mechanisms such as education, publications etc, can be used for transmitting and preserving past knowledge.

5.7 Building resilience requires knowledge equity, recognition of local voices, respect for self-determination and understanding of multiple aspects of community life. These can be important in responding effectively to climate change.

5.8 There should be long term investment in innovative methods for incorporating Indigenous Knowledge (IK) and Traditional Ecological Knowledge (TEK) into modern hazard risk modelling; recognising the innovative adaptation strategies of Pacific communities; role of the Pacific diaspora; supporting community-driven, culturally responsive resilience initiatives that are citizen-based; promoting research approaches that align with community priorities and produce actionable knowledge; and developing educational strategies that integrate climate change and ocean literacy into practical, real-life experiences.

6.0 Pacific Agency and Perceptions of Climate Crisis: Empowering the People's Narratives (Chapter 6)

6.1 Contemporary perceptions, narratives, and voices of Pacific peoples in relation to climate change are diverse and, in many cases, are grounded in their deep connection to land, ocean, and environmental stewardship. It is important to decolonize perception of climate change in the contested space of climate discourses.

6.2 Pacific community narratives are based on a holistic understanding of the interconnectedness between land, ocean, sky, animals, and people, with land seen as an ancestor and vital to identity and heritage.

6.3 There is a need to shift the existing climate change narratives within academia and the media to one that is inclusive and emphasise Pacific agency. This includes a critical examination of the environmental, social, cultural, political, and economic impacts of climate change on Pacific communities.

6.4 There needs to be recognition of the critical role of Pacific villages and community groups as first responders during natural disasters and there is a need to provide these local agencies with financial aid and necessary equipment. This challenges the traditional 'fly in and fly out' approach to disaster response, emphasising the need to compensate and support local efforts.

6.5 A bottom-up approach to building civil systems is relevant and needed, to support localisation and long-term resilience. This approach empowers local communities to determine their immediate needs and develop innovative development models that align with their priorities.

6.6 Effective and meaningful community consultation is crucial, particularly within the Pacific diaspora. Policies should be guided by community perspectives, allowing Pacific individuals and communities to actively participate in climate change decision-making processes.

6.7 There is a pressing need for climate change civic and citizenship education to be integrated into school curricula across the Pacific. This includes prioritising early childhood education through storytelling and play, ensuring that climate change content is accessible and relevant from a young age.

7.0 Solwara, Moana, Ocean and Local Communities – The Social, Cultural and Economic Connections (Chapter 7)

7.1 The lives of Pacific people have deep connections with the ocean, their islands, and the social, cultural, and economic systems they developed to thrive in these environments. Pacific communities have, over the years, adapted to the rapid changes caused by climate change using community innovation and practices with modern strategies to build climate resilience.

7.2 To adapt to the oceanic environment, Pacific peoples have, over generations, developed sophisticated social, cultural, and economic systems that enabled them to survive and thrive in small island and big ocean environments. The Pacific people's cosmology, customs, and traditions are deeply tied to the ocean, which is essential for their livelihood, culture, and identity.

7.3 Pacific communities are facing severe challenges due to climate change, and there is a need for strategies that empower and support them to build resilience and adapt to these changes.

7.4 Full recognition and support of land and resource rights are essential for effective conservation and sustainable management of the region's biodiversity.

7.5 A multisectoral and rights-based approach involving local communities is crucial for the sustainable governance of ocean resources and addressing historical and current inequities.

7.6 There is a need to frame coastal development policies focused on adaptation and resilience and integrating local innovation with scientific approaches to address the climate crisis in the region.

7.7 Strengthening the socioeconomic capacity of Pacific communities through technical and financial resources is vital for ensuring their ability to live secure and prosperous lives amidst the ongoing environmental challenges.

8.0 Safeguarding Biodiversity through Indigenous and Local Knowledge for Climate Change (Chapter 8)

8.1 Biodiversity in the Pacific region is deeply intertwined with cultural survival and sustainable living. With the profound impacts of rapid climate change, this now poses serious challenges to the social and ecological systems of Pacific countries threatening livelihoods.

8.2 The Pacific is internationally recognised to include several unique biodiversity hotspots; its biodiversity is essential for life and well-being of the Pacific people and needs protection because it is the lifeblood of our planet as well as a major contributor to climate change mitigation and resilience.

8.3 Globally, loss of biodiversity is at crisis point and impacting on the functioning of our planet and in turn the welfare of our culturally diverse Pacific people. Biodiversity, ecosystems, and communities in Pacific Islands are seriously and uniquely impacted by climate change. Rising seawater temperatures, sea-level rise, changes in ocean chemistry - acidification, increasing human populations, loss of biodiversity and loss of cultural connections are some of the main threats to Pacific communities.

8.4 Climate change adaptation and mitigation are already happening in the Pacific Islands region, underpinned by local and Indigenous culture and practice.

8.5 Biodiversity in the Pacific Islands region is intertwined with, and not separate from, people and culture. There is a strong ancestral and spiritual bond between Pacific communities and their natural environment.

8.6 Policy responses will need to integrate across climate, biodiversity, and other economic and social policy areas. These will need to integrate public and private sector finances and stakeholders, but in ways that serve the needs of Pacific peoples and ecosystems.

8.7 Biodiversity policy and governance should thus put Pacific peoples and cultures at the heart of efforts to conserve biodiversity and build climate resilience. A revision of outdated environmental regulations and a new vision of resilient ecosystem conservation in harmony with Indigenous and local knowledge is the way forward to adapt to the threats facing Pacific Islands in the 21st century and beyond.

9.0 Thirst for Life: Water Security and Changing Climate in the Pacific (Chapter 9)

9.1 Water security, climate change and development are closely connected since the availability, accessibility, and quality of water are impacted by climate change and other human activities. Thus, water security should involve an integrated, collaborative, and context-specific approaches which consider both climatic and non-climatic stressors.

9.2 PICTs have scarce water resources due to their small land mass and reliance on fragile freshwater systems like shallow water lenses in atolls. Climate change exacerbates water scarcity, making the protection and management of these resources critical. These vary from country to country and island to island depending on the type of island (high islands vs. atolls) and the specific water resources available.

9.3 One-dimensional, top-down approaches to water security governance are insufficient. Effective strategies must integrate traditional knowledge systems, local governance structures, and national policies to build resilience against climate and non-climate stressors. Successful examples of water security governance often involve collaboration between national governments, local communities, and traditional leaders. These partnerships help align priorities, mobilise resources, and integrate climate change adaptation into water security planning.

9.4 More research is needed to understand the relationship between climate change impacts and water security, particularly regarding the progress of SDG 6 (clean water and sanitation). Improved data collection, monitoring, and evaluation are essential for assessing water quality and the effectiveness of interventions.

9.5 To enhance water security in Pacific Island communities, further research should focus on the effectiveness of integrating traditional knowledge with modern governance, documenting local resilience strategies, and developing bio-indicators for water quality. Strengthening the capacity to monitor and evaluate water security interventions is crucial for ensuring healthy water resources for people and the environment.

9.6 There needs to be a comprehensive review of water security policies at national and subnational levels to better align stakeholder needs, integrate governance systems, and address resource constraints. There is also a need for policies that integrate climate change adaptation into water security strategies.

10.0 Safe Livelihoods & Social Protection in the Climate Crisis (Chapter 10)

10.1 The role of social protection in addressing the climate crisis needs serious consideration because of its role in providing support for victims of natural disasters such as cyclones, droughts, sea-level rise and other climate change-related events. Social protection is also important in ensuring sustainable livelihoods and human security for communities.

10.2 Apart from state-based and formal social protection systems, there are also local and participatory social protection systems based on kinship networks and other redistributive norms, which people are familiar with. Kin-based relationships, deeply rooted in Pacific communities and expressed through cultural practices like totems, dance, and artistry, play a vital role in ensuring sustainability. These connections, both tangible and intangible, have historically enabled communities to adapt to environmental changes.

10.3 Social protection in Pacific communities involves a blend of formal, informal, and hybrid adaptation processes. These mechanisms, which include Indigenous and cross-border forms of protection, challenge conventional notions of national borders and are often gendered, reflecting the complex social dynamics within these communities.

10.4 Locally-led decision-making in social protection needs further development as climate change stress on communities increase. To sustain this, there is a need for capacity building in local leadership and skills, as well as increased financial investment in adaptation efforts.

10.5 Current funding for social protection and livelihoods in Pacific communities is limited and fragmented, with high transaction costs that can undermine rather than support efforts in addressing human security. There is a critical need for more coordinated and substantial investment to ensure the long-term sustainability of social protection mechanisms in the face of ongoing climate crises.

11.0 COVID-19, Community Health, and Mitigating Climate Crisis (Chapter 11)

11.1 There is an urgent need for integrated climate and health interventions and the need for a multisectoral approach to climate resilient planning and climate financing to protect at-risk populations.

11.2 Climate change impacts health through three primary pathways: direct effects from extreme weather, indirect effects mediated through natural systems like disease vectors and pollution, and effects mediated by human systems, including occupational hazards, undernutrition, and mental stress.

11.3 The increase in global temperatures, particularly over land surfaces, has led to increased heat stress, illness, and food insecurity due to crop failures. The climate crisis is exacerbating existing health challenges, particularly in vulnerable communities.

11.4 Climate change has increased the prevalence of vector-borne diseases like dengue and malaria, and worsening air pollution, which contributes to respiratory and cardiovascular diseases. These effects are particularly pronounced in Pacific Island nations.

11.5 The health impacts of climate change disproportionately affect disadvantaged communities, including women, children, the elderly, and those with disabilities. Pre-existing social inequities, such as poverty and limited access to resources, exacerbate these impacts, particularly in the Pacific.

11.6 Women and girls are more vulnerable to climate change due to existing gender inequalities. In the Pacific, women's livelihoods are heavily impacted by climate-related disruptions to agriculture, further entrenching their marginalised status.

11.7 Community-based health practices and knowledge should be incorporated into the climate change adaptation strategies. These practices offer culturally appropriate, resilient responses to health challenges, and should be integrated with scientific approaches to effectively mitigate climate-related health risks.

11.8 Addressing the health impacts of climate change requires a holistic, multisectoral approach that includes strengthening healthcare systems, promoting climate-resilient urban planning, and integrating environmental education. Collaboration between governments, communities, and individuals is essential for effective preparedness and response.

11.9 Climate financing is crucial for supporting health adaptation and mitigation efforts. Allocating financial resources to build resilient healthcare systems and prepare communities for climate-related health challenges is vital for reducing the vulnerability of at-risk populations.

12.0 Climate Crisis and Food Security in Pacific Island Countries and Territories (Chapter 12)

12.1 Climate variability and extreme events impact food production, nutrition, and health in the PICTs and there is a need for resilience-building strategies. Agriculture plays a crucial role in the livelihoods and food security of Pacific communities, yet it is highly vulnerable to climate change. We need to recognise the importance of addressing research gaps to effectively manage the food systems and improve health outcomes in the face of climate challenges.

12.2 The PICTs encompass more than 20 countries including some of the smallest and most isolated islands, creating diverse challenges in managing resources and ensuring food security. Agriculture is vital for food security, employment, and cultural identity in the PICTs, with most farming systems being rain-fed and highly dependent on favourable climatic conditions.

12.3 The region's agricultural systems are highly susceptible to climate-related extreme events such as droughts, cyclones, and rising sea levels, which threaten food production and livelihoods.

12.4 Climate change exacerbates malnutrition and non-communicable diseases by reducing local food production and increasing reliance on imported, ultra-processed foods.

12.5 Changes in food systems due to climate impacts are leading to decreased food sovereignty and increased food insecurity, particularly in rural and low-lying island communities.

12.6 There is a need for more research on cost-effective capacity-building strategies, interdisciplinary knowledge, and improved governance to enhance resilience in the PICTs' food systems. Integrating Indigenous knowledge with modern practices, along with targeted research and capacity building, is essential for developing sustainable and resilient food systems in the Pacific.

12.7 Strengthening governance and decentralised decision-making in food security is critical for effective policy implementation and adaptation strategies in response to climate change.

13.0 Climate Crisis, Geopolitical Vulnerability, Transnational Crime and Mitigating Responses (Chapter 13)

13.1 The Pacific is facing three critical and intersecting security challenges posed by climate change, transnational crime, and geopolitics. These challenges create multiple dilemmas. At times they converge in ways which amplify or exacerbates existing threats and drivers of insecurity and instability. At other times they inadvertently compete, for example, with funding prioritised to address one challenge at the expense of addressing the other.

13.2 The relationship(s) between climate change, a systemic risk to the Pacific, the geopolitical vulnerability of the Pacific region as a persistent threat, and transnational crime as an enduring threat pose a critical set of challenges today. For policymakers, researchers, and communities on the frontlines of these challenges, understanding the nexus between climate change, transnational crime and geopolitics will become increasingly vital.

13.3 Climate change, transnational crime and geopolitics are identified as distinct – and at times, direct - challenges to the vision of a 'resilient Pacific Region of peace, harmony, security, social inclusion and prosperity, that ensures all Pacific peoples can lead free, healthy and productive lives' (Pacific Islands Forum 2022).

13.4 Climate change and transnational crime are often felt most acutely in 'settings where public institutions are already failing to meet the population's needs. Moreover, geopolitics is increasingly regarded as a 'disruptor' in the Pacific threatening to overwhelm and 'undermine… peace and security efforts' (Pacific Islands Forum, Pacific Security Outlook 2022-25)

13.5 However, climate change, transnational crime and geopolitics are cascading and converging threats with the ability to create vulnerability across societies and nations. The implications of this snowball – or threat multiplier - effect is under-appreciated.

13.6 As a consequence, researchers and policymakers have inadvertently siloed the three issues and in doing so failed to recognise the areas of potential convergence and mitigation responses. A more nuanced understanding of the intersection between climate and transnational crime will require the prioritisation and allocation of funding across funding streams.

13.7 To address this, further research to map and understand the patterns and convergence of climate change and transnational crime in the Pacific. This would allow for the identification of existing points of friction and the projection and trajectory of future possible flashpoints.

13.8 The failure to understand and respond to the intersection of climate change and transnational crime will not be readily mitigated against with profound implications for Pacific societies and states.

For example, climate insecurity is often felt most acutely in contexts where public institutions are already struggling to meet the population's needs; transnational crime contributes to governments already under duress, is fuelled by corruption and contributes to elite capture, undermines governance, and contributes to the erosion of the state.

13.9 Managing the intersection of climate change and transnational crime with the geopolitical agendas and ambitions of partner countries will becoming increasingly challenging as competing regional architectures challenge regional unity.

14.0 Loss and Damage: Save the Pacific, Save the World (Chapter 14)

14.1 Pacific Island leaders and climate campaigners have long advocated for the establishment of a Loss and Damage (L&D) fund to address the severe impacts of climate change on vulnerable communities. Despite the formal endorsement of such a fund at COP28, the funds committed and accessible are far below the necessary levels, leaving Pacific Island communities to contend with mounting and unavoidable losses. It delves into case studies highlighting the struggle of farmers, fishers and Micro and Small Enterprise (MSEs) as they cope with climate-induced damages and calls for the urgency for better documentation of these experiences for improved access to financial resources to help communities recover and adapt to climate crisis.

14.2 Pacific Island communities face severe and unavoidable loss and damage due to the increased frequency and intensity of extreme weather events and irreversible impacts like sea level rise. These climate-related disasters lead to ongoing financial hardships, particularly for farmers, fishers, and micro and small enterprises (MSEs), who struggle to recover due to limited resources.

14.3 There is a significant lack of documentation on the real experiences of loss and damage at the household level. This chapter addresses this gap by presenting case studies that highlight the unavoidable losses suffered by local communities, particularly focusing on the agricultural and fishing sector.

14.4 Households in the Pacific Islands employ various coping mechanisms to recover from disasters, such as using limited savings, remittances, and traditional knowledge. However, these resources are often insufficient, leading to prolonged recovery periods and a state of perpetual recovery due to the frequent occurrence of climate-related disasters.

14.5 Pacific leaders have been at the forefront of global climate advocacy, pushing for the inclusion of L&D in international climate agreements. Their efforts culminated in the recognition of L&D in Article 8 of the Paris Agreement, but funding commitments have fallen short, with developed countries hesitant to provide adequate financial support.

14.6 The operationalisation of the L&D fund remains challenging, with early pledges amounting to only a fraction of the estimated needed. Issues such as unclear allocation mechanisms, vague guidance in the Governing Instrument, and reliance on voluntary contributions highlight the ongoing difficulties in ensuring sufficient and accessible funding for affected communities.

14.7 There is an urgent need to increase the availability and accessibility of funds to avert, minimise, and address loss and damage. New financing mechanisms should be established to ensure that resources reach national governments, NGOs, SMEs, and local communities, allowing them to rebuild their lives and livelihoods after disasters.

14.8 Key priorities include improving the documentation of loss and damage experiences, developing better methodologies for evaluating adaptation efforts, and increasing research on the effectiveness of adaptation strategies in the Pacific Islands. These efforts are essential to support global negotiations and mobilise additional resources to address the ongoing impacts of climate change in the Pacific region.

15.0 Climate Change and Impacts on Socio-Economic and Infrastructural Development (Chapter 15)

15.1 The socio-economic and infrastructure development challenges and opportunities in the Pacific need to consider the complex interrelationship between Indigenous and mainstream economic perspectives. Climate crisis impacts on key economic sectors such as agriculture, fisheries, tourism, and infrastructure, while also showcasing the resilience, innovation, and solidarity embedded in Indigenous responses.

15.2 There needs to be a more inclusive approach to development that acknowledges the value of community-based economic systems alongside mainstream economic practices and offers recommendations for policy and research to support a just and sustainable transition.

15.3 The climate crisis is affecting key economic sectors in the Pacific, particularly agriculture, fisheries, tourism, and infrastructure, with mainstream approaches often underestimating the full scope of these impacts. Mainstream approaches tend to focus on measurable economic activities, overlooking the significance of non-monetary economic practices that sustain Pacific communities.

15.4 Local responses to the climate crisis, characterised by innovation, solidarity, and resilience, offer alternative pathways for adaptation and mitigation. The intersection of Indigenous and mainstream economic perspectives provides opportunities for more comprehensive and inclusive development strategies.

15.5 There is also a need to understand the gendered nature of economic practices, emphasising the importance of integrating gender perspectives into climate and economic policies.

15.6 It is important to engage in interdisciplinary assessments of climate impacts on key economic sectors, with a focus on supporting or transitioning these sectors through just and sustainable means.

16.0 Climate Crisis and Cultural Heritage: Conversations (Chapter 16)

16.1 Using the storytelling approach, the chapter explores the resilience and adaptability of Pacific Island communities in the face of climate change, emphasising the role of traditional cultural practices, knowledge systems, and heritage in disaster preparedness and recovery. It highlights how these long-held practices, such as traditional gardening, food storage, and kinship-based support networks, serve as vital tools for mitigating the impacts of climate change.

16.2 Climate change poses significant threats to cultural heritage and there is a need to integrate Indigenous knowledge and cultural practices into broader climate adaptation strategies.

16.3 Pacific Island communities utilise traditional practices like customary gardening, food storage, and kinship systems to prepare for and recover from natural disasters, demonstrating resilience in the face of climate change. Traditional building techniques, such as the construction of nakamal (meeting houses), have proven effective in protecting communities during extreme weather events like cyclones.

16.4 Artistic and cultural expressions, such as storytelling, song, and dance, play a crucial role in raising awareness, educating communities, and fostering activism for climate change preparedness and resilience.

16.5 There is a need to incorporate traditional knowledge and cultural practices into climate adaptation strategies, recognising the value of these practices in building sustainable and resilient communities.

16.6 Land and sea are seen as forms of cultural wealth in the Pacific, providing a crucial shield against the impacts of climate change. Protecting these resources is essential for the survival and well-being of Pacific Island communities.

16.7 Pacific Islander youth and contemporary artists have used cultural expressions to demand climate justice on the global stage, exemplified by movements like 'We are not drowning, we are fighting,' which highlight the determination and agency of Pacific peoples in the face of the climate crisis.

17.0 To Move or Not to Move: Climate Mobilities in the Pacific (Chapter 17)

17.1 The issues of climate mobility and immobility are complex, and, in the Pacific, it is important to emphasise the importance of understanding these phenomena through the lens of Pacific peoples' cultural, spiritual, and historical contexts.

17.2 Studies of climate mobility should highlight the resilience and agency of Pacific communities needs to be more nuanced, recognising the importance of voluntary immobility, cultural connections to land, and the need for bottom-up, community-driven relocation strategies that respect Pacific worldviews and values.

17.3 Pacific Islanders have a long history of mobility as great oceanic navigators, and contemporary climate-related mobility must be understood within this cultural and historical framework.

17.4 Voluntary immobility, or the decision to remain in place despite climate pressures, is an important coping mechanism rooted in cultural and spiritual connections to land, which current migration theories often overlook.

17.5 Climate mobility in the Pacific is highly context-specific, and policies must reflect the diverse experiences, worldviews, and socio-cultural realities of Pacific communities. Effective climate mobility strategies should integrate local experiences and knowledge, customary governance mechanisms, and community-driven approaches to ensure they are culturally appropriate and sustainable.

17.6 The emerging categories of 'trapped populations' and involuntary immobility, where individuals or communities are unable to move despite a desire to do so, and the stress this causes needs some emphasis.

17.7 The concept of cultural statelessness, or the loss of cultural identity and connection to land due to displacement or migration, is critical and requires greater attention in policy and legal frameworks.

17.8 There needs to be bottom-up approaches to relocation, involving Pacific elders, women, and other marginalised groups in decision-making processes, and calls for a continuum-based understanding of mobility and immobility that respects Pacific peoples' connections to land, ocean and cultural systems.

18.0 Climate Finance and Carbon Market: Implications on Local Communities in the Pacific (Chapter 18)

18.1 The climate finance space can be contested with multiple stakeholders (including donors, development partners and other intermediaries) competing for customer influence, impact and legitimacy. This has potential to create unease amongst local governments and stakeholders, who in some cases may be expected by the competing donors to make choices which may not be in the best interest of local development priorities and needs.

18.2 Framing climate finance is often shaped by political imperatives. For instance, rebranding normal aid programme as being climate-related can be a way of ticking the global good citizenship box as well as contribute to a donor's carbon reduction pledge in a strategic way.

18.3 Climate finance project designs can be cumbersome and, in many cases, do not take into consideration the local technical capacities, local needs, socio-cultural environment, community structures and cultural norms. A common practice is to hire expatriate experts and consultants to design, manage and implement climate projects.

18.4 Because some of the climate mitigation ideas and techniques are new, Pacific countries have sometimes been used to pilot some new approaches. The idea of piloting new projects has both a positive feel (in terms of being a pioneer) and a negative connotation (being a guinea pig) by donors and development partners.

18.5 A significant portion of the Green Climate Fund is in the form of loans, apart from the actual grant component. For instance, the GCF finance for utilities is often in the form of loans. The co-financing principle ensures that partners such as the ADB will provide loans. This adds more debt burden to Pacific countries, which are already shackled with excessive debt.

18.6 The model based on co-financing and public-private partnership can lead to transfer of public money to private hands, which enables corporations to profit from the climate finance. This is a concern since it can reinforce the process of corporate 'greenwashing.'

18.7 A key concern is how what is perceived to be performative and 'ticking the box' development strategy by some donors' affects real emission reduction efforts on the ground. Equally important are the risks associated with long-term commitment of donors to the future sustainability of climate projects, especially when donors are more focused on the limited 'lifespan' of usually around five years or so.

18.8 Although the GCF policy on Indigenous people talks about engagement with communities, climate projects are often state-driven and issues such as unfamiliar bureaucratic processes, government development priorities, local elite interests and political patronage often get in the way of people-to-people relationships and connection with grassroots local Indigenous communities.

18.9 Understanding the complex interconnection between land and culture and development is important for the success of climate finance. Engaging with landowners and other community stakeholders in a meaningful and sustainable way, will go a long way in ensuring that the beneficial returns and success of projects are realised. Political, bureaucratic, technical, and economic decisions which dismiss local cultures as archaic and irrelevant usually create conflict which undermine the success of community projects.

18.10 Local communities must be part of the climate-based projects at the planning, implementation and review stages rather than just the final implementation stage. They need to provide informed, free, fair and prior consent for the use of their land and resources. They also need to feel empowered with a sense of sovereignty over their land, resources and the benefits derived from these.

18.11 At the moment, there is no finance targeted specifically at strengthening local traditional knowledge and cultural innovation, especially in cases where the private sector is involved in projects. This focus of climate finance allocation should be on deepening and strengthening community resilience, as this will be a more cost-effective and sustainable approach.

18.12 There should be more transparency in the way money and resources are allocated and disbursed from the international level, within the region, at the national level and at the local level. While there are some initiatives in place to monitor quantifiable financial flows, these are not enough to monitor more implicit and deceptive practices of questionable contracting (based on political patronage, kinship links and professional connections) at the local level.

18.13 Carbon trading in the Pacific is limited and not well developed and organised in terms of market structures, trading processes, legislations, and policies. Some countries such as Fiji, Vanuatu, Solomon Islands and Papua New Guinea have community-based projects linked to carbon trading, but often external players define the protocols and distribution of money.

18.14 Given the increasing interests in the Pacific carbon market, it will be timely to set up a regional climate forum for landowners and communities to provide a strong and representative platform for their interests and voices. The collective regional forum should advise and carry out ongoing consultations with national governments, regional bodies and international bilateral and multilateral donors on the best way forward.

18.15 In the broader scheme of things, carbon trading may induce local communities in the Pacific to protect their forests and earn some money from carbon credits. There are consequences as well in terms of restricted access to their traditional land designated as protected for the purpose of planting, hunting, gathering firewood, extracting medicinal plants and collecting building materials. The amount they receive is often very small. On the other hand, big corporations reap the benefits of purchasing credits through intermediary players to offset the greenhouse gases they emit; thus, carbon trading directly subsidise the emitters.

Chapter 1

Introducing the Pacific Ocean Climate Crisis Assessment (POCCA) Project

Authors

Steven Ratuva, Bronwyn Hayward, Viliamu Iese, Joeli Veitayaki, Christina La'ala'ai-Tausa, Hilda Waqa-Sakiti and Elisabeth Holland



Where a playground used to be, but now submerged underwater in Funafala, Tuvalu (Photo: POCCA Team).



> We must develop innovative initiatives based on our ways of life and Indigenous practices to help our community. When we work together, we can achieve great things. By supporting one another and pooling our resources, we can create a better future for ourselves and future generations

Community participant
Tongatapu
Tonga
(POCCA research team interview, 2023)

Shows part of a seawall built by a community in Tongatapu, Tonga (Photo: POCCA Team, 2019).

1.1 The project: A brief overview

The Pacific Ocean Climate Crisis Assessment (POCCA) project provides an interdisciplinary, multicultural and transnational study of the impacts of climate change and community responses covering 16 Pacific Island Countries and Territories (PICTs): Cook Islands, Federated States of Micronesia, Fiji , Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of the Marshall Islands, Samoa, Solomon Islands, Timor-Leste, Tokelau, Tonga, Tuvalu and Vanuatu. It was in response to the increasing demand for research and evidence-based adaptation and resilience policies, strategies and approaches to address the increasing impacts of climate change. The Pacific leaders as well as various organisations and citizens, have, in various forums, called for a region-wide research such as this to take place.

The project was funded through the Aotearoa New Zealand International Development Cooperation Programme which is administered by the New Zealand's Ministry of Foreign Affairs and Trade. It is a collaboration between the University of the South Pacific and University (USP) and the University of Canterbury (UC) and involved multiple institutions and organisations across different countries.

POCCA brought together the largest number of Pacific scholars ever to work together collaboratively on a single project. The project helped to transform and enrich the Pacific research culture, regional, networking, and collaboration in significant ways. Those involved were from all universities in New Zealand (University of Canterbury, University of Otago, Lincoln University, Victoria University of Wellington, Massey University, University of Auckland and Auckland University of Technology) as well as crown research entities such as the National Institute of Water and Atmospheric Research Ltd (NIWA) and Institute of Geological and Nuclear Sciences (GNS); universities from the Pacific region (The University of the South Pacific, National University of Samoa, Fiji National University, Solomon Island National University, University of Papua New Guinea and University of Hawaii); as well as scholars from Australian universities (University of Melbourne, University of Queensland, Grifith University and University of Tasmania).

The disciplines represented include meteorology, oceanography, biology, physics, geography, environmental studies, geology, hydrology, engineering, medicine, public health, nursing, sociology, social anthropology, history, economics, accounting, development studies, political science, education, fisheries, agriculture, sustainability, international relations, media studies, cultural studies, Indigenous studies, history, accounting, theology, psychology, law, policy, management, social work and governance. This diversity of intellectual, applied and methodological approaches is indicative of the multidimensional and interdisciplinary nature of climate change. Climate change impacts on every aspect of our physical environment as well as every facet of social, cultural economic, technological, political, infrastructural, psychological, and spiritual life. The report covers all these aspects by weaving together technical assessments as well as Pacific community narratives and Indigenous knowledge.

The project took three years (2021 to 2024) and the deliverables consisted of a thematic report, country studies report together with a database of Pacific climate change resources and other virtual resources in the form of videos and other materials for public engagement purposes. The authors were able to share progress of their research during the three conference's which were organised. The first conference was held at the University of Canterbury (UC) (1-2 September, 2022); the second, hosted by the University of the South Pacific (USP) was held in Nadi, Fiji (13-15th June, 2023); and the third was held at the University of Canterbury (8th to 10th of May, 2024). As part of the capacity building process for the project, there was a series of staff exchange between the two universities in 2023 and 2024.

Perhaps one of the biggest achievements was the forging of connections amongst Pacific researchers, and between stakeholders and communities around the Pacific.

The two lead universities signed an MOU in 2019 to facilitate the collaborative project and the joint team was co-led by Steven Ratuva (UC), Elisabeth Holland (USP), and later Awnesh Singh (USP). The other members of the UC POCCA team were: Christina Laalai-Tausa (Research Manager), Suli Vunibola, Dalila Gharbaoui and David Garcia. The USP POCCA team consisted of Hilda Sakitiwaqa (Research Manager), Luisa Young, Jasha Dehm, Eliki Drugunalevu, Jiaoji Sigavata, Shree Ready, Nasoni Roko, Metuisela Gauna and Salote Nasole.

1.2 Weaving together science, social science and Indigenous knowledge

The physical science of atmospheric warming is clear. The climate crisis is a threat to human wellbeing, the health of the planet and a liveable future (IPCC, 2023, p.24). The Intergovernmental Panel on Climate Change (IPCC) Synthesis Report states:

> Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1°C above 1850-1900 in 2011-2020. Global greenhouse gas emissions have continued to increase, with unequal historical and ongoing contributions arising from unsustainable energy use, land use and land-use change, lifestyles and patterns of consumption and production across regions, between and within countries, and among individuals (high confidence) (IPCC, 2023, p. 4).

What then are the impacts of these on communities, especially those which are most exposed to climatic disasters? The IPCC report states that,

> This has led to widespread adverse impacts and related losses and damages to nature and people,…and ...(v)ulnerable communities who have historically contributed the least to current climate change are disproportionately affected (IPCC, 2023, p. 5).

Taking its cue from this, the POCCA project goes a step further and examines how 'vulnerable communities' (a controversial term that will be critically analysed later in Chapter 5) respond to 'adverse impacts' of climate extremes in sixteen PICTs.

The study has no intension of replicating the physical science of climate change, which is very comprehensively and systematically presented in the IPCC Assessment Round 6 (AR6) reports, but approaches the issues from the perspective of human agency — the emotional, cultural, economic, psychological and environmental experiences of communities, and the relationships to people and places that are crucial as Pacific communities adapt and respond to slow changes and sudden shocks of climate crisis.

The quantitative scientific data on global warming can only become meaningful in the context of its relationship to human and cultural experiences and the destructive, and disruptive effects of climate change on the ground (Dominica & Krupocin, 2024; Pantelis & Kafka, 2023). Perhaps one could say that the most effective and reliable 'measure' of climate crisis impact is not the thermometer or the complex meteorological machines in the laboratory, but the lived experiences of people as they go through the pain, the fear and the feeling of hopelessness when uprooted from their ancestral land and when their lives are shattered by climate change-related calamities, and the sense of collective purpose and strength when facing cumulative challenges over time (Stanley et al., 2021; McDermott & Craith, 2024, Gero et al., 2024).

While physical science can be relied upon to provide quantitative evidence of global warming, social science, humanities and Indigenous knowledge are well positioned to complement this through both qualitative and quantitative evidence of the impacts of climate crisis on people and communities (Hernandez et al., 2022; Cameron et al., 2021). As the survival of the planet and humanity are under threat, there's a need for international, intercultural and interdisciplinary collaboration, thus different knowledge systems, especially science and Indigenous knowledge, must work together in partnership (Schipper et al., 2021; Redvers et al., 2023).

The mainstream discourses of 'them' versus 'us' dichotomy and 'ranking' of different types of knowledge, are often based on historically embedded and institutionalised cultural and intellectual prejudices which undermine rather than enhance our understanding of the complexities of humanity's challenges (Fiske, 2017; Ratuva, 2021). Local and Indigenous communities around the world, which are often outside the gaze of mainstream research, have used their epistemic power, technical innovation, cultural wisdom, resilience norms and adaptation strategies, to respond to climate calamities and these provide important lessons to learn from (Reyes-Garcia, 2024). From this perspective cultures and cosmologies are intrinsically tied to the environment, thus for survival, local and Indigenous communities have perfected skills in observation, analysis and interpretation of nature and in the process have built up an accumulative reservoir of knowledge through intergenerational cultural socialisation over generations (Grix & Watene, 2022; MacNamara & Westoby, 2016).

Within this broader context, the POCCA project provides a multidimensional, epistemic, methodological and cultural approach to connect different knowledge systems—including Indigenous knowledge, natural science, social science, and humanities—to shed light on the impacts of climate change on the social, cultural, psychological, environmental, economic and political aspects of community life in the PICTs. This approach is represented in Figure 1.1.

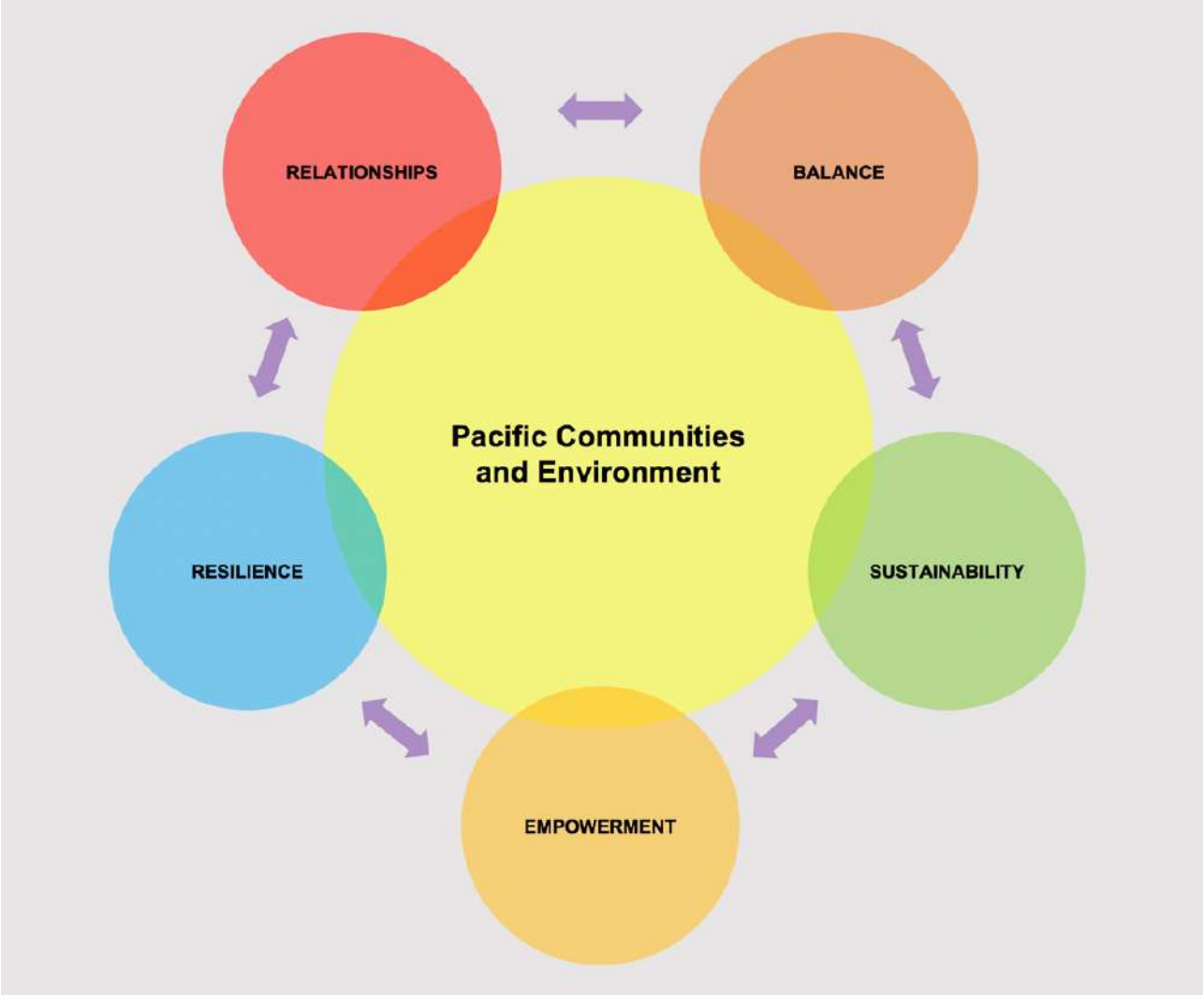


Figure 1.1: Connecting people, environment, and climate change.

1.3 Aims and objectives of the study

The broad aim of the project is to carry out a comprehensive, evidence-based research assessment of the diverse range of impacts, community experiences, adaptation strategies, community innovations and Indigenous knowledge systems relating to climate change in PICTs. It was guided by a number of more specific objectives:

a. Engage in an interdisciplinary, multi-country and multi-culture analysis of climate change on the multidimensional impacts climate crisis in Pacific communities across diverse but intersecting issues including culture, health, wellbeing, socio-economic life, infrastructure, environment, infrastructures, identity, geo-politics, transnational crime, resources, mobility, security, sense of place, governance system, economic, wellbeing, and power relations.

b. Examine the response mechanisms in the form of Indigenous knowledge, traditional innovation, adaptation strategies, resilience building methods and rehabilitation approaches and how these help Pacific communities to sustain their lives in the midst of the climate calamities.

c. Expand and enhance collaboration between physical science, social science, and Indigenous knowledge systems as a way of enriching and deepening our understanding of the impact of climate crisis on the Pacific communities.

d. Identify possible policy and strategy approaches at the local, national, regional and international levels based on the evidence, circumstances and community narratives identified in this assessment.

These objectives response to a number of challenges and rationale which include:

a. The increase in the existential threats of climate emergency in the Pacific and the destructive impact on communities.

b. The lack of evidence-based data on community resilience and response mechanisms.

c. The lack of reliable data on how Indigenous knowledge and cultural resilience can work together with science-based approach to inform climate and oceans policy in an integrated and interdisciplinary way.

d. The absence of Pacific-based expertise, research and voices leading climate research and wider discourses.

e. The need to strengthen and deepen the interface between research and policy of climate and ocean in the Pacific to advance the wellbeing of Pacific peoples as well as contribute to the global climate research agenda.

1.4 Regional context

The rationale and aims of the POCCA project run parallel with the *2050 Strategy for the Blue Pacific Continent* endorsed by the Pacific Islands Forum leaders in July 2022, which talks about the need for investment and focus on 'Pacific relevant and participatory science, cultural and traditional knowledge and innovative research' to address the worsening impacts of the climate crisis (PIFS, 2022, p. 27). Indeed, the need to address the issue of the climate crisis in the Pacific is serious and urgent. In the build up to the Paris Agreement in 2015 numerous declarations were made in the Pacific (the details are outlined in Chapter 4). One of the most significant regional positions was the 2018 Boe Declaration, which proclaimed that, 'climate change remains the single greatest threat to the livelihoods, security and wellbeing of the peoples of the Pacific' (PIFS, 2018). One year later in 2019, the leaders reaffirmed that, 'Urgent action is needed to ensure our shared needs and interests, potential and survival of our Blue Pacific and this great Blue Planet' (PIFS, 2019).

These sentiments continue to be articulated in regional statements and proclamations such as by the leaders such as the Nadi Bay Declaration (2019) and Kainaki II Declaration for Urgent Climate Action Now (2019). The latter urged the, 'The international community to immediately increase support and assistance for Pacific-led science-based initiatives intended to improve our understanding of risk and vulnerability, including through support for modelling and risk mapping capabilities, the development of methodologies for understanding, projecting and responding to climate change-related economic and infrastructure impacts, and capacity building support for evidence-based decision-making and project development' (PICS, 2019). This call also provided inspiration for the POCCA project.

While much climate change research have focused on technical and physical science, there is still very little systematic research on how to embed Indigenous science and local knowledge systems, in decision making in the Pacific (Mycoo & Wairiu et al., 2022, p. 2043). This project attempts to address this gap by engaging in a comprehensive assessment of the impact and responses to climate crisis in the Pacific, how people adapt and build up resilience using Indigenous knowledge and other forms of innovation and survival strategies. It does this through a synthesis of expert research findings by a diverse group of researchers from across multiple disciplines, countries and cultures across the Pacific. While the broad focus is on assessing the impact of climate crisis, the specific themes are wide-ranging but interrelated and cover most aspects of people's lives in the sixteen PICTs. These countries are shown on the map in Figure 1.2 below.

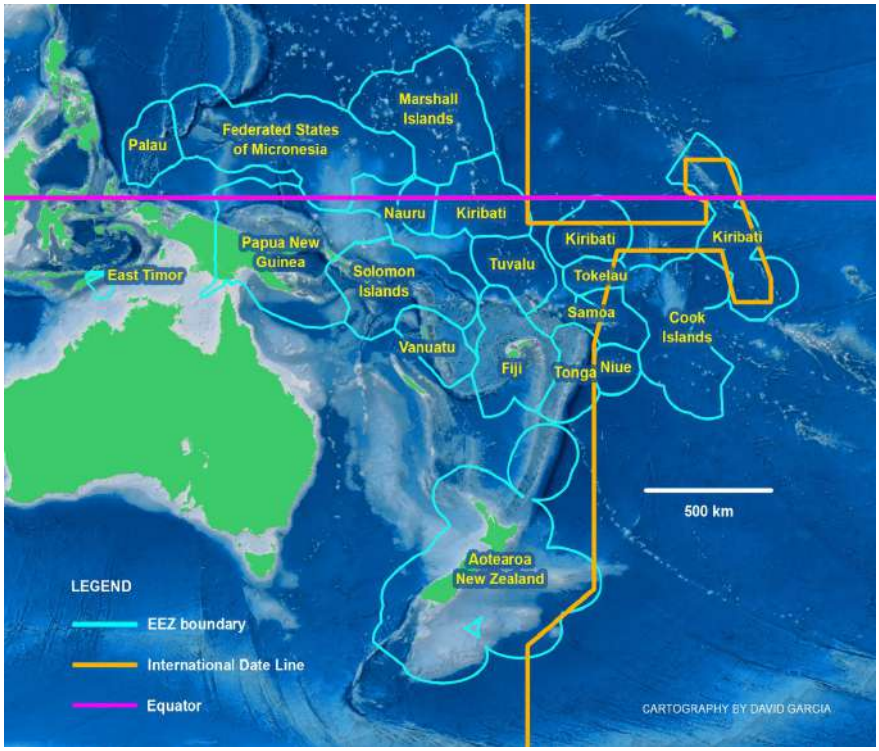


Figure 1.2: *Map of the PICTs in the POCCA study scope (Does not include New Zealand). Source: David Garcia.*

1.5 Power of narratives and community voices

What is often missing from official climate change reports is the importance of community narratives (Montoute et al., 2019). There had been a steady increase in the people's climate change and environmental movements in the Pacific, which started in the 1970s when the Nuclear Free and Independent Pacific movement started. In recent years the movements by youth groups, civil society organisations as well as local communities have become part of the groundswell of people's narratives at a time when social media has become a powerful tool of communication and mobilisation (Barbara et al., 2023; Montoute et al., 2019) For example, the social media campaigns of the 350 Pacific (Climate Warriors) support for 'front-line communities affected by the climate crisis throughout the Pacific region and diaspora communities in Australia, New Zealand, and the US' (350 Pacific, 2022).[1]

Over the years, a large number of scientific reports, political declarations, policy statements and assessment strategies have been compiled on the Pacific and these have to some extent being shaped by global discourses, such as those of the UNFCCC (Shea, 2022). While these may have noble intensions, these official narratives tend to overshadow and crowd out the voices and narratives of local communities who are at the frontline of the ongoing climate catastrophe (Ruiu, 2023). This assessment incorporates a multiplicity of POCCA narratives from diverse communities across the Pacific Ocean, the largest body of water in the world, or in scientific parlance, one of the largest carbon sinks on the planet (Yamashita, 2022).

What are the impacts of climate change on poor people in the Global South (particularly the Pacific), who are already faced with poverty and conflict? What are the impacts on island communities who are surrounded by ocean and at the forefront of the ferocity of climate-related calamities such as cyclones, droughts, coastal erosion, coral bleaching, food insecurity, poor health, environmental damage and reduced wellbeing? This report provides a comprehensive account of how PICTs have lived and engaged with and responded to the climate crisis using their local knowledge together with other innovative approaches, including hybrid ones. It captures the local narratives and Indigenous epistemic systems, which have often been romanticised by writers (Waldron & Newton, 2012) and dismissed by many scholars as lacking scientific rigor (Carr, 2022). These dismissive assumptions are often superficial and dogmatic and do not capture the complexities of different knowledge systems. Only now are scientists coming to terms with the fact that empiricist and experimental approaches of hard sciences have limitations especially when dealing with impacts of climate change on people and thus there is an urgent need for different types of epistemic and methodological systems to cooperate to address the climatic calamity besetting us (Lauter, 2023).

1. *350 Pacific Climate Warriors - 350*

Rural and island communities who have experienced the wrath of climate crisis in the Pacific have developed and built-up important culture and experience-based narratives and wisdom that need to be heard, accumulative knowledge to learn from and traditional innovation to transform how we understand climate crisis (Congretel, 2020). There is often voice imbalance in the global power dynamics where the climate change narratives and discourses have been dominated by the interests of big powers, donors, scientists from the Global North and large corporations. This project attempts to address this situation of global knowledge and voice imbalance and inequity by providing a platform for Pacific scholars, experts and local communities to articulate their knowledge and voices on an issue which has been transforming our island communities and planet and threatening the very nature and existence of humanity.

The inescapable reality is that the PICTs are situated in the largest ocean on the planet and thus are at the forefront of the daily struggle against the ocean-based environmental, social, cultural, economic, psychological and political impact of the ever-encroaching climate calamities (Newport, 2023). There are unique characteristics of the PICTs which are explored and analysed in detail in the thematic chapters.

1.6 Methodological partnerships: Indigenous knowledge, social sciences and physical sciences

The 2015 Paris Agreement acknowledges that addressing climate change must take into consideration the obligations to human rights including 'rights of Indigenous people, local communities, migrants, children, persons with disabilities, gender equality, empowerment of women and intergenerational equity' (UN, 2015, p. 2). It also affirms that adaptation should be 'guided by the best available science, and, as appropriate, traditional knowledge, knowledge of Indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions, where appropriate' (UN, 2015, p. 9). While the Paris agreement provides the broader conceptual parameters, it does not provide the actual specifics of how Indigenous knowledge and Western science and social sciences can work together.

The term Indigenous knowledge can be diverse in terms of usage and contexts and needs unpacking and clarification here. Sometimes the terms traditional knowledge, native science, traditional ecological knowledge, community knowledge and local knowledge are used interchangeably (da Silva et al., 2024). The differences have more to do with contextual emphasis (Bruchac, 2014) For this particular project, the broader term of Indigenous knowledge is used to refer to all the different labels mentioned above.

The relationship between social science and Indigenous knowledge has a problematic history, especially in the way both the sciences and social sciences have played a critical role in supporting colonialism and were used to provide justification for the oppression of Indigenous peoples and suppression of Indigenous knowledge, which was considered inferior by virtue of the 'primitive' genetic make up of non-Europeans (Smith et al., 2024; Ratuva, 2021; Tuck & Yang, 2012). This had deep epistemic, cultural, and political implications and the impacts still resonate today (Gomez-Baggerthun, 2022).

The view that Indigenous knowledge and Western science are epistemologically and methodologically at odds and therefore fundamentally different has a long history which dates back to the notion of 'scientific racism' during the European enlightenment period of the 17th and 18th Century where scholars ranked societies and their cultural systems in relation to their levels of genetically induced intelligence (Hyde, 2024; Ratuva, 2021). This trend of thinking was reinforced by colonialism and its education system and continued in many forms and levels of implicitness across disciplines from science to the social sciences and humanities (Tarlow, 2024). The focus was not only on assumed genetically induced cultural differences, also on power differences and ranking, with Western science considered more superior—something which has been referred to by Aikenhead & Ogawa (2007, p. 540) as 'colonial false dichotomy'.

Only recently have there been attempts to critically and systematically understand the importance of Indigenous knowledge in its own right rather than being defined using Eurocentric lenses to affirm its validity and acceptance (Janif et al., 2016). In the study of climate crisis, there is increasing recognition that the collaborative use of Indigenous knowledge and Western science (natural and social sciences) has promise in unpacking and synthesising the varied and complex issues associated with climate knowledge and responses (Stein et al., 2024). Through Indigenous scholars and empathetic academics. Indigenous knowledge has been introduced into academia as a methodological and epistemological approach in its own right (Tarlow, 2024). It provides a deep insight into the complex levels of relationships between culture and ecosystem and how these form the basis for adaptation and resilience.

This provides a useful connection with natural science which often focuses on investigating the causal-effect relationship of a specific climate-related phenomenon and making predictions and also with social science which focuses on people's social organisation and power including the social, economic and political aspects of climate change (Mazzocchi, 2006).

The way forward is not to frame Indigenous knowledge and Western science with dichotomous lenses but to see them as part of the multiple domains of human knowledge systems arising out of unique historical and cultural contexts (Agrawal, 1995). While there are differences in epistemological approaches and application the context of place an circumstances, there are also some broader and specific commonalities which need to be considered (Stein et al., 2024).

Aspects of both systems of knowledge have consistently changed and used over the years in integrated, alternate, or parallel ways in applied areas of ecological and climate adaptation in various communities.

The partnership between Indigenous knowledge and other forms of knowledge can be seen as a way of bridging the epistemological and applied gap between knowledge systems but the problem of unequal power relations in the context of culture and gender still needs addressing (Oloukoi et al., 2014). However, we must make sure that partnership does not turn into assimilation (Zidny et al., 2020). There is a danger that Indigenous knowledge can easily be overwhelmed because of institutional as well as financial power dynamics. A good place to start in this partnership is to recognise some epistemological and methodological similarities. For instance, Indigenous knowledge and Western science both use observation, analysis of information and drawing conclusions in their study of the world around them (Parsons et al., 2016). They both use rational explanations about the cycle of nature (Krupnik & Ray, 2007). However, physical science tends to be reductionist by breaking up complex relationships into discrete and isolated parts (Rosenberg, 2001). This shortcoming can be addressed by Indigenous knowledge which frames climate issues as being interconnected and causally related in some ways (O'Sullivan, 2024). While science can focus on discrete parts and make predications using quantitative methods (Rosenberg, 2001), Indigenous knowledge is able to make broader connections, by putting people, communities, places, and wellbeing at the centre of the study (Krupnik & Ray, 2007).

In addition to these challenges, there are also unique epistemological and methodological features which Indigenous knowledge, physical science and social science can draw from each other.

1.7 Framing a Pacific approach

For Pacific researchers who were socialised in their own local cultures and communities, knowledge of the Indigenous ecosystem is part of their cultural memory, sense of place and identity (Sanga & Reynolds, 2020). Formal training often reframes embedded knowledge in a different way and may help expand the methodological tools at the researchers' disposal within or outside the rubric of Indigenous epistemology. An important feature of this study is that it allows for an interdisciplinary approach while privileging the Indigenous worldviews, adaptation strategies and resilience building cultures of the Pacific communities. For many Pacific researchers, many of the cultural norms associated with Indigenous knowledge are not institutionally learnt but passed down from elders as part of the community intergenerational process of cultural socialisation and intellectual reproduction. This study recognises Pacific intellectual communities as active and integral parts of the ecosystems which they relate to in complex, dialectical, and reciprocal ways. People transform and adapt to the ecosystem while the ecosystem in turn transforms cultures, provides support and means of sustainability, a sense of identity, community, a past and future.

This sense of reciprocal relationship and balance is being undermined by the worsening climate crisis which is dramatically altering the ecosystem and seriously impacting on community wellbeing. Understanding these impacts, and the means by which local communities respond to these, is a central focus of this study.

What makes this study unique is that it privileges and incorporates the 'Pacific approach,' which can be broken down into three interrelated concepts (See Figure 1.2).

a. The participation of Pacific and Pacific-based experts and researchers in the study. This is important in terms of providing critical views and knowledge from within communities based on a deep understanding of local realities and dynamics.

b. The use of Indigenous lenses together with other disciplinary lenses (physical science and social science) to frame complex cultural, economic, political, environmental, psychological, infrastructural and wellbeing issues related to climate crisis.

c. Facilitating the voices and responses of Pacific communities which are often 'invisible' from the global discourse on climate using Indigenous, local and community knowledge.

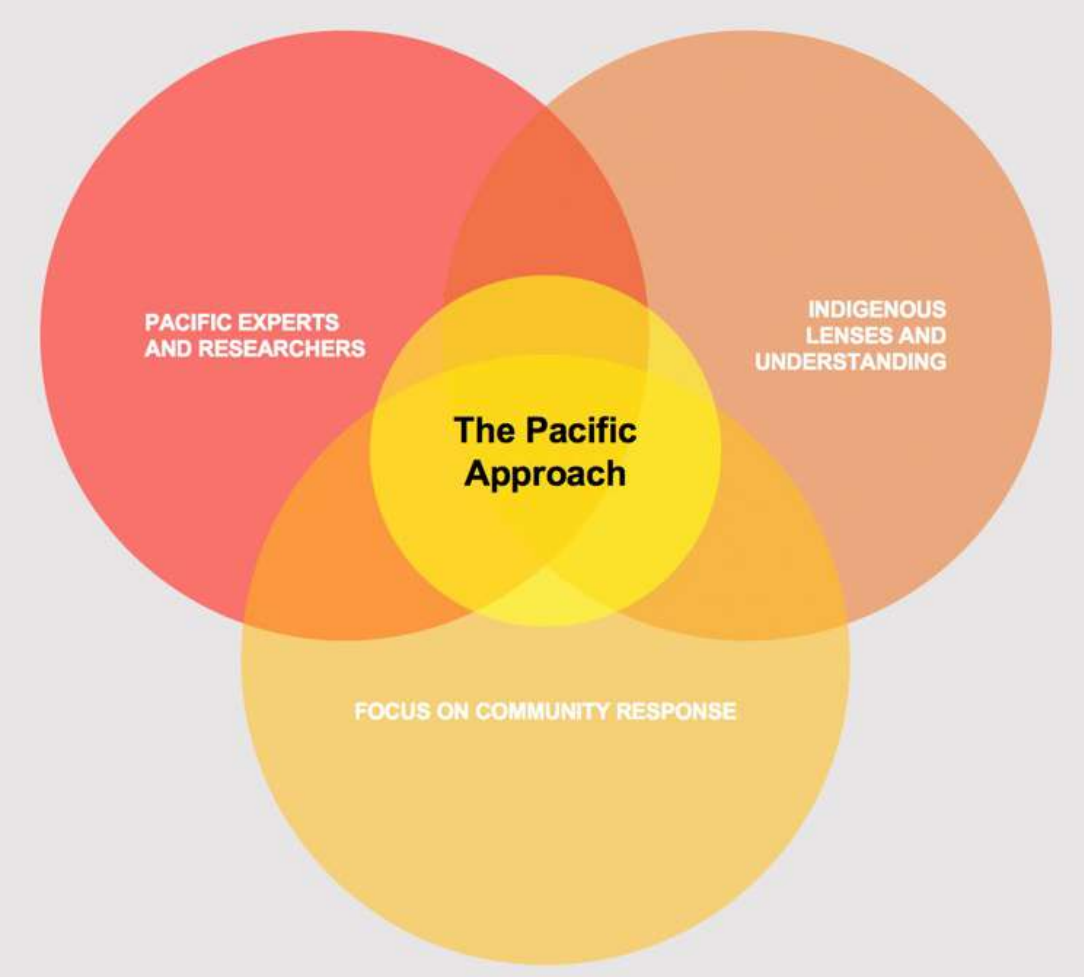


Figure: 1.2: Interdisciplinary Pacific-based approach



> "Young people should return to older people to obtain as much traditional knowledge on how their forefathers used to adjust to changes in climate change as possible, as this is the greatest way for dealing with the effects of climate change"
>
> Andron Grace
> Fanafo Santo
> Vanuatu
> (POCCA research team interview, 2023)

A traditional Vanuatu haus rebuilt quickly using local materials after cyclone Judy, 2023 (Photo: POCCA Team, 2023).

1.8 Thematic focus and chapters

The report consists of three sections and 18 chapters. Each chapter consists of an abstract; executive summary for policy makers and general public; analyses of the problem; unpacking of specific themes; how these themes are linked to climate crisis, potential areas of mitigation, adaptation and resilience; examination of the importance of Indigenous knowledge in addressing the issues and some policy implications of the findings

1.8.1 The science of climate change and ocean in the Pacific

Chapter 2 provides an overview of the physical and natural science of the Pacific Ocean, and this is the starting point of the assessment report. While the IPCC Report focuses on the global climatic system, this chapter is more specifically concerned with the intersecting and multiplier relationships between various environmental, meteorological, climatic, geological, and oceanographic aspects of the Pacific Ocean. The Pacific Ocean is the largest ocean and one of the largest carbon sinks on the planet and it sustains and defines the Pacific people's culture and livelihood. Pacific peoples have interacted with the island and oceanic environment for millennia and have suffered the destructive forces of climate-related calamities such as cyclones and storm surges, and this chapter provides the climatic and oceanographic contexts for these.

1.8.2 PICTs as global norm entrepreneurs in the ocean-climate nexus

Chapter 3 looks at the governance of the climate-ocean nexus in the Pacific in the context of climate change. It focuses on PICTs as global norm entrepreneurs in international and regional frameworks to successfully manage the threats to their sovereign rights at the time of climate crisis. The chapter looks at examples of international ocean and climate regimes in which PICTs have played an influential role as political actors in helping to frame the norms of global governance and international law. It also examines sea level rise as a threat to state sovereignty in the Pacific region, the work done by the Pacific Islands Forum to protect regional state sovereignty and maritime boundaries, as well as the innovative national approach adopted by Tuvalu. The chapter also provides a discussion of ocean management by looking at the examples of Pacific engagement with critical marine resources.

1.8.3 Stock take and mapping of regional climate initiatives

In order to have a broad view of the different climate related activities in the PICTs, Chapter 4 provides a stock take and region-wide social mapping of the climate-ocean strategies, policies, and frameworks at the regional, national, and local levels in the Pacific. Several declarations, frameworks, agreements, policies, and strategies have been created and implemented. Some of them were framed within the region while others were the result of engagement with external stakeholders. This chapter analyses how these instruments were created and implemented. It also examines the nature of these instruments and how they have shaped the climate-ocean agenda. This assessment provides important information on regional and national initiatives, their level of effectiveness, and lessons learned.

1.8.4 Climate resilience and a critique of the vulnerability discourse

Chapter 5 introduces contested narratives of vulnerability and Indigenous Pacific resilience as precursors to understanding climate risks to help set the contextual scene for subsequent chapters. Emphasis is made on highlighting key narratives which underscore perceptions of resilience. It discusses elements of historical/residual legacies and how these influence present perceptions, as well as Indigenous led approaches to reclaiming these narratives in support of efforts to shape future adaptation/resilience opportunities. It then highlights inter-related but distinct thought-provoking themes and cases of integrated approaches to inclusion and representation of local, Indigenous, knowledge in resilient initiatives and decision-making. The importance of monitoring and evaluating adaptation through Indigenous lenses are discussed to contextualise the significance of such frameworks in relation to inclusivity, sovereignty, uptake of adaptive practices and sustainability at local levels. Lastly, the chapter presents key gaps and takeaway messages in the context of implications/opportunities for policy development.

1.8.5 Community perceptions and narratives of climate change

Chapter 6 examines people's perceptions and narratives of climate, the role of civil society and civic education. While people experience the destructive impact of the climate calamities, it is important to understand how these have changed perceptions of individuals and groups in the Pacific and the role of civic education in expanding and deepening the knowledge of these experiences. Raising community consciousness is a vital aspect of this process. Knowledge of climate change and its impact provides us the platform for consciousness raising, civic education and action.

1.8.6 People, ocean identity and climate change

Pacific peoples, as Chapter 7 discusses, are people of the sea: it is their pathway to each other, to the rest of the world, their endless malaga or journey and their most powerful metaphor, because 'the sea is in them.' Pacific peoples, whose lands are in the world's largest ocean, have developed unique cultures and knowledge, which include an in-depth understanding of their oceanic environment. The people's customs and cosmologies, livelihood, food security, identity and connections across space and time are derived from their small islands and the large ocean that surrounds them. These rich community experiences and challenges across the Pacific Ocean, arguably the largest carbon sinks in the world, and how people have adapted to the climate crisis using culture-based responses passed down over generations present useful lessons for us all today and in the years to come.

1.8.7 Climate change and Pacific biodiversity

Chapter 8 highlights how the interconnected processes of climate change and biodiversity loss threaten balanced social-ecological outcomes on Pacific Islands and explores how climate change responses that are embedded in nature and culture can be led by local communities in partnership with local and national governments. It looks at fundamental importance of biodiversity to the health and spiritual well-being of the Pacific region and people, and to the health of our planet, especially in the context of climate change. The Pacific is internationally recognised for its vast ocean and exceptional biodiversity which for centuries has sustained life, provided food, medicine, and resources for highly diverse cultural and traditional practices. Addressing and mitigating the impacts of climate change on biodiversity in the Pacific region requires a holistic perspective from terrestrial to freshwater and marine environments, including impacts on areas of both high (hotspot) and low (cool spot) biodiversity in unison with the unique human communities they sustain.

1.8.8 Climate change and water security

Chapter 9 examines the relationship between climate change and water security. The two are inseparable issues in PICTs as climate change impacts on the availability, equitable accessibility and good quality of water for people and the environment. Availability of good quality water (for drinking, cooking and other household purposes) is very limited in many PICTs and they are amongst the most precious local resources. Needless to say, water connects and sustains the lives of people and the environment. Through 8 case studies, the chapter demonstrates the diversity of impacts of climate change on high islands and atoll countries across the PICTs. The chapter then discuses the challenges of one- dimensional and top-down approaches of addressing a multi-sectoral, complex issue as water security in local communities. It also examines how a 'marriage' between government, technical and local traditional knowledge systems, relationships, structures and processes can improve water security for the people and environment as well as build the resilience of local water sources against climatic and non-climatic stressors.

1.8.9 Climate change, human security and social protection

Chapter 10 discusses the complex interactions that arise for Pacific peoples and communities in ensuring safe livelihoods and social protection as the climate crises unfold. The chapter looks at how Pacific people experience livelihood security and reciprocity in response to rapid and slow onset climate change. Formal, informal and hybrid processes of adaptation are evident, and these are considered to be forms of 'social protection' and 'human security'. Some are Indigenous forms of protection and security while others have been introduced. The chapter critically examines the concepts of 'social protection' and 'human security' as they are defined in global climate policy and as we understand them in our lived experience as Pacific and allied scholars. It looks at how these ideas intersect with the realities faced by communities in the Pacific region.

1.8.10 Climate change and health

As shown in Chapter 11, climate change significantly impacts the health of Pacific peoples. These impacts now need to be understood in the aftermath of a global COVID-19 pandemic. To best understand the connection between the climate crisis, COVID-19 and health, a holistic view of health encompassing the physical, mental, spiritual, and social factors that influence health outcomes, is needed. Knowledge of the impact of climate change on health continues to develop, however, positive health adaptation strategies can also be found within Pacific Indigenous knowledge and health models. Connecting understandings gained from the COVID-19 health response, Pacific Indigenous knowledge and practices, alongside other scientific knowledge will provide Pacific people with the best opportunity to successfully mitigate climate and pandemic repercussions.

1.8.11 Climate change and food security

Chapter 12 explores how climate change has contributed to increase in the rate of transition in food systems and nutrition to more ultra-processed foods in PICTs. Increasing frequency and intensity of climatic extreme events and loss of land due to rising sea levels make the recovery of local food systems very slow. This has led to permanent and irreversible lack of food availability, accessibility and stability, as well as increasing food insecurity, poor diets and high incidence of non-communicable diseases (NCDs). How can we understand and address climate change impacts on food security and reduce non-communicable diseases in PICTs? The chapter addresses this question in a number of ways by looking at the perception of food, culture of food and the impact of climate change on these.

1.8.12 Climate change, regional security, geopolitics and transnational crime

Chapter 13 provides an analysis of climate change, in the context of regional security and geopolitics. The Pacific is facing an array of complex and, at times converging, security challenges ranging from the existential threat posed by climate change to the enduring threat of transnational crime. Increasingly, however, geopolitical competition is threatening to divert attention away from efforts to address its existing security priorities, especially climate security. This chapter explores the relationship between climate change, a systemic risk to the Pacific, the geopolitical vulnerability of the Pacific region as a persistent threat, and transnational crime as an enduring threat. It considers the ways in which climate change intersects with and amplifies the geopolitical vulnerability of the Pacific region and transnational crime by drawing on the available literature and the observations of the authors.

1.8.13 Loss and damage (L&D) in the Pacific

The issue of loss and damage (L&D) is a significant one for PICTs and Chapter 14 highlights the journey and leadership of PICTs to recognise and include L&D under the United Nations Framework Convention for Climate Change (UNFCCC). It also presents examples of L&D experienced and witnessed by Pacific people through presentation of qualitative data using storytelling which traditional scientific reports are unable to do yet is deeply embedded and hence meaningful in Pacific communities and cultures. These examples will help understand the magnitude and characteristics of L&D, regardless of whether these are related to non-economic or economic loss. In doing so, this chapter will question the usefulness of attribution science in a Pacific and people-focused context. However, rather than dismissing the concept of attribution which does have its validity, the chapter attempts to offer a re-framing of attribution through a Pacific, Indigenous lens which will be more meaningful in its given context.

1.8.14 Climate change and socio-economic implications and impacts

Chapter 15 deploys the diverse economies approach to explore existing socio-economic and infrastructure development challenges presented by the climate crisis, while privileging alternative Indigenous responses and possibilities. The chapter initially provides an outline of the diverse economy's perspective and its application to the Pacific. It then examines a broad literature review of existing studies on the climate impacts for agriculture and fisheries, tourism and infrastructure. It then explores Indigenous approaches to the economic impacts of the climate crisis. These revolve around Indigenous innovation, solidarity economies and resilience. In doing so, this chapter privileges Indigenous economic agency within constraining global economic conditions and climate change impacts.

1.8.15 Climate change and cultural heritage

Chapter 16 examines the complex inter-connectedness between cultural heritage and climate change. In another sense, Pacific peoples' cultural heritage is vulnerable to, and threatened by, the rapidly increasing impacts of human-induced climate change. Importantly too, this cultural heritage forms a strong foundation from which Pacific Island peoples develop resilience and adaptation mechanisms to the climate crisis. This chapter adopts a tok stori approach, as a series of 'conversations' between different 'voices', or narratives. The people-centred, storied narrative, which is at the heart of the chapter, is in conversation with an 'institutional' narrative of law, policy, and administration. Engaging this 'conversational' approach, the chapter describes, through case studies and other material, the intersections between cultural heritage, Indigenous knowledges, and the climate crisis, and from this, proposes some recommendations for law and policy.

1.8.16 Climate mobility in the Pacific

Chapter 17 explores the issue of climate mobilities in relation to relocation, migration and displacement of Pacific communities. This is done by exploring some of the legal, political, and economic implications of climate mobility in both original and destination countries. It also looks at the international and national legal instruments, processes, and institutional responsibilities for climate migrants. Relocation as a process (both temporary and permanent, long-term and short-term) is also explored, along with problems associated with land disputes, resource sharing, travelling knowledges and Indigenous culture and sense of place. Relocation can lead to loss of place, cultural roots and customary lands. Related to this is the significance of Pacific perspectives on climate mobilities lens which could contribute to providing useful policy directions based on lessons learnt from communities in the Pacific.

1.8.17 Climate change and climate finance

Financial resources are important in mobilising strategies towards climate change, something which Chapter 18 examines in detail. Climate finance is now seen as an important component of mitigation and adaptation in the campaign to address the slow onset and dramatic impacts of the climate crisis. However, there are debates around the political, economic and logistical aspects of climate finance and how impactful it is in addressing the needs of local communities at the forefront of climate-related disasters. This is because of the focus funding for long term mitigation strategies rather than immediate adaptation and rehabilitation approaches. The study shows that while PICTs have benefitted from climate finance in certain sectors, they are faced with issues relating to accessing the different categories of climate finance because of the complexity of the processes involved. The chapter also looks at the controversial carbon trading scheme and how local Pacific communities have been involved in providing carbon credit through environmental conservation and the extent of monetary benefits to local villagers. In the bigger political economy rubric, the sale of carbon credits to big international corporations through middle operators, raises questions of climate ethics, equity and justice.

1.8.18 Country studies and community narratives

This section reports on case studies from the sixteen countries assessed in the project. The case studies focus on a diverse range of climate adaptation, resilience and mitigation initiatives in the communities as well as some of the personal and community experiences, reflections and voices. These are also linked to the POCCA website.

1.8.19 Research process: Ethical and cultural consideration

There were two strands of the POCCA research process. The first was based on chapter thematic teams engaged in their own literature survey and field research. The second strand consisted of teams from UC and USP engaging in field research in the sixteen PICTs and data was fed into the chapters as well as the country reports. The POCCA ethics approval was provided by the UC Human Ethics Committee.

Care was taken to ensure adherence to ethical and cultural processes and norms. The consent of the communities were sought beforehand through culture-specific protocols. The nature and purpose of the POCCA project was clearly explained to the local communities, including how a team of academics and experts is carrying out research about climate change in relation to various topics, and our intention to enhance this work by documenting and presenting community voices and stories. The participants signed an informed consent form, acknowledging their understanding of the project, their rights, and the voluntary nature of their participation.

They were reminded that they could withdraw or request the removal of their answers at any time.

Confidentiality was strictly maintained, with personal information kept secure and anonymity prioritised. It was explained to them that the POCCA team would like to use some quotes and stories from the interviews in various POCCA publications. While these quotes would be anonymised by default, the POCCA team offered to include their names if they preferred. Depending on their preference, quotes are either attributed or anonymised in this publication.

Participants were also asked if they were comfortable with photos being taken during the interview process, and photos were taken only with their consent. If a story that resonated with POCCA themes emerged during the interview, people were asked if they would be willing to retell it for a video. A video was recorded only with their approval.



> There are alot of visible changes in our oceans. Not only is our food being affected but so is our lagoon, especially our shorelines. Our government needs to work with traditional leaders to design frameworks and policies that can help mitigate climate change impacts and keep our islands safe and clean

Chris Makiphie
Majuro
Marshall Islands
(POCCA research team interview, 2023)

A dramatically transformed shoreline in Laura Community, Marshall Islands (Photo: POCCA Team, 2023).

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Chapter 2

Framing Climate Science in the Pacific Islands

Authors

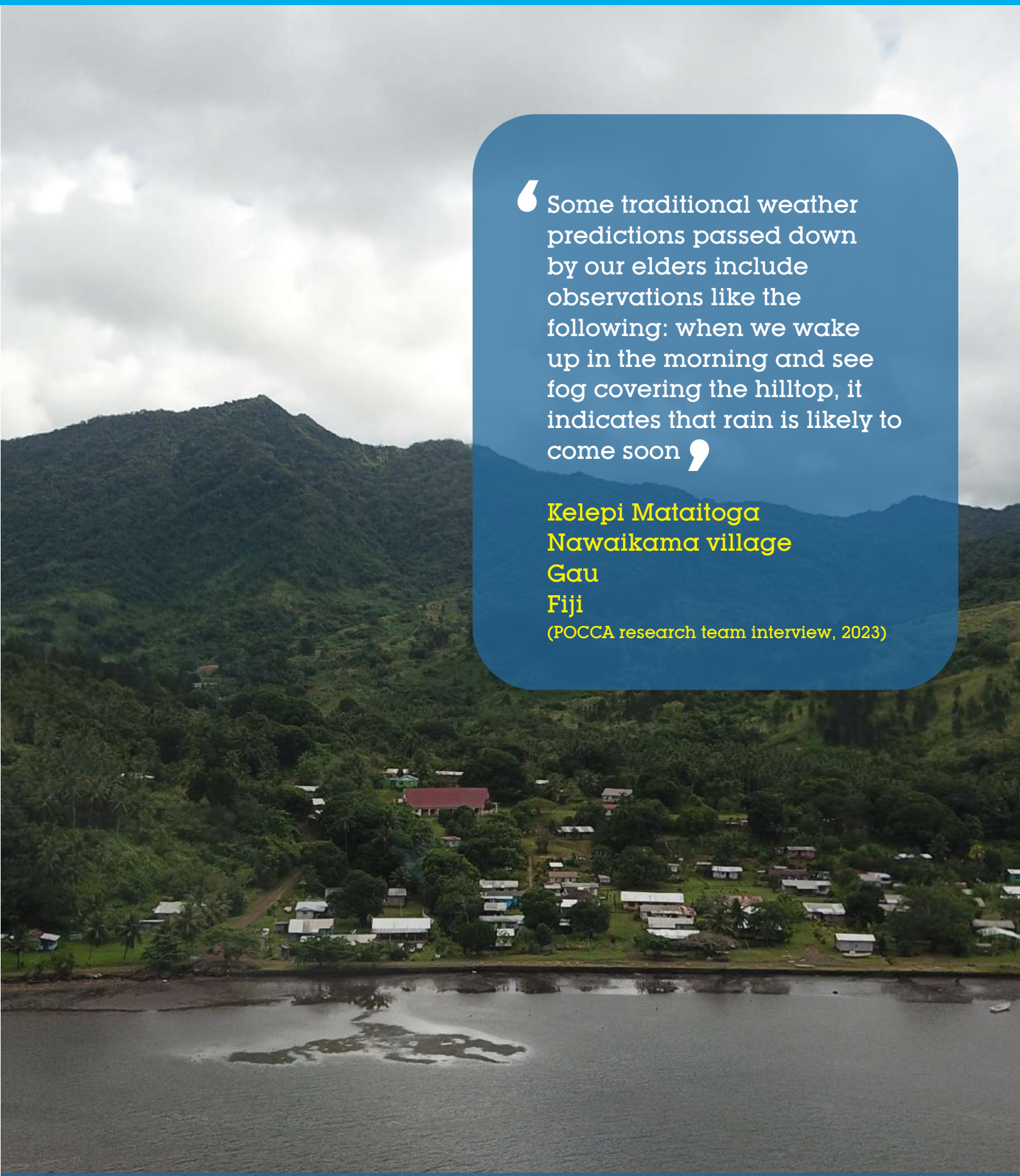
Awnesh Singh, Andra Whiteside, Moleni Tu'uholoaki, Siosaia Vaihola, Matthew Chinappa ,Shalini Singh, Ashneel Chandra, Lency Muna and Jasha Dehm



Vatukia village in Rewa, Fiji, is highly vulnerable to flooding due to the increasing frequency and rainfall intensity caused by climate change (Photo: POCCA team, 2023).

Abstract

The Pacific Islands are highly vulnerable to climate extremes due to their geography, remoteness, and developing economic status. This is further complicated by the impacts of human-induced climate change. While global scientific research on the cause and impacts of climate change has been well documented for most countries, the data from the Pacific region is limited to provide meaningful and confident assessments for the region. The climate in the region has been evolving over many decades and Pacific Islanders have been continuously adapting to these changes on a regular basis. Learning from this traditional knowledge and marrying it with current scientific understanding may help in providing adaptation and mitigation strategies for the region. In this chapter, a review of the major climate variabilities affecting the region are discussed with some case studies provided that were conducted in the region to provide an idea of the work done to contribute to and improve our scientific understanding of how the current climate affects the region.



> “Some traditional weather predictions passed down by our elders include observations like the following: when we wake up in the morning and see fog covering the hilltop, it indicates that rain is likely to come soon”
>
> Kelepi Mataitoga
> Nawaikama village
> Gau
> Fiji
> (POCCA research team interview, 2023)

Nawailkama Village in Fiji which was badly damaged by Tropical Cyclone Winston in 2016, and now fully rebuilt (Photo: POCCA team, 2023).

2.1 Introduction

2.1.1 Uniqueness of the Pacific

> Oceania connotes a sea of islands with their inhabitants. The world of our ancestors was a large sea full of places to explore, to make their homes in, to breed generations of seafarers like themselves. People raised in this environment were at home with the sea. They played in it as soon as they could walk steadily, they worked in it, they fought on it. They developed great skills for navigating their waters, and the spirit to traverse even the few large gaps that separated their island groups, (Epeli Hau'ofa).

These poignant lines from Epeli Hau'ofa's work, *Our Sea of Islands,* encapsulate the essence of Pacific Island identity, the profound relationship between its inhabitants, and the nexus between oceanic and atmospheric conditions that define the climate of the Pacific. While much of this report is centred around lived experiences and traditional knowledge, including lores, beliefs, spoken words and religion, it is essential to frame the natural and physical sciences. This chapter explores the geological and physical setting of the Pacific Island climate and offers a sentiment on the existence of a traditional knowing of the sciences.

Geology of the Pacific Ocean

From a geological standpoint, the Pacific Ocean emerged approximately 250 million years ago because of the fragmentation of the Pangea supercontinent, arising from the Panthalassa Ocean surrounding the Pangaea landmass (Dera et al., 2015). Presently, it stands as the earth's largest and deepest ocean, encompassing over 165,000,000 square kilometres, which constitutes roughly 32% of the planet's surface area. While the average depth of the Pacific Ocean hovers around 4000 meters—approximately 40 rugby fields—the ocean's topography is highly diverse (Neall & Trewick, 2008). It features oceanic ridges, trenches, and lengthy seamount chains formed by hotspot volcanoes beneath the Earth's surface.

Oceanic ridges, characterised by the formation of new oceanic crust, are relatively shallow regions found in select areas of the Pacific, such as the East Pacific Rise, which boasts the fastest growth rate among ocean ridges at approximately 15 centimetres per year (National Geographic, 2023). Conversely, trenches, where Earth's crust descends into the mantle, are notably deeper. Some of the world's deepest trenches are located within the Pacific Ocean, including the Challenger Deep in the Mariana Trench and the Horizon Deep in the Tonga Trench. The Challenger Deep, situated in the northwestern Pacific between Palau and Guam, plunges to a depth of approximately 10,920 meters, marking the Earth's deepest known point (Gvirtzman & Stern, 2004). Meanwhile, the Horizon Deep, the Southern Hemisphere's deepest point, reaches over 10,800 meters and is located southwest of Tonga (Leduc et al., 2016).

The movement and interaction of oceanic plates—tectonic plates—within the Pacific Ocean are facilitated by processes such as subduction[1] and abduction[2]. Within the Pacific Ocean, numerous tectonic plates exist, including the Pacific Plate, the most notable and also the fastest moving plate, typically advancing northwestward at a rate of seven to eleven centimetres per year, and the Juan De Fuca Plate, which moves east-northeasterly at approximately four centimetres per year (Pacific Northwest Seismic Network, 2024). These active plate tectonics contribute to the Pacific's designation as the 'Ring of Fire,' a region renowned for its high concentration of geothermally active features.

Geology of the Pacific Islands

Scattered across the Pacific Ocean, lie a vast number of islands, including the Pacific Islands of Oceania. Often, this region is marginalised and generalised as a result of their comparatively small land area and population size when being represented in the literature of natural and societal change (Crocombe, 2001; Connell, 2010, 2011; Nunn, 2013). However, vast differences in geology, predominantly distribution, lithology, and elevation, exist and are key considerations which make Pacific Island countries unique. Through the classification of over 1,700 Pacific Islands, Nunn et al. (2016) described the islands as being unevenly distributed throughout the Pacific basin. The majority of the islands are found in the southwest quadrant, while the fewest are in the northeast quadrant. These islands are mostly clustered in linear patterns, but vast expanses of landless ocean exist, especially in the eastern Pacific (approximately 140–100°W) and in high-latitude areas. The distribution is dominated by small islands, with 67% being less than 10 km^2 and 44% being less than 1km^2 in area. A mere six percent are classified as large islands, those with an area greater than 100 km^2. Additionally, Nunn et al. (2016) have identified five key lithology types that compose Pacific Islands: volcanic, reef, limestone, composite, and continental. Volcanic islands are the most common, comprising 39% of the islands, followed closely by reef islands at 36%. Limestone islands account for 17%, while composite islands make up 7%. Islands with continental lithologies are the least common, representing only 1% of the total. Classification by elevation, reveals that 45% of the islands are lower than 30 meters, with 27% less than five meters and 26% higher than 100 meters (Nunn et al., 2016).

1. *When two plates collide and the denser oceanic plate is forced under the lighter continental plate*
2. *When material from the upper layer(s) of the dense oceanic plate get pushed up and onto the edge of the lighter continental plate*

2.1.2 Synergies between Pacific Islands and weather/ climate

The geological and geographical characteristics of the Pacific Islands significantly influence their environments and human livelihoods and microclimates, including land and sea breezes. High islands, such as those in Papua New Guinea and Fiji, have large, elevated terrains that generate distinct microclimates with regular land and sea breezes.

During the day, the land heats up faster than the sea, causing the air above it to rise and cooler sea air to move in, creating a sea breeze (Australian Bureau of Meteorology & CSIRO, 2011a). At night, the process reverses, producing a land breeze as the land cools faster than the sea. These breezes moderate the island temperatures, bringing moisture, rainfall, and cooling effects essential for diverse ecosystems, agriculture and comfortable living conditions. Low islands, often reef islands or atolls like those in the Marshall Islands, experience less pronounced variability in microclimates, due to their smaller landmasses and lower elevations (Australian Bureau of Meteorology & CSIRO, 2011b). The lack of significant elevation differences results in a less dramatic temperature contrast between land and sea, making the breezes weaker. Consequently, low islands tend to have hotter and more humid climates with less effective natural cooling and challenging ecosystem diversity, agriculture, and human comfort. Furthermore, single island countries, like Nauru and Niue, exhibit unique microclimates influenced by their isolation and specific geological features. Nauru's phosphate plateau affects its land and sea breezes by altering the typical thermal dynamics, while Niue's raised coral atoll structure influences the local air circulation patterns (Australian Bureau of Meteorology & CSIRO, 2011b).

2.1.3 Pacific Island climate vulnerability

The Pacific Islands, despite their shared traits of geographical remoteness, isolation, and heavy reliance on external trade, exhibit significant diversity in geology, geography, environment, and microclimate. These variations are crucial factors in understanding the islands as unique entities rather than homogenising them into a single group. The amplified effects of climate change on small islands, compared with larger landmasses, underscore the importance of recognising and addressing the unique challenges faced by the Pacific Islands. The boundedness of these islands, their small land areas, and their remoteness from more populated parts of the world contribute to the amplification of climate change impacts. Regional variations in phenomena like sea-level rise and extreme sea levels further highlight the need for localised adaptation strategies tailored to each island's specific circumstances. By acknowledging the diversity and localised differences among Pacific Islands, policymakers and stakeholders can develop more effective climate adaptation and mitigation efforts to safeguard the islands' ecosystems, economies, and communities for future generations.

The Pacific Islands are relatively small in land area making them particularly vulnerable to global environmental changes. Surrounded by the vast Pacific Ocean and isolated from the larger continents, the islands have developed unique ecosystems and cultures over millennia, making them invaluable reservoirs of biodiversity and Indigenous cultures (Mimura et al., 2018). However, such isolated nature presents challenges for the local communities like limited access to essential resources and service, thereby increasing their vulnerability to external issues with significant national and local implications (Barnett & Waters, 2016).

2.1.4 IPCC, Pacific voices, rationale for this chapter

The IPCC Assessment Report (AR) 6 (2021) report highlights the significant impacts of climate change on small islands, particularly the Pacific Islands, and underscores the growing vulnerabilities that affect local livelihoods and resilience. The report stresses the urgent need for both local adaptive strategies and international cooperation to bolster the resilience of Pacific Island communities amid ongoing and projected environmental changes. The Pacific Islands are especially vulnerable to climate change-induced phenomena such as sea-level rise, storms, and ocean acidification, which have already altered natural ecosystems and local communities' lifestyles and sense of security. For example, the devastating coastal inundation caused by Tropical Cyclone (TC) Winston in 2016 in Fiji (Figure 2.1) illustrates the severe impact on infrastructure and vegetation, with seawater reaching up to 200 meters inland in some areas (Government of Fiji, 2016).

Rising sea levels and increased frequency and intensity of severe tropical cyclones have severely damaged infrastructure and disrupted livelihoods, especially in low-lying atoll islands like those in Tuvalu (Australian Bureau of Meteorology & CSIRO, 2011b). Ocean acidification further threatens marine biodiversity and fisheries, which are crucial for many island economies. According to the IPCC AR6 (2021), under the Representative Concentration Pathways (RCP) 4.5 and RCP8.5 scenarios, severe coral bleaching is projected to occur annually on some small islands, worsening as temperatures exceed the 1.5°C threshold. This diminishes coral reefs' capacity to protect coasts from extreme waves and storm surges, exacerbating coastal erosion and inundation. Such localised differences, alongside regional and global climate patterns, must be addressed to frame effective climate adaptation and mitigation efforts discussed in subsequent chapters.



Figure 2.1: *Damage caused by TC Winston in 2016 on Vatulele village in Koro Island, Fiji. (Source: Jacot Des Combes, 2020)*

Despite their small size, Pacific Islands harbour diverse terrestrial and marine ecosystems supporting unique species and extensive coral reefs, essential for fisheries, coastal protection, and tourism. These ecosystems and the favourable tropical climate have supported lush vegetation and agricultural productivity, sustaining communities for generations. The islands' cultural heritage, deeply intertwined with the ocean and the climate, includes traditional knowledge systems and sustainable practices that have developed over centuries. However, climate change and increasing human development pressures threaten these practices and the resilience of island communities. Integrating traditional knowledge with scientific approaches is crucial for enhancing adaptive capacities and ensuring the sustainability of Pacific Island cultures and environments in the face of rapid climate change.

2.2 Understanding Pacific Islands climate

2.2.1 Pacific weather

General circulation systems

The tropical Pacific's climate is fundamentally shaped by the Hadley and Walker circulations (Australian Bureau of Meteorology & CSIRO, 2011a). The Walker circulation, introduced by Bjerknes in 1969, involves zonal components with ascending air in the equatorial western Pacific and descending air in the equatorial eastern Pacific. This circulation plays a crucial role in the region's weather, influencing patterns of precipitation and temperature. Meanwhile, the Hadley circulation, a thermally direct circulation, involves air rising near the equator, moving poleward aloft, and descending in subtropical regions, forming a belt of high-pressure systems (anticyclones) that generally move from west to east. High pressure systems occupying in the northeastern and southeastern Pacific are semi-permanent features of these areas. The belt, significantly affects weather patterns by driving the trade winds and contributing to the region's seasonal climate variations.

Trade winds and seasonal variations

These winds are persistent low-level flows that play a major role in defining the climatology of the area. In Hawaii, for instance, trade winds occur approximately 70% of the year, peaking during the summer months when they blow on around 90% of days. Conversely, during the Hawaiian cool season from October to April, the frequency of trade winds drops to about 50% due to the intrusion of extratropical storms (Hawaii Life, 2012). In the Mariana Islands, trade winds are most persistent during the winter months, highlighting the seasonal variability influenced by the shifting positions of the anticyclones and monsoon troughs (Li et al., 2023). In terms of trade wind intensity in the South Pacific, generally they tend to intensify/weaken from May to October/ November to April especially in tropical region when the subtropical high pressure zone shifting equatorward/poleward.

2.2.2 Pacific climate features/variability and their influence on Pacific Islands

The climate of the tropical Pacific region is very dynamic as it is influenced by various climatic features and modes of variability on different spatial and temporal scales. Two large scale features in the Pacific region include the Intertropical Convergence Zone (ITCZ) and the South Pacific Convergence Zone (SPCZ). Their movements, due to the different modes of climate variability, influence the weather and climate in the region. On intra-seasonal timescales, the dominant mode of variability in the tropical Pacific region is the Madden-Jullien Oscillation while on inter-annual timescales, the dominant mode of variability is the El Nino Southern Oscillation (ENSO) phenomenon. On even longer timescales, the Pacific Decadal Oscillation (PDO) modulates the climate in the region. Understanding each mode of climate variability and their impacts improves our knowledge of what can be attributed to natural versus anthropogenic influences in the region.

Convergence Zones

Convergence zones are critical features that shape the weather in the Pacific Islands. The near-equatorial trade wind convergence, referred to as the Intertropical Convergence Zone (ITCZ), is a key area of large-scale ascending motion and deep convection located zonally just north of the equator in the Pacific basin. This zone migrates with the seasons, reaching its northernmost extent during the boreal summer and moving southward in the boreal winter. Similarly, the South Pacific Convergence Zone (SPCZ) is characterised by low atmospheric pressure, cloudiness, and rainfall and is often associated with heavy rainfall and thunderstorms. The SPCZ is obliquely oriented and extends southeastward from Papua New Guinea to French Polynesia. The position of the SPCZ varies seasonally, moving northward during austral winter and southward during austral summer. The SPCZ exists all year-round and is very active in austral summer. Its intensity and movement are very important for small island countries in the South Pacific as it modulates the weather and climate of the region.

Madden-Julian Oscillation (MJO)

On timescales of between one to three months (intraseasonal), a planetary scale (~ 10,000 – 20,000 km) band of clouds with associated rainfall, originating over the Indian Ocean, moves eastward around the equator. This eastward propagating large-scale pattern of clouds and rainfall is known as the Madden-Julian Oscillation (MJO; Madden, 1971; Madden, 1972; Zhang, 2005). The MJO is prevalent during austral summer and coincides with high tropical cyclone activity in the Pacific region (e.g., Chand & Walsh 2010). For each cycle around the world, there are eight MJO phases. Phases six to eight are when the MJO is traversing the equatorial Pacific region enhancing the SPCZ and thus contributing to convectively enhanced rainfall in most places in the Pacific (e.g., Pariyar et al., 2016) and conditions conducive to cyclogenesis (e.g., Chand & Walsh, 2010; Diamond & Renwick, 2015; Tu'uholoaki, 2023). Given the importance of the MJO in modulating precipitation extremes and cyclogenesis, the MJO is an important source of sub-seasonal predictability for the region and as such, MJO forecasts are regularly monitored by most weather warning centres around the world on a weekly and monthly basis.

El Niño-Southern Oscillation (ENSO)

ENSO phenomenon oscillates between a warm phase (El Niño) and a cold phase (La Niña). An El Niño phase is characterised by warmer than average ocean temperatures in the central to eastern Pacific associated with a weakening of the trade winds. This leads to the SPCZ moving northeastwards towards the equator and merging with the ITCZ, which moves southwards towards the equator, resulting in increased rainfall near the equator and decreased rainfall in the western Pacific (Figure 2.2).

In contrast during a La Niña phase, opposite changes in ocean temperatures occur, with warmer than average temperatures found in the far western Pacific in conjunction with strengthened trade winds. This causes the SPCZ and ITCZ to move further away from the equator, resulting in reduced rainfall near the equator and increased rainfall in the south-west Pacific and north of the equator. During neutral years (in the absence of El Niño or La Niña phase) ocean temperatures are near average and relatively cooler in the central and eastern tropical Pacific.

El Niño and La Niña events typically begin to develop between May and June and last until the following March to May with peak intensities occurring during austral summer (McPhaden, 2008). While these events tend to follow a typical pattern of development, each event's strength and timing are different as indicated by the ENSO indicator, the Niño 3.4 index which is a measure of the average sea surface temperature anomalies in an equatorial region that shows dynamic changes during different ENSO phases (Figure 2.3). If maximum warming occurs in the central tropical Pacific rather than in the east, then the El Niño event is sometimes referred to as a central Pacific El Niño or an El Niño Modoki, which can have different impacts on some countries. For example, El Niño Modoki events have had a different impact on rainfall in Kiribati and Nauru than other canonical El Niño events (McGree, 2022).

ENSO has a profound influence on climate variables including rainfall, temperature, and sea level, and influences the risk of tropical cyclones in the region. ENSO events have distinct impacts on the rainfall of most Pacific Island countries, with changes in sea-surface temperature and winds associated with these events causing large-scale shifts in rainfall patterns (Table 2.1).

During El Niño (La Niña) events, sea level is relatively higher (lower) in the eastern Pacific due to the movement of waters zonally along the equator. This may cause elevated sea level temporarily in some countries. The 10-degree zone poleward of the SPCZ in the southwest Pacific is known as the favourable area for tropical cyclone formation (Tu'uholoaki et al., 2022). During El Niño events, when the SPCZ moves equatorward, the central and eastern Pacific are at higher risk to be impacted by tropical cyclones (Tu'uholoaki et al., 2022). In contrast, during La Niña events, when the SPCZ moves southwestward and away from the equator the western and central Pacific are at a higher risk.

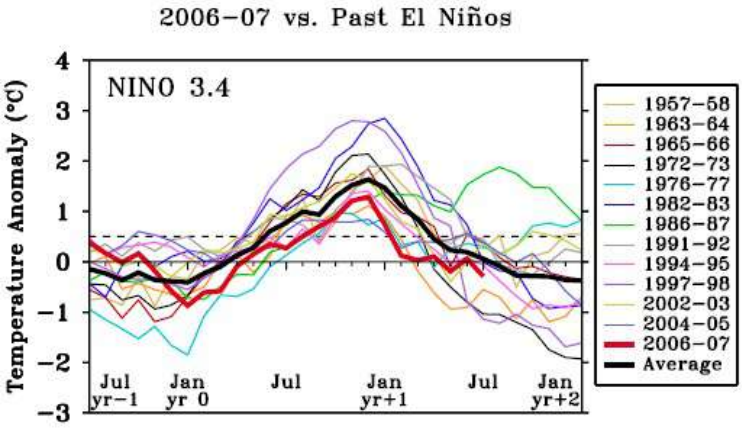


Figure 2.2: *Niño3.4 index for El Niño events since 1957-1958 to 2006-2007. Time series are split into 2.5-year segments starting July the year before the peak warm anomaly (Jul yr-1) and ending January approximately one year after the peak anomaly (Jan yr+2). Dashed horizontal line indicates the 0.5°C threshold for the definition, of El Niño warm anomalies. The thick black line is the average Niño 3.4 anomaly based on the twelve previous El Niños from 1957-1958 to 2004-2005. (Adapted from McPhaden, 2008)*

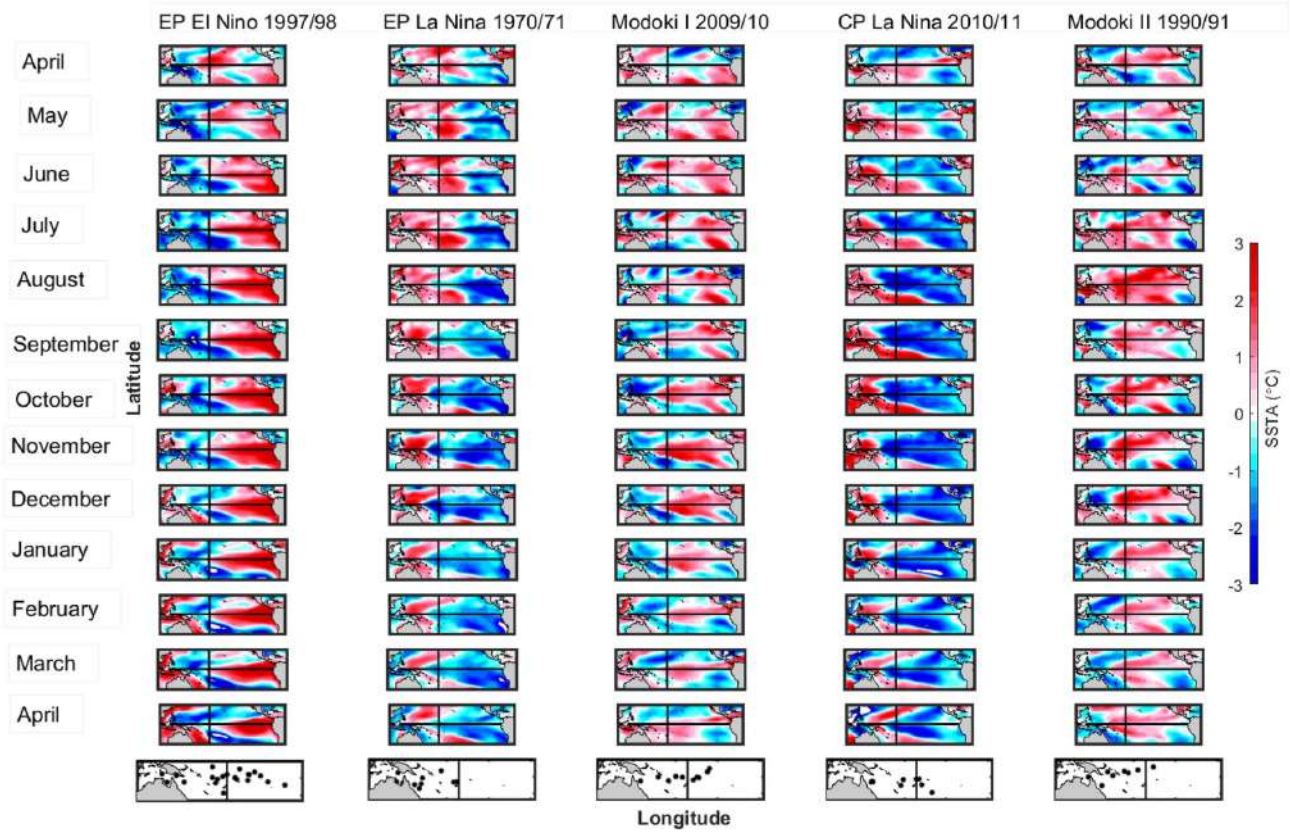


Figure 2.3: *Monthly SSTA from April of the year of ENSO onset to the following April for five selected ENSO events after removing the linear trend and the monthly climatology from 1970 to 2019: (first column) EP El Niño-1997/98, (second column) EP La Niña-1970/71, (third column) Modoki I El Niño-2009/10, (fourth column) CP La Niña-2010/11, and (fifth column) Modoki II El Niño1990/91. The horizontal and vertical lines (in black) represent the equator and date line, respectively, in each plot. At the end of each column (on the last row) are plots showing the geographical positions in the SWP of TCGs (in dark dots) that occurred in that particular TC season (Source: Extracted from Tu'uholoaki, 2023)*

Table 2.1: Summary of the impacts of El Niño and La Niña during November to April in each country and region, showing whether there is a clear change in rainfall and sea level. 'El Niño' covers all years of El Niño, and 'Extreme El Niño' includes only the years 1982/3 and 1997/8. (Source: Table adapted from Pacific-Australia Climate Change Science & Adaptation Planning Program)

Country	Region	El Niño	Extreme El Niño	La Niña
Cook Islands	North	Wet	Wet	Dry
	South	Dry	Very dry	Wet
Federated States of Micronesia	West	Dry	Very dry	No consistent impact on rainfall and sea level
			Lower than normal sea level	Higher than normal sea level
	East	Lower than normal sea level	Dry	Wet
			Lower than normal sea level	Higher than normal sea level
Fiji		Dry	Very dry	Wet
Kiribati	Gilbert Islands	Wet	Dry	Dry
	Line Islands	Wet	Wet	Dry
		Higher than normal sea level	Higher than normal sea level	Lower than normal sea level
Marshall Islands	North	Lower than normal sea level	Lower than normal sea level	No consistent impact on rainfall and sea level
				Higher than normal sea level
	South	Lower than normal sea level	Very dry	Dry
			Lower than normal sea level	Higher than normal sea level
Nauru		Wet	Dry	Dry
Niue		Dry	Very dry	Wet
Palau		Dry	Dry	Wet
		Lower than normal sea level	Lower than normal sea level	Higher than normal sea level
Papua New Guinea		Lower than normal sea level	Dry	No consistent impact on rainfall and sea level
			Lower than normal sea level	Higher than normal sea level
Samoa		Dry	Dry	No consistent impact on rainfall and sea level
			Lower than normal sea level	Higher than normal sea level
Solomon Islands		Dry	Dry	Wet
		Lower than normal sea level	Lower than normal sea level	Higher than normal sea level
Timor-Leste		Dry	Dry	Wet
Tonga		Dry	Very dry	Wet
Tuvalu		Wet	Wet	Dry
		Lower than normal sea level	Lower than normal sea level	
Vanuatu		Dry	Dry	Wet

Pacific Decadal Oscillation

The Pacific Decadal Oscillation (PDO) is a natural climate oscillation that occurs over a period of approximately 20 to 30 years and affects the temperature of the Pacific Ocean (Mantua & Hare, 2002). During a positive PDO phase, sea surface temperatures in the central and eastern Pacific tend to be warmer than usual, while the western Pacific tends to be cooler (Mantua & Hare, 2002). This can lead to increased rainfall and tropical cyclone activity in the western Pacific, including some Pacific Island countries and territories. Conversely, during a negative PDO phase, the opposite occurs, leading to drier conditions and reduced tropical cyclone activity in the western Pacific, and wetter conditions in the eastern Pacific. These changes in temperature and rainfall patterns can significantly impact agriculture, freshwater resources, and other aspects of life in Pacific Island countries and territories. For example, during a positive PDO phase, increased rainfall can cause flooding and landslides, while during a negative PDO phase, droughts may occur, leading to water scarcity and crop failures (Wang et al., 2014).

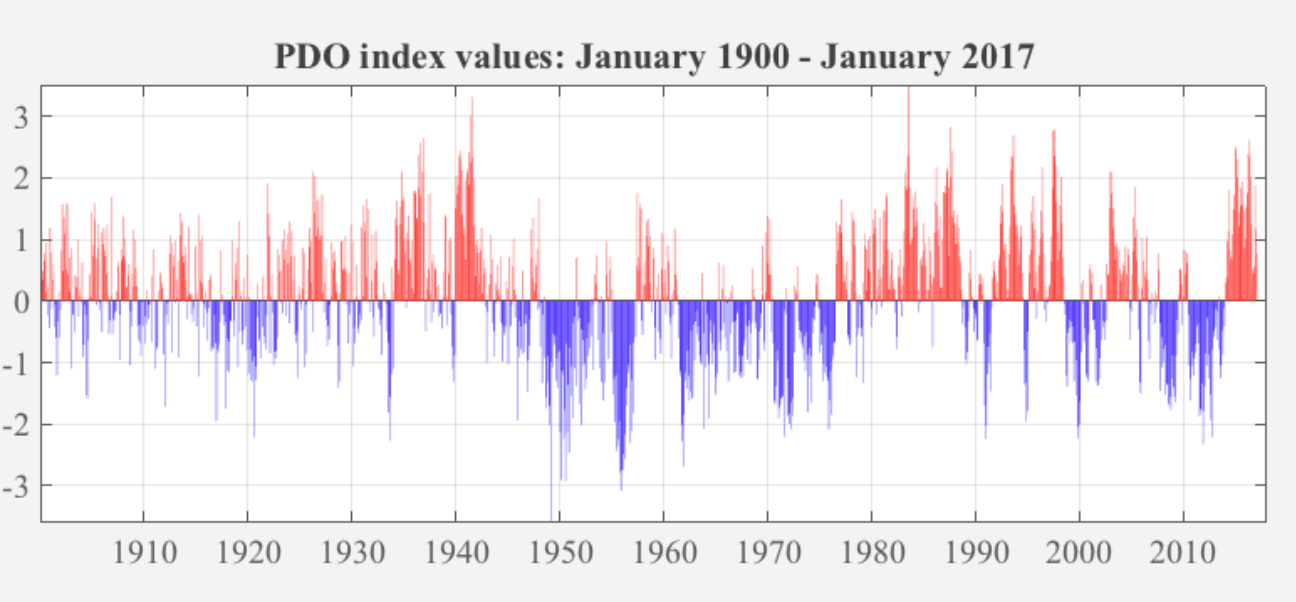


Figure 2.4: *The Pacific Decadal Oscillation Index over the last century showing PDO related 'cool' and 'warm' events. Source: http://research.jisao.washington.edu/pdo/*

2.2.3 Climate variability indicators in the Pacific region

Rainfall

Rainfall patterns in Pacific Island nations (see Table 2.1) are characterised by a high degree of variability and are influenced by various factors, including geographic location, local topography, and the interaction of atmospheric systems. The region experiences two primary seasons: the wet season and the dry season (Australian Bureau of Meteorology & CSIRO, 2011a). During the wet season, which typically occurs between November and April, Pacific Islands receive a significant amount of rainfall, often accompanied by tropical cyclones and heavy downpours. This period is crucial for replenishing freshwater sources, supporting agricultural activities, and promoting lush vegetation. In contrast, the dry season, occurring between May and October, is characterised by reduced rainfall and higher temperatures. This season poses challenges for agriculture and water availability, as water scarcity becomes a concern. However, some islands may experience localised rainfall patterns influenced by local winds, land-sea breeze systems, orographic effects, and El Niño or La Niña events.

Winds

Winds play a significant role in shaping the climate of Pacific Island nations. The region is influenced by the dominant trade winds, which generally blow from the east or southeast throughout the year (Australian Bureau of Meteorology & CSIRO, 2011a). These trade winds bring moist air from the ocean, contributing to the rainfall patterns observed in the region. However, there are variations in wind patterns across the Pacific Islands due to factors such as topography, proximity to equatorial or subtropical regions, and local weather systems. For instance, islands located in the path of prevailing trade winds experience a higher frequency of rainfall and stronger winds, while those shielded by larger landmasses may have more sheltered conditions. Local wind patterns, such as land and sea breezes, can also affect coastal areas, creating a cooling effect during the day and influencing localised rainfall patterns.

Temperature

Pacific Island nations generally experience warm and tropical climates throughout the year. The temperatures remain relatively consistent with minor seasonal variations. However, there can be variations in temperature due to factors such as elevation, proximity to ocean currents, and local weather patterns (Australian Bureau of Meteorology & CSIRO, 2011a). Coastal areas usually have slightly cooler temperatures compared to inland regions due to the moderating influence of the surrounding oceans. During austral summer, warmer temperatures result in increased convection and cloud cover resulting in higher rainfall. In contrast, austral winter brings cooler temperatures and reduced rainfall. Climate change poses a concern for rising temperatures, as higher heat levels can exacerbate existing challenges, such as water scarcity, heat stress, and impacts on ecosystems and agriculture.



> “Three types of wind – Aiue (Westerlies) bring lots of rain; Arre brings short spurts and erratic rain randomly and Ayub doesn’t bring much rain. The Aiue is the stormiest, but it’s still not a cyclone”
>
> Vincent Scotty
> Anabar District
> Nauru
> (POCCA research team interview, 2023)

A coastline in Nauru which has been receding fast in recent years (Photo: POCCA team, 2023).

2.3 Climate change and future trends

2.3.1 Historical climate change vs anthropogenic climate change

The Earth's climate has been changing for millions of years through numerous events. This change has been associated to internal or external forcings such as solar cycle modulations, significant volcanic eruptive activity and the more recent anthropogenic influences which have altered atmospheric composition.

Prior to the rise of the industrial revolution, past climates were determined mainly by natural events. During the Pleistocene Epoch (beginning two million years ago and ending 12,000 years ago), the temperature on earth and its climate changed numerous times. The last glacial period, which concluded 12,000 years ago, saw climate beginning to warm with increased temperatures at approximately 10 degrees Celsius every 100 years. In the last 5,000 years, an interglacial climate period has persisted, dominated by internal and external forcings over the previous Ice Age. For coasts, including the Pacific basin, environmental change during this period has primarily been changes in sea-level (Nunn, 2007). Pacific people who have occupied islands in the Pacific for over 3,000 years, have endured such climate-driven changes to their environment, which have challenged and resulted in the evolution of traditional knowledge to cope in the lands they occupy (Nunn, 2024). Anthropogenic climate change has resulted in an increased surface temperature of over 1°C globally for the previous decade alone (2011-2020) when compared to the 19th and beginning of the 20th centuries (1850-1906; Bongaarts, 2024). Much of this change is a result of the excessive emissions of greenhouse gases (GHGs) released by human activities. In the beginning of the 20th century, wholesale energy consumption rose making fossil fuels the primary source of that energy. In 2019, approximately 79% of global GHG emissions came from the sectors of energy, industry, transport, and buildings together and 22% from agriculture, forestry, and other land use (Bongaarts, 2024).

Carbon dioxide (CO2) in particular, is an important GHG in the climate change conversation and despite it occupying less than 0.04% of Earth's atmosphere, its presence has increased considerably by 25% (Matos, 2007). Global net human induced GHG emissions in 2019 were 12% higher than that of 2010 levels, largely supplied by CO2, followed by methane (IPCC, 2023). Global GHG emissions have continued to increase, with unequal historical and ongoing contributions arising from unsustainable energy use, land use and land-use change, lifestyles and patterns of consumption and production across regions, between and within countries, and among individuals (high confidence) (Bongaarts, 2024).

2.3.2 Anthropogenic influence

Comparatively, Least Developed Countries (LDCs) and Small Island Developing States (SIDS) have much lower per capita emissions than the global average (UN-OHRLLS, 2009). This is inclusive of the Pacific Islands. However, agricultural and land use activities in the islands could not only increase emissions but pose risks to the natural environment. In the Solomon Islands, though currently estimated to have net negative emissions as of 2022 due to its large, forested areas, such ecosystems are under pressure from logging activities and changes in land use. As a result, this could drive the country to net positive beyond 2050 (Ministry of Environment, 2023). The IPCC Sixth Assessment Report (IPCC, 2021) states that it is unequivocal that human influence has warmed the atmosphere, ocean and land with human activity being the main driver of this warming since the 1970s. It further states that anthropogenic influence has likely increased the change of compound extreme events for the past seven decades.

2.3.3 Climate change indicators

Key indicators of a changing climate in the Pacific in recent years have included rising atmospheric and ocean temperatures, sea level variations and upper-ocean heat content, changing rainfall patterns and many others. Low-lying islands and atolls remain some of the most vulnerable places to live in the world because of these events exacerbated by climate change. Some of these key indicators specific to this region are discussed below.

Temperature

Average temperature in the Pacific has increased by 1.1° C since 1951 (Figure 2.5) with the year 2020 being one of the warmest years recorded, 0.9 °C higher than the 1961-1990 average of 24.9°C (Marra et al., 2022). This warming trend occurs against a backdrop of inter-annual climate variability, attributable to El Niño and La Niña in the tropical Pacific. As a result, such naturally occurring drivers can have a modifying impact on Pacific climates (Whan et al., 2014; Dutheil et al., 2019).

The effects of climate change are not only creating more historically high atmospheric temperatures, they are also causing spells of increased temperatures in the ocean (Laufkötter et al., 2020). Regional average sea surface temperature has warmed over the past few decades, with an approximate overall warming of 0.9° C since 1982 (Marra et al., 2022).

Rainfall

For the last seven decades, insignificant changes to yearly precipitation in most islands have occurred resulting in drier trends and lower periods of rainfall particularly in the South Pacific subtropics.

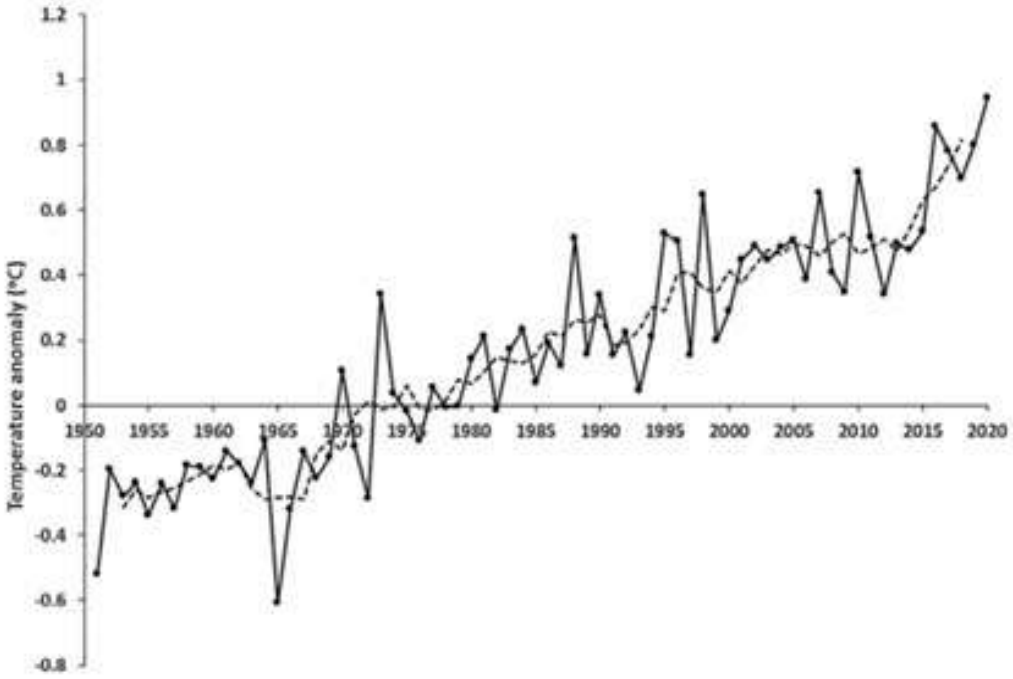


Figure 2.5: Shows increasing regional temperature anomalies from the 1950s to 2020. Dashed line indicates five-year running average. Graph adapted (Marra et al., 2022).

The placement of the ITCZ and SPCZ largely affects the higher variability and trends of a drier climate while in the equatorial Pacific, the ENSO phenomena influence rainfall in this area (Marra et al., 2022).

This can have implications for populations especially in low-lying atolls who depend on consistent rainfall for drinking water and agricultural practices.

Tropical cyclones

Examining threats, intensity, and frequency of TCs is essential for a coordinated response at individual country levels in the Pacific (Tu'uholoaki et al., 2022). Their impacts have caused devastating losses to human life and assets in island countries particularly situated in the southwest Pacific. Category 4 and 5 cyclones in recent times have led to significant economic losses from infrastructure, agriculture, and other sectors (e.g., 2015 TC Pam in Vanuatu and 2016 TC Winston in Fiji). Since 1980, the southwest Pacific has seen a significant increase in frequency of 34 knot wind events, as well as a rise in stronger TCs and stronger TC days (Tauvale & Tsuboki, 2019).

Sea level rise

Sea level rise has been a crucial topic for many islands in the Pacific. This issue relates to coastal inundation, erosion, and flooding (Oppenheimer et al., 2019; Storlazzi et al., 2018). The beginning of global sea level satellite measurements in 1993, which have largely been consistent with local rates of change from tide gauges, global mean sea level (GMSL) rose on average to 3.1 mm annually (Fox-Kemper, 2021).

Sea levels in the western tropical Pacific rose between 10 to 15 cm and in the central tropical Pacific between 5 to 10 cm. Natural variability patterns influence regional and local sea level variation at a seasonal, interannual, and multidecadal timescale (Marra et al., 2022).

Marine heat waves

Due to the overall rise in ocean temperatures for the past number of decades, marine heatwaves (MHWs) have become more frequent in recent years. (Laufkötter et al., 2020) demonstrated that these heatwaves are likely to occur on a yearly to decadal timeframe if mean air temperature moves up by 3°C: a sheer contrast compared to the once every hundred or thousand years in the pre-industrial era. In the tropical western and central Pacific region, MHWs have become more frequent in the last 40 years which have resulted in species mortalities, and coral bleaching in Samoa, Vanuatu, Fiji, Kiribati, and Palau (Holbrook et al., 2022). The biggest trends of increasing ocean heat content were found in Tokelau, Papua New Guinea, Solomon Islands and Nauru (Marra et al., 2022).

2.3.4 Tipping points

The latest IPCC report (IPCC, 2023) confirmed substantial damages and irreversible loss caused by climate change. Extreme heat and warming have affected many ecosystems and resulted in significant losses to biodiversity on land and in the sea. Warmer ocean temperatures have impacted the production of food in the fisheries sector. This could be particularly detrimental to Pacific populations whose largest natural resource is the Pacific Ocean. The likelihood of irreversible changes in the climate system inclusive of changes triggered when tipping points are reached, increase with further warming globally. Thus, as warming continues, so do risks of species extinction from forest ecosystems to coral reefs.

In terms of future trends, with the rise in GHG emissions the region is likely to experience further changes to climate. These include but not limited to:

- Continued drier trends in parts of the western and equatorial Pacific.
- Heavy rainfall events likely to increase in the western tropical Pacific.
- Continued warming in all future emissions scenarios, triggering more heat stress and extremes.
- Marine heatwaves and ocean acidification will rise further even with a 1.5 °C of global warming.
- Sea levels will very likely continue to increase around small islands with increasing emissions.
- Small islands could experience fewer but more intense tropical cyclones in the future, except for the central north Pacific where frequency will increase (Mycoo et al., 2022).

2.4 Recognising traditional understanding of climate science

2.4.1 Observation using traditional methods for weather and climate

It is well understood and documented that Pacific Islanders have strong and complex relationships to their marine environment as well as to the earthen land; with both providing material sustenance such as food, building material and medicine, and spiritual sustenance such as stories, culture and belief. Often overlooked however is that there exists also a rich history of traditional practices and cultural adaptations developed in response to understanding climate variability, forecasting extreme weather events and the physics of climate modes. These adaptations often incorporate Indigenous knowledge systems and oral traditions, passed down through generations, which provide invaluable insights into historical climate patterns and effective adaptation strategies.

Traditional forecasting extreme weather events

Forecasting extreme weather events is crucial for the survival and well-being of communities across the Pacific Islands. With the threat of cyclones, floods, droughts, and heatwaves looming large, being able to anticipate these events allows communities to take proactive measures to mitigate their impacts and adapt to changing conditions. Traditional knowledge, deeply ingrained in the cultural practices and belief systems of Pacific Islanders, has played a pivotal role in this regard (Lloyd et al., 2022).

Over generations, the Pacific Islanders have developed a keen understanding of their local environment, honing their ability to observe and interpret natural signs and phenomena. For instance, residents of Druadrua Island in Fiji can predict cyclones up to a month in advance by closely observing breaking waves, while specific phrases on Vanuatu's Torres Islands describe tidal conditions that hint at unusual events (Davis et al., 2020). Similarly, traditional lore in Samoa recognises various wind patterns that signal impending heavy rain or cyclones. Additionally, certain atmospheric conditions, such as a cloudless, dark blue sky or rapid cloud movements, are interpreted as precursors to cyclones. These observations, although rooted in Indigenous knowledge, are supported by scientific research, as changes in clouds and winds often precede cyclone development (Tu'uholoaki et al., 2023). Moreover, Pacific Islanders have observed the behaviour of animals and plants, which serve as additional indicators of weather changes. Frigate birds flying over land in Tonga, for example, indicate the development of cyclones, while insect-nesting behaviour can signal a wetter-than-normal wet season. This traditional knowledge, passed down orally between generations, not only explains the causes and manifestations of natural phenomena but also identifies the best ways to respond.

Traditional understanding of climate variability

Understanding climate variability is essential for survival and well-being of Pacific Islanders, given the region's vulnerability to extreme weather events and environmental changes. Over 3000 years of inhabiting the Pacific Islands, the communities have experienced a multitude of challenges, including migration, displacements, natural disasters, and changing climates (Adger, 2013; Nunn et al., 2024). These lived experiences have shaped Pacific Islanders' resilience and adaptation strategies, translating into a rich traditional knowledge of natural climate variability.

Pacific Islanders have honed their ability to observe and interpret the dynamics of their natural environment, encompassing the sky, land, and sea. This traditional knowledge, deeply embedded in cultural practices, empowers communities to anticipate and mitigate the impacts of climate-related threats such as tropical cyclones, droughts, and other extreme weather events (Nunn et al., 2024).

Clouds serve as dynamic indicators of atmospheric conditions and play a pivotal role in Pacific Islanders' weather forecasting practices. Different cloud types, from cirrus to stratocumulus, are associated with specific weather phenomena, providing valuable insights into future weather patterns. By closely observing cloud formation, movement, and characteristics, Pacific Islanders can make informed predictions, enabling them to take proactive measures to protect their livelihoods and communities.

Similarly, wind patterns are studied through meteorology, providing additional insights into impending weather events. Pacific Islanders categorise winds based on their direction, intensity, and associated weather conditions, allowing them to anticipate changes and prepare accordingly. Whether securing structures, safeguarding crops, or making arrangements for shelter, communities leverage their understanding of wind patterns to mitigate potential risks.

This traditional knowledge of cloud and wind patterns is deeply intertwined with scientific understanding, reflecting centuries of observation and empirical study. While modern technology has enhanced weather prediction capabilities, the ancient practice of reading clouds and winds remains a fundamental aspect of Pacific Islanders' resilience strategies (Adger, 2013; Nunn et al., 2024). Passed down through generations, this traditional wisdom empowers communities to adapt and thrive in their dynamic environment, preserving their cultural heritage while safeguarding their livelihoods.

Traditional understanding of climate modes and physics

Understanding the physics of climate is paramount for societies across the globe, as it provides crucial insights into weather patterns, environmental changes, and their impacts on livelihoods and ecosystems (Adger, 2013; Nunn et al., 2024). In the context of Pacific Islanders, this understanding takes on added significance due to the region's vulnerability to extreme weather events, such as tropical cyclones, as well as its reliance on marine and terrestrial resources for sustenance and cultural practices.

Pacific Islanders have cultivated a deep-rooted traditional understanding of climate physics, honed over centuries of living in harmony with their natural environment. This knowledge has been instrumental in various aspects of their lives, including travel, navigation between islands, and determining fishing locations. By observing and interpreting climate indicators such as trade winds, swell patterns, ocean currents, and wind interactions between air and sea, Pacific Islanders have developed sophisticated techniques to navigate their surroundings and optimise resource utilisation (Adger, 2013; Nunn et al., 2024).

In Palau for example, one of the fundamental climate modes mastered is the trade winds, locally known as rak (Lee, 2014). These winds delineate the transition between rainy and dry seasons in places like Palau, providing crucial cues for anticipating changes in weather conditions. For instance, during the Easterly Winds season, characterised by dry and windy conditions, vigilance for the possibility of typhoons increases among Palau villagers. By closely monitoring trade wind patterns, Pacific Islanders can make informed decisions about activities such as fishing and agriculture, mitigating risks associated with extreme weather events.

Traditional navigation techniques have been integral to Pacific Island culture for millennia, with Polynesian navigators exhibiting remarkable prowess in traversing vast distances between islands. By harnessing their understanding of climate indicators such as wind patterns, ocean currents, and wave formations, navigators charted their course with precision. Swell patterns served as reliable guides due to their consistency over long distances, providing a straight-line trajectory for navigation. Additionally, te lapa, described as underwater lightning or flashing lights, served as a crucial navigational aid, especially in the absence of visible stars or during daylight hours.

Beyond navigation, Pacific Islanders' understanding of climate modes has informed their fishing practices and resource management strategies. By recognising the influence of climate variability on fish migration patterns and ocean currents, Islanders can identify optimal fishing locations and times, ensuring sustainable resource utilisation. Practices such as coral reef conservation and rotational farming underscore the resilience of Pacific Island communities in adapting to environmental change.

2.4.2 Impacts of climate change on traditional climate observation

As the climate changes, traditional methods of weather and climate observation are becoming increasingly hindered. These traditional practices, which have been refined over generations, rely heavily on predictable patterns and seasonal variability. However, climate change is disrupting these patterns, making it challenging for Pacific Island communities to accurately predict weather and climate events using traditional knowledge alone.

To address these challenges, there is a critical need to integrate traditional knowledge with modern scientific observation practices. By combining the deep, place-based understanding that traditional knowledge holders possess with advanced scientific tools and data, communities can enhance their ability to cope with the impacts of a changing climate. For instance, integrating traditional weather signs and seasonal indicators with satellite data and climate models can improve the accuracy of weather forecasts and climate predictions. This blend of ancient wisdom and modern science allows communities to effectively anticipate and prepare for extreme weather events such as cyclones, floods, and prolonged droughts.

Integrating traditional practices with modern science is not just about improving weather forecasts; it is also about enhancing overall resilience. Pacific Island communities can implement proactive measures to minimise socio-economic disruption and human suffering caused by climate change. Revitalising traditional practices, implementing climate-smart agriculture, and incorporating ecosystem-based adaptation into development plans are ways to strengthen resilience. Education and technology transfer play pivotal roles in empowering communities to adapt to changing conditions while safeguarding their cultural heritage. By harmonising traditional wisdom with modern science, Pacific Islanders are charting a sustainable path forward, ensuring their resilience amidst climate uncertainty.

As Pacific Island nations confront the myriad challenges posed by climate change, there is a renewed emphasis on adapting traditional knowledge to contemporary contexts. Government policies, community-based initiatives, and international collaborations are all geared towards building resilience to climate impacts. This integration of traditional wisdom and modern adaptation strategies is crucial for addressing the dynamic and often unpredictable nature of climate change. Climate-associated shifts, such as changes in fisheries, marine heatwaves, and variations in the ENSO, underscore the need for adaptive and integrated approaches. By leveraging both traditional and modern knowledge systems, Pacific Island communities can better navigate the uncertainties of a changing climate while preserving their cultural heritage and ensuring a sustainable future.

2.5 Case studies of impact of climate change

The disruption caused by climate change affects a multitude of other traditional practices that depend on an understanding of seasonality and climate variability, such as agriculture, fishing, and cultural rituals. The ability to forecast seasonal changes and prepare for weather events is essential for maintaining food security, economic stability, and cultural practices. In this section, we explore some examples of how changes in physical components and drivers of climate can have a cascading impact. In the following case studies we explore some examples.

2.5.1 Case study 1: Climate change and coastal fisheries (giant clams)

Giant clams *(Tridacna spp.)* are among the largest bivalves in our oceans and were once abundant throughout the South Pacific, including Fiji (Moorhead, 2018). Their immense shell size and rich meat yield made them a valuable resource for local communities, serving as a staple food source and holding spiritual and cultural significance. However, due to overfishing, many species of giant clams have become extinct in several Pacific Island nations in the mid-20th century (Lewis et al., 1988).

In Fiji, the *Tridacna gigas*, one of the largest species of giant clams, became extinct due to overexploitation (Lewis et al., 1988). Through concerted conservation efforts, particularly at the Makogai Island Marine Research Station, these magnificent creatures are making a comeback (Moorhead, 2018; Lewis et al., 1988). This case study explores the journey from extinction to sustainable farming and the ongoing challenges posed by climate change.

Re-seeding Fiji's reefs

In the 1980s, recognising the ecological and cultural importance of giant clams, the Fiji Government initiated a breeding programme on Makogai Island (Lewis et al., 1988). *Tridacna gigas* clams were brought from the Great Barrier Reef in Australia to establish a hatchery aimed at creating a sustainable population that could reseed depleted reefs across Fiji (Lewis et al., 1988).

Makogai Island's marine research station focuses on the applied mariculture of giant clams and trochus clams (Figure 2.6). The breeding process involves carefully nurturing fertilised eggs through their vulnerable early stages, ensuring they find suitable reef habitats to attach and grow (Government of the Republic of Fiji, 2019). Despite high mortality rates due to predators and environmental challenges, the programme has succeeded in producing mature clams that can contribute to local populations (Government of the Republic of Fiji, 2019).

The hatchery at Makogai has been pivotal in reseeding reefs across Fiji, including notable locations such as Ovalau, Tokoriki, Tavarua, and Wakaya (Government of the Republic of Fiji, 2019). These efforts have helped restore ecological balance and bolstered local fisheries and tourism. By establishing protected breeding colonies, the initiative aims to ensure the survival of giant clams, allowing them to reproduce and repopulate the surrounding areas naturally.

Threats from climate change

Climate change presents several physical and ecological threats to giant clams, which are sensitive to changes in their marine environment. The primary threats include rising sea temperatures, ocean acidification, changes in ocean circulation patterns, and habitat loss due to climate-induced phase shifts. Each of these factors contributes to the vulnerability of giant clams and poses significant challenges to their conservation and sustainability.

1. Rising Sea Temperatures (Buck et al., 2002)

    - Bleaching Events:

    Mechanism: Giant clams, like corals, rely on symbiotic algae (zooxanthellae) within their tissues for nutrition via photosynthesis. Increased sea temperatures can stress these algae, causing them to be expelled from the clams' tissues.

    Impact: The loss of zooxanthellae leads to bleaching, which severely compromises the clams' ability to obtain energy, leading to reduced growth, reproductive failure, and increased mortality.

    - Thermal Stress:

    Mechanism: Prolonged exposure to elevated temperatures can disrupt the metabolic processes of giant clams.

    Impact: Thermal stress can cause physiological damage, reduce immune function, and make clams more susceptible to diseases and predation.

2. Ocean Acidification (Watson et al., 2012)

    - Decreased Shell Calcification:

    Mechanism: Ocean acidification, driven by increased CO^2 absorption, lowers the pH of seawater, reducing the availability of carbonate ions essential for calcification.

    Impact: This results in weaker, thinner shells, making clams more vulnerable to physical damage and predation. It also impacts their overall growth and survival rates.

    - Disruption of Biological Functions:

    Mechanism: Lower pH levels can interfere with physiological processes, including enzyme function and nutrient uptake.

    Impact: Acidification can impair reproductive success, larval development, and overall health of giant clams.

3. Changes in Ocean Circulation Patterns (Benzie et al., 1995)

    - Altered Spawning and Larval Distribution:

    Mechanism: Climate change can alter ocean currents and circulation patterns, which are crucial for the dispersal of clam larvae.

    Impact: Changes in currents can lead to misplacement of larvae, reducing their chances of finding suitable habitats and affecting population connectivity and genetic diversity

    - Nutrient Distribution:

    Mechanism: Altered circulation can change the distribution of nutrients in the water, affecting the primary productivity essential for the food web.

    Impact: Nutrient-poor waters can lead to reduced growth rates and reproductive success for clams, as well as impacting the broader marine ecosystem on which they depend.



Figure: 2.6: *Giant clams reared at the Makogai hatchery have been distributed to many of Fiji's marine protected areas (MPAs) which are managed by the local communities and hotels. Inset: The brooders especially the T.gigas have heavier body masses, which needs more manpower in transferring them from the ocean nursery to the land-based hatchery. Source: Fiji Sun, 16 October 2021 https://www.pressreader.com/fiji/fijisun/20211016/282205129076569)*

4. Habitat Loss and Climate-Induced Phase Shifts (Andréfouët et al., 2005; Purcell, et al., 2020; Rehm et al., 2022)

   - Destruction of Reef Habitats:

   Mechanism: Increased storm intensity, rising sea levels, and higher temperatures can physically damage coral reefs, which are critical habitats for giant clams.

   Impact: The loss of coral reefs leads to a loss of shelter and breeding grounds, directly affecting clam populations

   - Phase Shifts in Marine Ecosystems:

   Mechanism: Climate change can cause shifts from coral-dominated reefs to algal-dominated systems due to factors like bleaching, overfishing, and nutrient loading.

   Impact: These phase shifts result in habitats that are less suitable for giant clams, reducing available space for attachment and growth. Additionally, algal-dominated reefs can alter the local water chemistry, further stressing clam populations.

5. Restricted Habitat Range:

   Mechanism: As climate conditions change, the suitable range for giant clams may shift, often shrinking due to the loss of optimal environmental conditions.

   Impact: This restriction can lead to population fragmentation and isolation, making it harder for clams to maintain genetic diversity and resilience against environmental changes.

Conclusion

The threats posed by climate change to giant clams are multifaceted and interlinked, exacerbating the challenges in their conservation. Rising sea temperatures and ocean acidification directly compromise their physiological health, while changes in ocean circulation and habitat degradation further threaten their survival. Addressing these threats requires a comprehensive approach that includes climate mitigation, adaptive management, and enhanced conservation strategies to ensure the resilience and sustainability of giant clam populations in the face of a changing climate.

2.5.2 Case study 2: Climate change and tuna fisheries in Tonga

Introduction

The potential impacts of climate change on the distribution of tuna in Tonga's exclusive economic zones have yet to be investigated rigorously, and so their persistence and abundance in these areas remain uncertain. The most economically important tuna species in Tonga are albacore *(Thunnus alalunga)*, bigeye *(Thunnus obesus)*, skipjack *(Katsuwonus pelamis)*, and yellowfin *(Thunnus albacares)*, which account for over 95% of all tuna fisheries' annual catch (Ministry of Agriculture and Food, Forests and Fisheries; Fishery Forum Agency, 2022). Given Tonga's geographical location within the Western Central Pacific Ocean (WCPO), the country's tuna fisheries face the challenge of climatic variabilities such as global warming (Bell et al., 2018; Brander, 2007) and the ENSO (Di Lorenzo et al., 2010; Kumar et al., 2014), which threaten global fisheries production and impact the distribution and abundance of tuna (Asmamaw et al., 2019).

In this context, we designed a study that aims to predict future environmental conditions and their effects on species distribution, which is crucial for tuna species conservation and mitigation strategies for climate change impacts on biodiversity in Tonga. Here, we estimate optimal fisheries areas for albacore, bigeye, skipjack, and yellowfin. We consider different climate change scenarios—RCP 2.6, RCP 4.5, RCP 6.0, and RCP 8.5—within a set of tuna catch records in the exclusive economic zone (EEZ) of Tonga. Using environmental and catch per unit effort (CPUE) datasets, species distribution modelling estimated and predicted these fisheries areas in the current and future climatic scenarios. The information provided here will be relevant in planning future national actions towards proper management.

Methodology

In this study we used catch per unit effort (CPUE) of the Tongan Long Line fishery from 2002 to 2018 and the Bio–ORACLE version 2.0 environmental datasets. The CPUE data was calculated as the weight of the catch in metric tons divided by the number of hooks deployed per fishing record, providing a standardised measure of fishing efficiency and effort in capturing the target species (Martinez et al., 2021; Smith et al., 2022). The environmental variables selected were temperature, salinity, and current velocity, among other factors at the sea surface.

Secondly, we performed a statistical selection by employing the variance inflation factor (VIF) method, utilising the sdm package in the R environment (Naimi et al., 2014; R Development Core Team, 2018). We included all selected variables due to their low VIF (<3) and Pearson correlation coefficients (rho <0.7). We used the most optimistic scenarios RCP 2.6, RCP 4.5, RCP 6.0, and RCP 8.5 to forecast the future distribution of the four tuna species across the range of climate change predictions, respectively. Next, we built an ensemble model for each species using the selected predictor variables, the presence points of occurrence data, and three algorithms of the sdm R package version 1.0–67 (Naimi & Araújo, 2016). These algorithms were: generalised additive models (GAM), generalised linear models (GLM) and flexible discriminant analysis (FDA).

We obtained climatically suitable areas using a weighted method, where the presence probability (obtained using the ensemble function in the sdm) of each current and future scenario is multiplied by the cell's area, then subsequently summing all raster values (Cossarizza et al., 2019). This approach results in a conservative area that considers that occupancy is not equal between cells, hence the uncertainty underlying each cell in terms of presence probability. For example, if a cell had a 0.1 value, that is a 10% chance of the species occurring in the cell, we calculated 10% of the cell area and added it to the total area occupied by the species. We applied this weighted method to all current and future scenarios of all species.

Results and analysis

The ensemble models of the species were used to produce maps (Figure 2.7) showing the suitability areas or presence (invaded area, coloured grey and blue) of tuna species. The thresholds for the ensemble models of albacore, bigeye, skipjack, and yellowfin were 0.23, 0.24, 0.26, and 0.26, respectively. Pixels below the threshold were considered not suitable (uninvaded, coloured red) for the species. Future projections indicate a general expansion of suitability areas for all species (Table 2.2, Figure 2.8). Furthermore, our future projections also indicated a shift trend in suitability areas to the south of the EEZ for albacore and yellowfin (Figure 2.8a,c) and towards the north for bigeye (Figure 2.8b).

Skipjack suitability areas increase (Figure 2.8d) in the northern, central, and along the western areas of the EEZ. These trends of suitability habitats, considering all species, are expected to in-crease and remain mainly in the central and towards the southern part of the EEZ. Our projection shows that skipjack has the highest suitability habitat areas and then bigeye and yellowfin (Table 2.3 and Figure 2.8). Hence, we identified three main climatic stable areas from our future projection: the southern part (more pronounced for albacore and yellow-fin), the northern part (more pronounced for bigeye), and the central and along western parts (more pronounced for skipjack). Stable areas were generally higher in the year 2050 (for all RCPs for all species, except RCP 8.5 for albacore and skipjack), when considering all future scenarios agreeing with the size of the tuna predicted suitability habitats areas (Table 2.2) for the species.

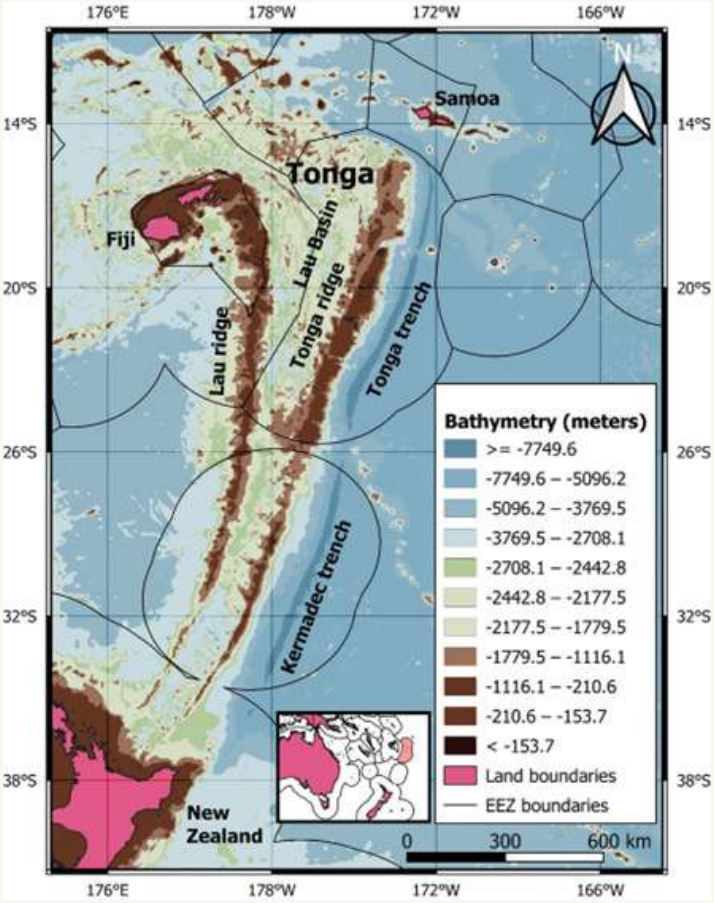


Figure 2.7: Map of the case study region, Tonga exclusive economic zone. Source: Vaihola, PhD Thesis, USP, in press.

Scenario	Albacore (km^2)	Bigeye (km^2)	Yellowfin (km^2)	Skipjack (km^2)	Total (km^2)
Current	10,222	32,876	18,503	17,350	78,951
RCP 2.6/2050	11,338	39,758	20,064	22,901	94,062
RCP 2.6/2100	11,105	43,466	19,787	26,158	100,515
RCP 4.5/2050	11,549	40,012	20,123	24,059	95,744
RCP 4.5/2100	11,011	33,558	19,353	22,000	85,923
RCP 6.0/2050	12,317	54,573	20,143	32,725	119,759
RCP 6.0/2100	11,670	41,539	19,667	29,964	102,840
RCP 8.5/2050	11,542	37,452	20,139	25,422	95,555
RCP 8.5/2100	13,095	48,053	20,015	56,682	137,845

Table 2.2: Total summed area in current and future scenarios taken within the EEZ (exclusive economic zone, latitude, longitude of Tonga using a weighted method described in Section 2.5. Source: Vaihola, PhD Thesis, USP, in press.

Scenario	% Increase Relative to the Current Scenario				
	Albacore	Bigeye	Yellowfin	Skipjack	Total
RCP 2.6/2050	10.92	20.94	8.44	31.99	19.14
RCP 2.6/2100	8.65	32.21	6.94	50.76	27.31
RCP 4.5/2050	12.99	21.71	8.76	38.67	21.27
RCP 4.5/2100	7.72	2.08	4.59	26.80	8.83
RCP 6.0/2050	20.50	66.00	8.86	88.61	51.69
RCP 6.0/2100	14.17	26.35	6.29	72.70	30.26
RCP 8.5/2050	12.92	13.92	8.84	46.52	19.76
RCP 8.5/2100	28.11	46.16	8.17	226.69	74.60

Table 2.3: The percentage increase of the future scenarios relative to the current scenario based on the assumption in maintaining present fishing efforts within the EEZ. Source: Vaihola, PhD Thesis, USP, in press.

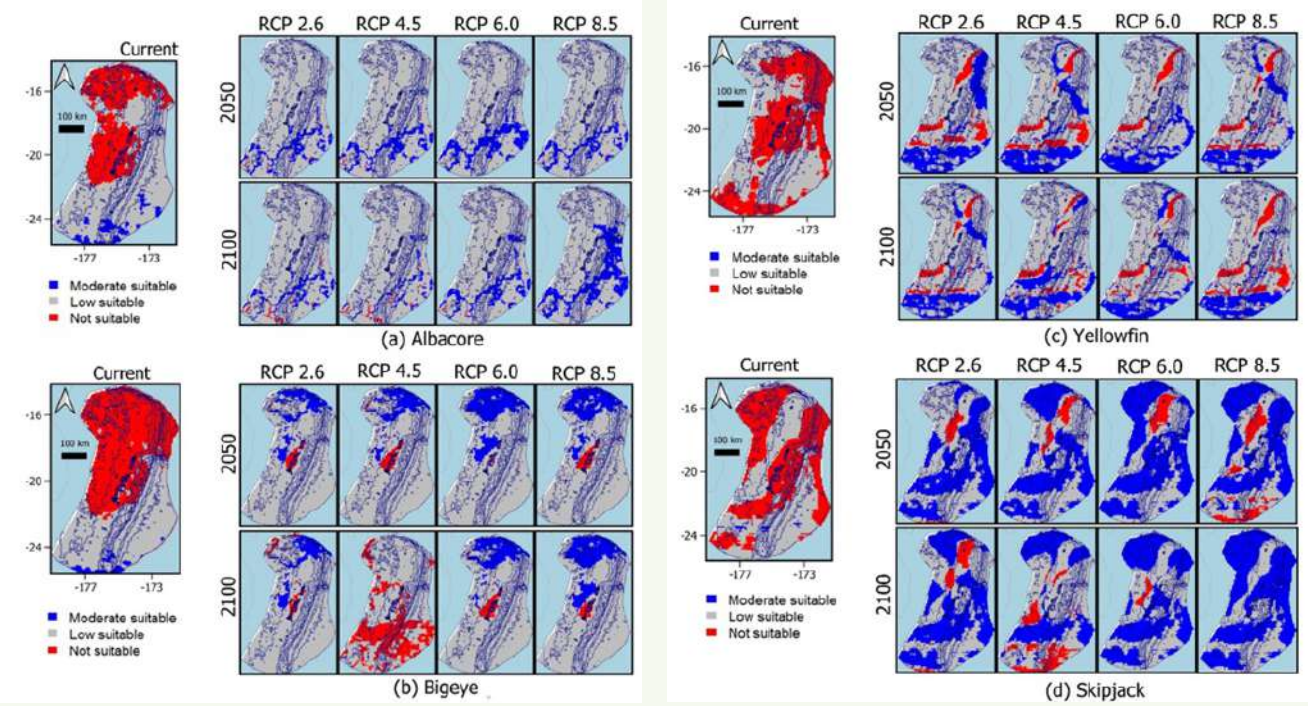


Figure 2.8: Projection distribution of suitability areas (invaded, indicated by blue and grey colours) and unsuitable areas (uninvaded, indicated by the red colour) for the current and future times for (a) albacore, (b) bigeye, (c) yellowfin, and (d) skipjack yielded by our ensemble niche models of each diagnostic species (see Table 1) taken within the EEZ. Also shown are the bathymetry contours (indicated by soft coloured blue lines) from the National Oceanic and Atmospheric Administration (51) data. Source: Vaihola, PhD Thesis, USP, in press.

Discussion & conclusion

We have predicted suitable habitats for four tuna species: albacore, bigeye, skipjack. and yellowfin in the current and future scenarios which may conserve species populations in the EEZ of Tonga. Considering environmental variation from current conditions to future scenarios of climate change in our models, RCP 8.5 in the year 2100 is likely to be more climatically stable for all four tuna species. It was also shown that tropical–subtropical tuna (bigeye, skipjack, and yellowfin) have more future occurrences and stable areas than temperate tuna (albacore) due to their ability to tolerate the environmental habitats in our study region. Furthermore, as discussed, we attributed climatically stable areas predicted in the current and future times to the environmental preferences of the species, the geologically bathypelagic features of the fishing ground, and the presence of pelagic prey species in the fisheries area.

Because our results were largely based on the use of environmental variables and catch data, our findings should not be treated as ready-made for on-the-ground application but could be used as one of many tools to help in the conservation planning of the studied species. We recommend that further studies on habitat suitability in the current study site be carried out for further quantification of the predicted occupancy status shown here. Furthermore, we also recommend that these future studies consider the inclusion of other environmental variables such as dissolved oxygen, mixed layer depth, sea surface height, and chlorophyll-a concentration as predictor variables. These variables have been shown as preferred habitats for various tuna species (Kininmonth et al., 2022; Martínez-Freiría et al., 2016) The application of species distribution modelling can be limited, for example, by model performance and the reliability of climatic future predictions (Naimi & Araújo, 2016) and by assuming that there is a balance between environmental changes and the spatial distribution of the species (Naimi et al., 2014) Nevertheless, our study provides a solid foundation for the future development of conservation measures aimed at the sustainable harvesting and management of the species populations. These findings are of relevance for conservation planning predicated on the protection of biodiversity under climate change scenarios.

2.5.3 Case study 3: Climate change and coastal circulation

Climate change and ENSO

The ENSO is the most significant natural interannual climate fluctuation, originating in the tropical Pacific Ocean and influencing global weather patterns, ecosystems, and economies. Understanding how climate change affects ENSO is crucial for developing accurate climate models and projections. This section explores the impact of climate change on ENSO, drawing on recent studies and reviews to highlight the complex interactions and potential future scenarios.

Increased ENSO activity and climate models

Recent studies have shown an increase in El Niño activity in the late twentieth century, suggesting a response to global warming. Jinbao Li et al. (2013) reconstructed ENSO activity over the past seven centuries and found anomalously high activity in recent decades, which constrains and improves climate models and projections . Similarly, Timmermann et al. (1999) projected that increasing greenhouse gas concentrations would lead to more frequent El Niño-like conditions and stronger cold events in the tropical Pacific Ocean.

ENSO frequency and intensity

The frequency and intensity of ENSO events are expected to change due to climate change. Cai et al. (2015) reviewed the state of knowledge on ENSO and greenhouse warming, concluding that climate change may increase the frequency of extreme El Niño and La Niña events, leading to more frequent ENSO-related catastrophic weather events. This is supported by Collins et al. (2010), who predicted significant changes in the tropical Pacific's mean climate, including weakened trade winds, warmer surface ocean temperatures, and altered thermocline structures, potentially affecting ENSO activity and frequency.

Challenges in predicting ENSO variability

Despite advancements in understanding ENSO, predicting its future variability remains challenging. Mason (2001) noted that recent El Niño episodes and reduced predictability of La Niña events are anomalies that may reflect a warmer climate's influence on ENSO predictability. The complex interactions between ENSO and other climate variability modes, such as monsoons and decadal climate oscillations, add to the uncertainty. Wang et al. (1999) highlighted the need for further research on ENSO's physical mechanisms, long-term variation, and predictive skill improvement.

Regional impacts of ENSO under climate change

ENSO significantly impacts regional climates, and these effects are likely to intensify with climate change. For instance, Cai et al. (2020) discussed ENSO's influence on South American climate, including floods and droughts, and noted that greenhouse warming could exacerbate these impacts. Similarly, Brönnimann (2007) reviewed ENSO's impact on European climate, noting seasonal modulation and nonlinear effects that could be influenced by future climate changes.

The impact of climate change on ENSO is a critical area of study with significant implications for global climate patterns and regional weather events. Increased El Niño frequency, more intense ENSO-related weather events, and challenges in predicting future variability highlight the need for continued research and improved climate models. Understanding these dynamics is essential for effective climate adaptation and mitigation strategies.

Intensification of TC Winston due to marine heat waves

In a warming ocean, the long-term effects on marine ecosystems, including crucial coastal ecosystems like mangrove forests, sea grasses, and coral reefs, have been linked to extreme Marine Heatwaves (MHWs) (Hodgkinson et al., 2014). MHWs are characterised by a prolonged period of unusually warm water in a specific location. The alterations to these marine ecosystems have a profound impact on human livelihoods worldwide (Pecl et al., 2017) and pose a significant challenge to socioeconomic development (Madin et al., 2012). MHWs also trigger changes in species distributions, ecosystem functions, and structure (Wernberg et al., 2013), leading to economic losses in the millions (Cavole et al., 2016).

Globally, there has been an increased frequency of MHW events and their duration (Holbrook et al., 2022). This trend is projected to continue throughout the 21st century (Amaya et al., 2020; Holbrook et al., 2019) due to long-term ocean warming (IPCC, 2022) IPCC documents that the mean global ocean temperatures are on the rise and have been the highest ever, as recorded by humans (Cheng et al., 2022). Significant data also validates increased MHW frequency over the last 100 years (Oliver et al., 2019). There was an increase in MHW frequency and duration in Oceania of 34% and 17% between 1925 and 2016, equivalent to a 54% increase in MHW days globally (Holbrook et al., 2019). As a result, storms, droughts, floods, and anomalously hotter-than-normal sea surface temperatures (SSTs) now have a more catastrophic effect on terrestrial ecosystems (Jentsch & Beierkuhnlein, 2017; Smith 2011).

Marine heatwaves and TC Winston

Tropical Cyclone Winston, a highly destructive Category 5 cyclone, made landfall in Fiji on Saturday, 20th February 2016. The event directly affected Fiji and stood as the country's most intense cyclone ever recorded. The initial impact occurred in Fiji's Eastern Division, causing severe damage to Koro, Ovalau, and Taveuni Islands. As the cyclone traversed Fiji's islands, it reached its peak intensity just before making landfall on the island of Viti Levu, the largest island. With maximum average wind speeds reaching 233 km h-1 and gusts peaking at approximately 306 km h-1, TC Winston ranked among the Southern Hemisphere's most potent cyclones. The cyclone disrupted the electrical grid and communication systems connecting the islands, leaving roughly 80% of the nation without power, including the entire island of Vanua Levu, where the confirmed death toll reached 44. Entire communities were obliterated, with approximately 40,000 people requiring immediate assistance. A total of 30,369 houses, 495 schools, and 88 health clinics and medical facilities suffered damage or destruction. Additionally, the cyclone caused extensive crop damage, affecting nearly 60% of Fiji's population's livelihoods. The estimated value of the disaster effects resulting from TC Winston in Fiji amounted to FJ$1.99 billion (US$0.9 billion), encompassing FJ$1.29 billion (US$0.6 billion) in damage (i.e., destroyed physical assets) and FJ$0.71 billion (US$0.3 billion) in losses (Esler, 2016).

TC Winston's passage over marine heatwaves

Prior to cyclogenesis, MHWS were detected all around Fiji waters. The passage of TC Winston was over waters where the maximum intensity of the MHW was above 1.2˚C. This indicated that the ocean SST was already at an extreme before the passage of TC Winston. During the MHW, SSTs increased to at least 31˚C. The mixed layer depth and temperature profiles were analysed at all points to examine the subsurface components of heating and cooling. The mixed layer is crucial to the physical climate, especially in oceanic and coastal regions. Ocean water has a much higher specific heat than air, meaning that the top ~2.5 m of the ocean can hold as much heat as the entire atmosphere above it. Therefore, the depth of the mixed layer plays a significant role in determining the temperature range in these areas. Even a small change in the mixed layer's temperature can substantially impact the atmosphere's temperature. In addition, the heat stored within the oceanic mixed layer is a significant source of heat that drives global variability, including phenomena such as El Niño Southern Oscillation events. The shallow mixed layer depth indicates extreme SST before both the MHW and the TC. The average temperature from the surface to 160 m depth (depth required to calculate OHC for slow-moving storms (Lin et al., 2008, 2013)) on the track of TC Winston was calculated and at every point along the track, the average temperature at each point on the track increased, with temperatures exceeding 29˚C. The cyclone traversed areas with elevated MHW intensity, indicating already warm ocean temperatures. SST increased during the MHW event, followed by relative cooling afterward. The study also analysed the mixed layer heat budget on the TC track, showing changes in temperature tendency and heat flux during the cyclone event. Additionally, the role of Ocean Heat Content (OHC) and Vertical Wind Shear (VWS) in TC intensification was explored, highlighting the complex interplay between these factors. Factors like OHC, translational speed, and VWS influenced TC intensification, with faster-moving storms able to intensify over shallower warm water layers. The study provides insights into the dynamic relationship between tropical cyclones and oceanic conditions, aiding in better understanding and forecasting of these weather events.

The findings revealed that the rise of the MHW before the cyclone's formation was primarily due to high sea surface temperatures (>~2˚C) and increased solar insolation into the ocean. Low wind speeds and the shoaling of the mixed layer resulted in an anomalously high thermal stratification. The temperature tendency during the MHW warming was predominantly governed by net surface heat flux which led to high level OHC's, therefore intensifying TC Winston which was already on a decline. Furthermore, the study found that the subsurface warming played a critical role in sustaining the mixed layer warming and providing heat potential for cyclone intensification. The strong MHW coincided with Tropical Cyclone Winston's track before declining. The cyclone's intensification resulted in the MHW's decline due to intense surface cooling and a homogenised water column.

2.5.4 Case study 4: Living and adapting to a changing climate – seagrass/mangrove marine resources

The science behind climate change shows that we need to reduce global greenhouse-gas emissions to avoid adverse impacts of climate change. Furthermore, the severity of climate change will depend on how much and how quickly we can cut greenhouse-gas emissions released into the atmosphere. Additionally, it has become evident that our climate is expected to change, and the impacts will be experienced globally.

Thus, recognising that warming of 1.5˚C or higher increases the risk associated with irreversible damages such as the loss of entire ecosystems has just been articulated in the IPCC report (IPCC, 2018).

The Pacific Islands, although described as vulnerable to climate change, are leading climate actions and combining their traditional knowledge with science to implement climate solutions.

National governments have recognised and support community effects to build resilient communities and ecosystems through ecosystem-based adaptation strategies that are entrenched in traditional knowledge and reinforced and supported by climate science, traditional leadership structures, and sustainable climate solution.

Ecosystem-based adaptation is defined as combining biodiversity and ecosystem services into an adaptation and development strategy that increases the resilience of ecosystems and communities to climate change through the conservation, restoration, and sustainable management of ecosystems (Colls et al., 2009).

Communities are establishing new protected areas and improving the management of existing protected areas, and developing climate-smart development plans that incorporate ecosystem-based adaptation.

In the Federated States of Micronesia, the community noted the following ecological impacts: declines in coral health, seagrass beds, and reduced fish populations due to increased sedimentation in the coastal environment and pollution run-off driving algal increases (LEAP, 2017).

Similarly, in Fiji, many coastal communities implement locally managed marine area (LMMA) to reduce threats facing coral reefs (e.g., controlling dynamite fishing and overfishing, coral and sand removal, commercial harvesting). The LMMA supports seasonal or permanent closures and fishery management through the traditional management system (qoliqoli). Based on the traditional qoliqoli system, coastal communities initiated an agreement to collectively enforce seasonal or longer closures of reef areas, based on scientific knowledge and community inputs, to ensure access to coral reef resources for future generations.

Additionally, many coastal communities, private and public sectors are actively involved in planting and restoring mangroves for coastal protection. Organisations such as Mangroves for Fiji, WWF, Ministry of Fisheries and Forestry, hotels, and resorts together with village youth and communities collaborate on mangrove rehabilitation and restoration in Fiji. Additionally, awareness programmes emphasising the importance of environmental conservation, especially the protection of mangroves, are conducted to let the villagers realise the true value of reforestation. Similarly, Fiji has established Mangrove Management Committee to assist private and public sector on mangrove issues. Furthermore, the committee has developed best practices mangrove planting guidelines to assist interested organisations and individuals learn more. This partnership is evidence of how traditional and scientific knowledge combination can assist in implementing a holistic community and ecosystem-based adaptation approach for climate solution.

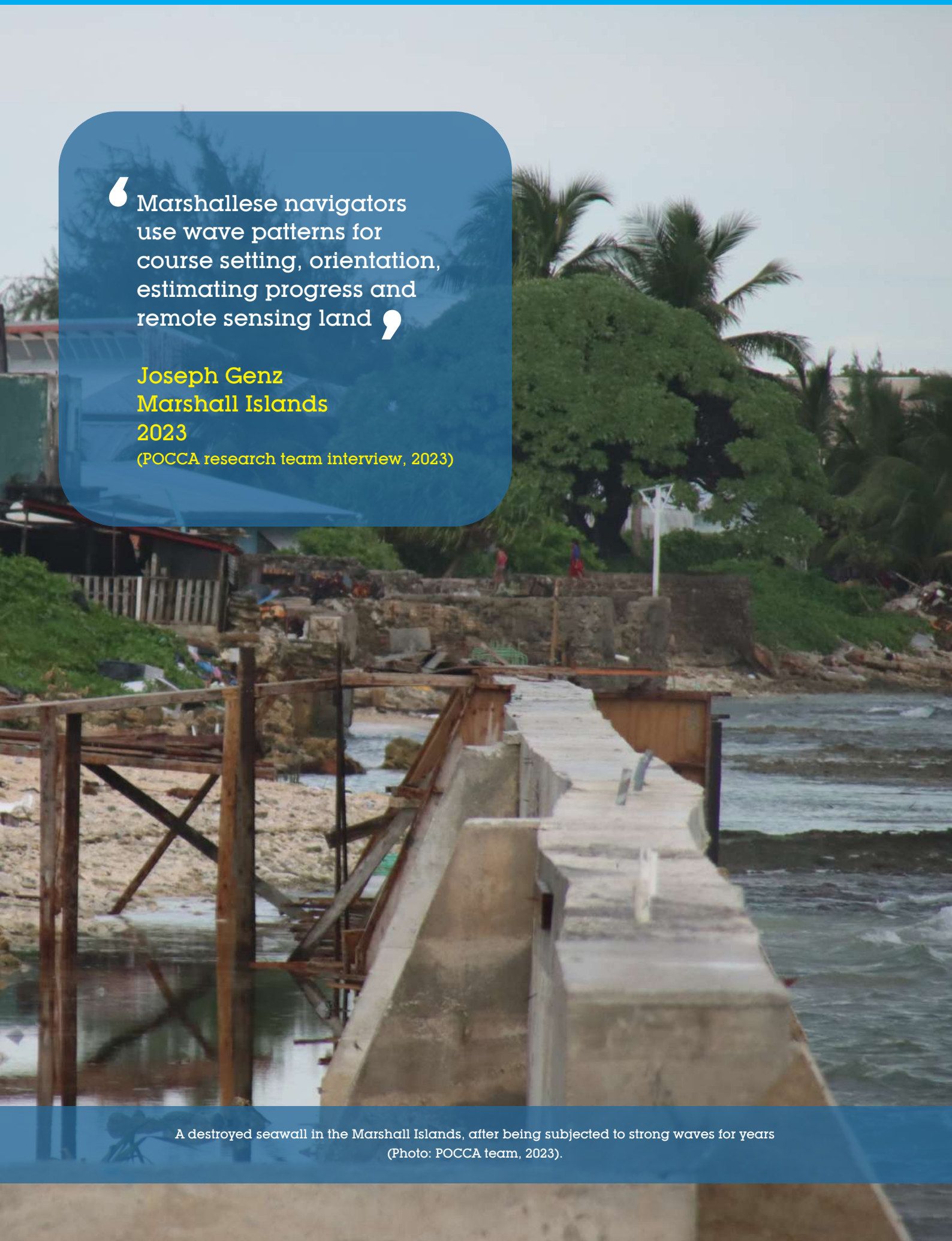
Currently, a pilot project in Dawasamu district, is underway in collaboration with German International Cooperation (GIZ), SPREP, SPC and tertiary institutions on restoring seagrass meadows. The project aims to create community awareness on the importance of seagrass meadows. So far, the project has tested multiple seagrass restoration techniques to re-establish seagrass meadows within degraded seagrass sites. The knowledge and lessons learnt from the pilot project will then contribute to developing management and restoration approaches on improving the health and extent of seagrass ecosystems in Fiji and the Pacific region.

2.6 Conclusion

The dynamic climate of the southwest Pacific region poses many different weather conditions daily for the numerous countries in the region. Influenced by climate variability on different timescales ranging from days to decades, and the geographical distribution of these islands over a large ocean continent, the challenges posed by extreme weather conditions need to be dealt with by the Pacific inhabitants on a regular basis. The situation is exacerbated by the imminent threats of human influenced global climate change impacts, such as from, sea level rise, increased ocean temperatures and increased uptake of carbon dioxide by the oceans, which cause loss of land, coral bleaching, and ocean acidification, respectively.

The topography of countries in the southwest Pacific region ranges from high volcanic islands (e.g., Fiji, Samoa) to low lying islands (e.g., Tonga, Nauru) and is dotted by atoll islands (e.g., Tuvalu, Kiribati). This makes the islands unique to the threats from both natural climate variability and anthropogenic climate change. Different islands face different challenges and so there is no one solution that fits them all. The challenges are further aggravated by the limited data available to provide robust scientific analysis on the environmental conditions on these islands. Hence there is an absolute need to increase the observational capacity in the region in terms of data collection, monitoring, and sharing for climate research and decision-making. This, in turn, hinges on regional cooperation, partnerships with global observing platforms, and international aid and support that can only come to fruition with a concerted effort from all PICTs.

The shortage of environmental data in the region to understand how Pacific countries have been dealing with continuous climate change over many decades/centuries has been ably compensated by the wealth of Indigenous and traditional knowledge passed down over many generations. This important source of information, though easily available, has not been well documented in the region. Consequently, it becomes difficult to understand how previous generations have coped with changing environmental conditions, and how effective they were. Their coping mechanisms may have changed over time making it even more difficult to comprehend them. However, combining whatever Indigenous/traditional knowledge can be documented now with modern scientific knowledge may provide solutions for how we cope with anthropogenic climate change in future.



> "Marshallese navigators use wave patterns for course setting, orientation, estimating progress and remote sensing land"

Joseph Genz
Marshall Islands
2023
(POCCA research team interview, 2023)

A destroyed seawall in the Marshall Islands, after being subjected to strong waves for years (Photo: POCCA team, 2023).

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Chapter 3

Climate Change and Ocean Governance in the Pacific: Challenges of Sovereignty and Political Agency

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Funafala, one of the many islet in Funafuti Atoll, Tuvalu, often experiences king tides which sweep across the tiny island from both sides with little to no protection for the community (Photo: POCCA team, 2023).

Abstract

Chapter 3 looks at governance of the climate/ocean nexus in the Pacific region. It focuses on Pacific Islands Countries and Territories (PICTs) as global norm entrepreneurs in international and regional frameworks to successfully manage the threats to their sovereign rights at the time of climate crisis. The chapter begins with examples of international ocean and climate regimes in which PICTs have played an influential role as political actors, framing the norms of global governance and international law. It then looks at sea level rise as a threat to state sovereignty in the Pacific region. Furthermore, the chapter looks at the work done by the Pacific Islands Forum to protect regional state sovereignty and maritime boundaries, as well as the innovative national approach adopted by Tuvalu. Finally, the chapter discusses ocean management by looking at the examples of Pacific engagement with critical marine resources.

Glossary of key terms

Falepili	Reciprocity, care
Kaitasi	Shared responsibility
Olaga fakafenua	Communal system



> "The seawall gives us more space to the ocean side and also improves the sea breeze in the hall. Before the seawall we experience water coming in our hall"

Lise Suiola
Disaster Relief & Recovery Officer
Funafuti
Tuvalu
(POCCA research team interview, 2023)

Land reclamation projects in Funafuti, Tuvalu are an ongoing effort increase land size and elevation as a part of the Tuvalu Coastal Adaptation Project (TCAP). (Photo: POCCA team, 2023).

3.1 Introduction

> To secure a future for our people, we will deepen our collective responsibility and accountability for the stewardship of the Blue Pacific Continent and protect our sovereignty and jurisdiction over our maritime zones and resources, including in response to climate change induced sea level rise, and strengthen our ownership and management of our resources (PIFS, 2022, p. 10).

The status of Pacific Small Island Developing States (PSIDS)[1] in international climate and ocean regimes is intriguingly twofold. On the one hand, PSIDS together with other SIDS are considered to share characteristics that make them uniquely vulnerable to the negative impacts of climate change (Mycoo et al., 2022). On the other, PSIDS have for decades played an important and innovative role in the (re)construction of climate and ocean policies and laws, with examples varying from the early negotiations of the United Nations Convention on the Law of the Sea (UNCLOS) and the United Nations Framework Convention on Climate Change (UNFCCC) to the Paris Agreement. Through their active participation at various global forums, PSIDS have become recognised as norm entrepreneurs in international climate and ocean politics and international law-making (Betzold et al., 2012; Corbett et al., 2019; Corbett et al., 2021).

This chapter analyses the relationship between the ocean and climate from the perspective of different levels of governance, specifically looking at how PSIDS have responded to the challenges through legal and political mechanisms available for them. The focus of this chapter, therefore, is on the Pacific states and their international and regional political agency. The chapter begins by demonstrating how PSIDS have influenced the crucial moments in the development of international climate and ocean regimes. The first section therefore looks briefly at the history of important United Nations oceans and climate frameworks, highlighting the role PSIDS have played in the governance of the global ocean/climate nexus. The section illustrates how, since the development of the international law of the sea, as well as the international climate regime, PSIDS have had an instrumental role in shaping international norms.

The chapter then addresses sea level rise as a specific concern of low-lying atoll nations and explores its potential impact on state sovereignty and territorial entitlements in the Pacific context.

By elaborating the regional approach on maritime boundaries and state sovereignty, as well as national policies, practices and laws adopted by the state of Tuvalu, the section examines how Pacific states have attempted to mitigate the risks to their sovereignty by adopting innovative approaches to international law and foreign policy. As we will illustrate, the Pacific approach to sovereignty incorporates the ocean as an inseparable element of territoriality of Large Ocean States.

1. *This chapter refers to the Pacific Islands Countries predominantly by using the term PSIDS. The decision to do so derives from the chapter's focus on state actors in international and regional settings, in which PSIDS has become a common reference in relation to the independent Pacific Islands Countries and as a sub-group of SIDS that includes Small Island Developing States from other regions.*

In the final section, the chapter provides an examination of the global and regional regulation of the ocean. Here, the capacities of ocean governance in the Pacific are examined by looking at different maritime sectors and the ways in which PSIDS have engaged with either managing or utilising marine resources. The purpose of this section is to identify some key issues and concerns of the ocean/climate nexus that not only have a particular importance in the Pacific context but also emphasise the political agency of PSIDS in governing the ocean internationally and regionally.

3.2 PSIDS as the global norm entrepreneurs

Small Island Developing States, including those in the Pacific region, are considered 'uniquely vulnerable' by the international state system. These unique vulnerabilities were recognised by the United Nations at the Conference on Environment and Development (the Earth Summit) in 1992. As stated in the UN Framework Convention on Climate Change (UNFCCC),

> ...low-lying atolls and other small island countries, other countries with low-lying, arid semi-arid areas or areas liable to floods, droughts and desertification, and developing countries with mountainous ecosystems are particularly vulnerable to the adverse effects of climate change (United Nations, 1992, pp. 4-5).

According to Corbett et al. (2019, p. 648), the unique vulnerability of PSIDS is based on three factors: first, PSIDS have a narrow export base, making them vulnerable to global economic changes and shocks; second, many PSIDS have fallen into the 'middle income trap,' being dependent on international aid yet having weak prospects to develop to the level of industrialised nations; and, third, most PSIDS have a high level of indebtedness, often worsened by the regular need to borrow for reconstruction after adverse climate events. Despite these shortcomings, PSIDS have skillfully used the international recognition of vulnerabilities to their benefit in different global settings by utilising various forms of groupings and coalitions to collectively draw attention to the matters important to them.

Through multiple multilateral groups and alliances (e.g., AOSIS, G77, LDC), PSIDS have been able to influence international norms and policies at different frameworks of global governance in the international organisations (Carter, 2016; Manoa, 2016). While participation in international regimes can indeed raise the profile of PSIDS, there are also significant capacity limitations that cannot be ignored when thinking about the role of small states in influencing the international climate and ocean laws and policies and these have been covered in relevant literature (see e.g., Baldacchino, 2023; Corbett & Connell, 2015). That said, several studies show how PSIDS have been instrumental in developing the international norms of climate change and ocean governance, and below we will highlight four such instances, show-casing PSIDS as global norm entrepreneurs (Corbett et al., 2021; Goulding, 2016; Carter, 2016).

3.2.1 United Nations Convention on the Law of the Sea: Implications on the Pacific

SIDS together with other coastal and archipelagic countries, played a crucial role in the development of the UN oceans regime. In the post-Second World War era, many of the newly independent, decolonised states were island and coastal communities and it was in their national interest to guarantee the protection of maritime entitlements. The international law of the sea can be historically traced back at least to Hugo Grotius, who famously, in his Mare Liberum (published in 1609), defined the ocean as 'the common to all' (Powers & Stucko, 2013, pp. 124-125). Due to imperial Europe's 'terrestrial bias', the ocean was consequently viewed as 'mare nullius' – no one's sea – and it was not until the process of decolonisation that its status became genuinely internationally challenged (de Carvalho & Leira, 2023). While there were failed attempts to codify the law of the sea already by the League of Nations, as well as by the United Nations in the late 1950s, it took three rounds of international negotiations between the UN member states before the United Nations Convention on the Law of the Sea (UNCLOS) was adopted in 1982 (Powers & Stucko, 2013). Fiji was the first country to ratify the treaty.

One of the key functions of UNCLOS is to provide a legal framework within which maritime entitlements and boundaries are negotiated and determined, while at the same time maintaining 'mare liberum' in the Grotian sense – an open and peaceful access to the oceans by all nations (Singh 2022, 73). UNCLOS divides the seas into five general zones: internal waters, territorial waters, the contiguous zone, the exclusive economic zone (EEZ) and the high seas. It further spells out the specific rules for maritime jurisdictional areas of archipelagic states (Powers & Stucko, 2013, p.126). According to Article 2 of UNCLOS, 'the sovereignty of a coastal State extends, beyond its land territory and internal waters and, in the case of an archipelagic State, its archipelagic waters, to an adjacent belt of sea, described as the territorial sea'. The outer limit of territorial sea, furthermore, is defined in Article 4 as 'the line every point of which is at a distance from the nearest point of the baseline equal to the breadth of the territorial sea'.

According to UNCLOS, every state with a coast has a right to establish the breadth of its territorial sea up to 12 nautical miles, measured from the baseline (Article 3). A normal baseline2 is the low-water line along the coast as marked on large-scale charts officially recognised by the coastal State (Article 5).

The EEZ, in turn, is defined as 'an area beyond and adjacent to the territorial sea, subject to the specific legal regime…under which the rights and jurisdiction of the coastal State and the rights and freedoms of other States are governed by the relevant provisions of this Convention' (Article 55). The state's EEZ shall not, as stated in Article 57, extend beyond 200 nautical miles from the baseline.

As explained in the previous chapter, and illustrated by Figure 3.2 below, PSIDS hold substantial exclusive economic zones:

> …as large oceanic States within a Blue Pacific Continent, Pacific countries have a profound connection to and reliance on the exclusive economic zone, which is at the heart of our geography, cultures and economies (PIFS, 2021a).

2. It is important to note that UNCLOS defines different ways to determine baselines (see International Law Commission 2020, p. 23). We would like to thank Karen Scott for emphasising this point. For the purposes of this work, whether baselines are considered permanent or ambulatory (see next section), is the significant matter.

Because PSIDS have small land territories, it has been in their interests to actively engage in the development of the law of the sea. Ambassador Satya Nandan, who was Fiji's principal negotiator at the Third Conference of UNCLOS negotiations, explains in his memoirs how Fiji, which had become independent only in 1970, took a proactive role in the process leading to the ocean treaty (Nandan, 2021). During the negotiations, Nandan served as a rapporteur of the Second Committee and therefore had a crucial drafting role for example in relation to Article 121 of the Treaty, establishing for the regime of islands (Nandan, 2021 pp. 138-141). Fiji also joined the Committee on the Peaceful Use of the Seabed and Ocean Floor, influencing therefore the articles important to the 'common heritage of mankind'.3

In the words of deLoughrey, 'in many ways, the 1982 Convention legitimated Indigenous philosophemes of environmental guardianship, particularly those drawn from the Pacific Islands' (deLoughrey, 2007, p. 33). UNCLOS became what she calls 'the most important remapping of the globe in recent history – a remapping of global sovereignty and common space (deLoughrey, 2007, p. 99) While UNCLOS brought significant changes into the ways in which the Pacific traditionally approached the ocean as vast and open (Hau'ofa, 2008; Hills et al., 2022), it also provided important 'maritime sovereignty' through territorialisation at sea (Strating & Wallis, 2022). The maritime zones recognised by UNCLOS, providing for territorial sovereignty at sea, transformed SIDS into significant political actors; the Large Ocean States (Baldacchino, 2022, p. 600).

The Pacific engagement with UNCLOS has continued to be active to this day. In 2021, Tuvalu together with a Caribbean SIDS Antigua and Barbuda initiated the establishment of the Commission of Small Island States on Climate Change and International Law (COSIS). The purpose of COSIS is to promote and contribute to implementation and progressive development of rules and principles of international law concerning climate change and maritime law. In the agreement founding the entity, the parties to the Commission affirm that maritime zones, 'as established and notified to the Secretary-General of the United Nations in accordance with the 1982 United Nations Convention on the Law of the Sea, and the rights and entitlements that flow from them, shall continue to apply, without reduction, notwithstanding any physical changes connected to climate change-related sea level rise' (ITLOS, 2021). The current membership of the Commission includes, in addition to the founding members of Tuvalu and Antigua and Barbuda, Niue, Palau, St. Lucia, Vanuatu, Saint Vincent and the Grenadines, Saint Kitts and Nevis, and the Bahamas.

In 2022, COSIS requested for an Advisory Opinion from the International Tribunal for the Law of the Sea (ITLOS), an independent judicial body established by UNCLOS adjudicating disputes arising from the interpretation and application of the Convention, to provide for two legal questions related to the treaty.

3. In his memoirs, Nandan describes the tensions between the developing and developed countries in negotiating the Part XI deep sea mining provisions: 'The ideological divide between developing states and industrialised states became readily apparent. While developing states readily lined up in support of the common heritage of mankind principle, believing deep seabed mining activities would provide the opportunity for the fair and equitable distribution of wealth amongst the rich and the poor. Industrialised states, on the other hand, driven by national interests and the opportunity to secure mineral resources, argued that a new regime based on the common heritage of mankind would conflict with the freedom of the high seas and traditional uses of the oceans' (Nandan 2021, pp. 143-144). We discuss deep sea minerals in the last section. We would again like to thank Karen Scott for reminding us about the important role the Ambassador Nandan and Fiji played in these negotiations.

The first question asked what are the specific obligations of states to 'prevent, reduce and control pollution of the marine environment in relation to the deleterious effects that result or are likely to result from climate change, including through ocean warming and sea level rise, and ocean acidification, which are caused by anthropogenic greenhouse gas emissions into the atmosphere?'. In the second, ITLOS was asked to advise what are the specific obligations of states under UNCLOS 'to protect and preserve the marine environment in relation to climate change impacts, including ocean warming and sea level rise, and ocean acidification?' (ITLOS, 2022).

The Tribunal gave its Advisory Opinion on 21 May 2024. In its ground-breaking opinion, ITLOS establishes that anthropogenic greenhouse gas (GHG) emissions in the atmosphere constitute pollution of the marine environment as defined in Article 1 of UNCLOS. The Tribunal further states that the state parties to UNCLOS have 'the specific obligations to take all necessary measures to prevent, reduce and control marine pollution from anthropogenic GHG emissions and to endeavour to harmonise their policies in this connection'. The Advisory Opinion confirms that the state parties have the specific obligation to take all measures necessary 'to ensure that anthropogenic GHG emissions under their jurisdiction or control do not cause damage by pollution to other States and their environment, and that pollution from such emissions under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights'. The Advisory Opinion also stipulates that the state parties have obligations to ensure laws and regulations, nationally and in cooperation with other states, that prevent, reduce and control pollution of the maritime environment (ITLOS, 2024). The Advisory Opinion is significant in terms of the ocean/climate nexus as it makes direct connections between due diligence obligations of states under UNCLOS and other relevant legal frameworks, such as the Paris Agreement and its climate change goals – most importantly, the goal to limit global warming to 1.5°C, which was a demand introduced to the Paris Agreement by PSIDS.

3.2.2 Regionalising the Paris Agreement

In 1991, when the United Nations Framework Convention on Climate Change (UNFCCC) was still being negotiated, Vanuatu on behalf of AOSIS proposed an article on permanent and irreversible loss and damage to be introduced to the new climate treaty (United Nations, 1991). As we now know, it took 20 more years before Article 8 on loss and damage was codified in the Paris Agreement in 2015. To that end, important interventions by both AOSIS and PSIDS were delivered (Burkett, 2015; Corbett et al., 2021; Fry, 2016). As will be discussed in detail in Chapter 14, loss and damage has since become a central mechanism for PSIDS to seek for climate justice.

In addition to loss and damage, the significant contribution of PSIDS to the Paris Agreement was the inclusion of 1.5°C ('to stay alive') into Article 2. The goals for PSIDS regarding the Paris climate conference were outlined in the Suva Declaration, adopted by the Pacific Islands Development Forum in September 2015. The Suva Declaration called for limiting the global average temperature increase to 1.5°C and demanded anchoring loss and damage as a standalone article, distinguished from adaptation measures (PIDF, 2015). Both 1.5°C and loss and damage were successfully included to the final climate treaty and have become important benchmarks for climate action and Pacific climate advocacy.

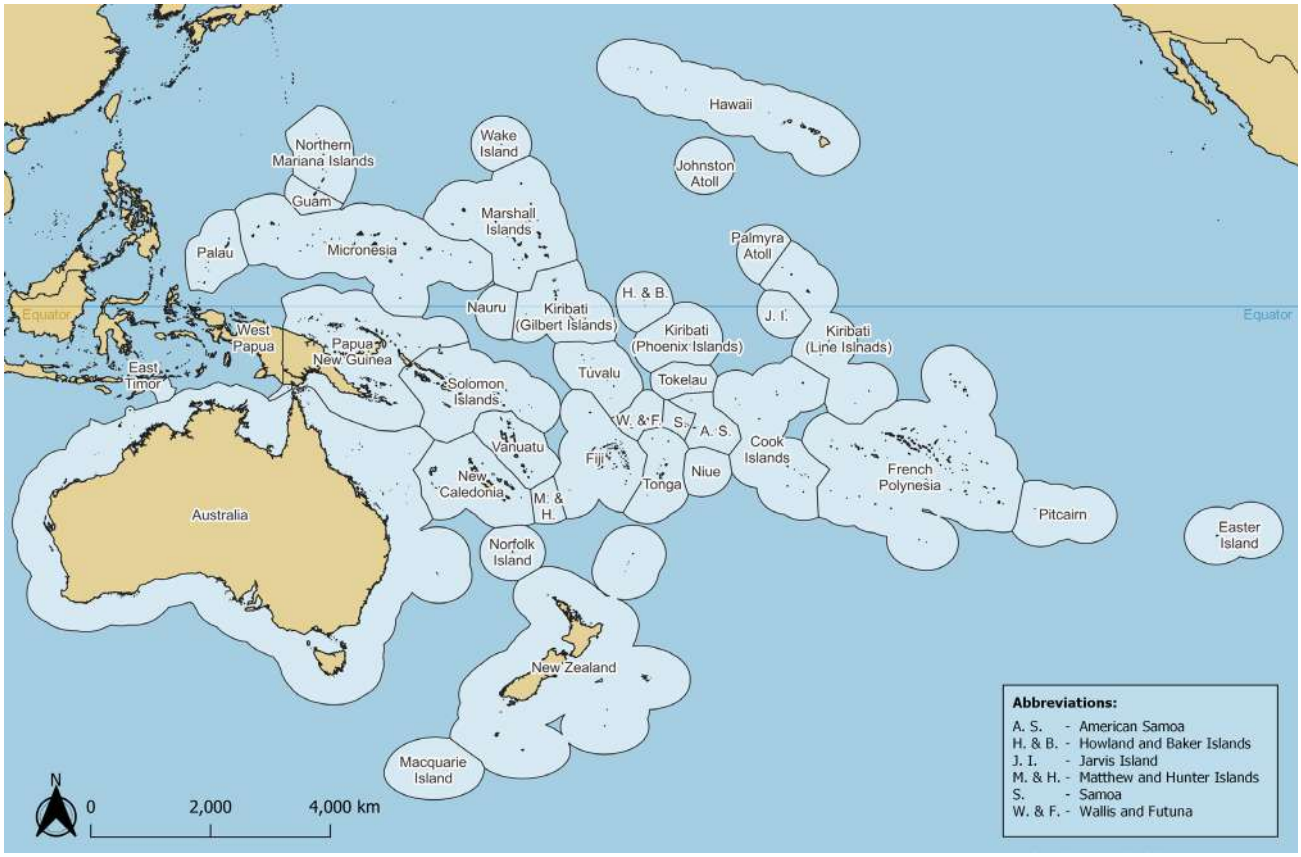


Figure 3.1: Pacific Island Countries and Territories, incl. Exclusive Economic Zones. Source: EEZ shapefile from Flanders Marine Institute (2023), countries shapefile from Flanders Marine Institute (2020), accessible at https://marineregions.org/

The 1.5°C temperature goal also received an important global recognition in the ITLOS Advisory Opinion:

> ...such measures (to prevent, reduce and control marine pollution from anthropogenic GHG emissions) should be determined objectively, taking into account, inter alia, the best available science and relevant international rules and standards contained in climate change treaties such as the UNFCCC and the Paris Agreement, in particular the global temperature goal of limiting the temperature increase to 1.5°C above pre-industrial levels and the timeline for emission pathways to achieve that goal (ITLOS, 2024).

The Suva Declaration also called for additional measures that were not recognised in the final climate treaty, such as the global dialogue on international moratorium on the development and expansion of fossil fuel extractive industries. To that end, PICTs renewed their call to world states to join a Fossil Fuel Non-Proliferation Treaty in a meeting in Vanuatu in 2022. The treaty proposes a mechanism that aims explicitly to address fossil fuels as a source of global warming.

3.2.3 The 2030 Agenda for Sustainable Development and PSIDS

Pacific Island Countries (PICs), through the PSIDS grouping at the UN, were instrumental in the inclusion of Sustainable Development Goals 13 (climate action) and 14 (life below water) in the 2030 Agenda for Sustainable Development. As explained by Quirk & Hanich (2016), PSIDS successfully used their national and regional experience in ocean governance to lobby a stand-alone sustainable development goal on the oceans, positioning Large Ocean States as their global guardians.

PSIDS have increasingly recognised the importance of comprehensive management and governance of the ocean also at national and regional level (Hills et al., 2022, pp. 291-292). Several PICs have adopted National Ocean Policies (NOPs) to integrate the work of various agencies and regulations under one policy on management and governance of ocean spaces, as will be discussed in the following chapter. Regionally, 2050 Strategy for the Blue Pacific Continent, adopted by the Pacific Islands Forum in 2022, builds on numerous previous regional agreements and declarations and focuses on the security and development needs and aspirations of Pacific states. The 2050 Strategy emphasises the role of PSIDS as the stewards of the Blue Pacific Continent and articulates the commitment to

> ...safeguarding the integrity of our natural systems and biodiversity through conservation action and by minimising the activities that degrade, pollute, overexploit, or undermine our ocean and natural environment (PIFS, 2022, p. 10).

At the same time, the 2050 Strategy places people-centred development as one of the thematic areas by which to secure the wellbeing of Pacific peoples. Importantly, the 2050 Strategy highlights that the Blue Pacific is about Pacific peoples, their faiths, cultural values, and traditional knowledge. People who know their needs and potential; plan and own their development agenda; and act collectively for the good of all (PIFS, 2022, p. 11).

3.2.4 International Court of Justice advisory opinion: Pacific origin

In March 2023, the United Nations General Assembly adopted, by consensus, resolution 77/276 requesting an advisory opinion from the International Court of Justice (ICJ) on obligations of states in respect of climate change (United Nations, 2023a). The resolution asks the ICJ to answer two questions regarding the relationship of climate change and human rights:

- What are the obligations of States under international law to ensure the protection of the climate system and other parts of the environment from anthropogenic emissions of greenhouse gases for States and for present and future generations?

- What are the legal consequences under these obligations for States where they, by their acts and omissions, have caused significant harm to the climate system and other parts of the environment, with respect to:

- States, including, in particular, mall island developing States, which due to their geographical circumstances and level of development, are injured or specially affected by or are particularly vulnerable to the adverse effects of climate change?

- Peoples and individuals of the present and future generations affected by the adverse effects of climate change?

The process leading to the resolution was headed by Vanuatu with a coalition of 132 states. The Vanuatu government was instrumental in drafting the legal question to which the ICJ is now expected to answer, as well as in facilitating the work of regional bodies for submissions. The ICJ advisory opinion process itself was initiated by a group of students at The University of the South Pacific (USP), who came up with the idea in a classroom in 2019 and started what later became a worldwide, youth-led campaign for climate justice (Pacific Islands Students Fighting Climate Change (PISFCC), 2024). The call for written submissions closed in early 2024, with a record of 91 submissions from states and international organisations delivered for the Court's consideration. When this chapter was written, the Court was expecting responses to these written submissions, with oral proceedings to be scheduled at a later date (ICJ, 2024).

While the ICJ advisory opinions are not legally binding, they offer important guidelines on the interpretation of different international legal norms. Therefore, the forthcoming ICJ advisory opinion will clarify the legal obligations of states on emissions as well as on acts and omissions in relation to climate and environmental action. Importantly, the Court has been asked to deliberate on the rights of future generations as well as on the obligations of states to small island developing states with their unique vulnerabilities. The ITLOS advisory opinion of May 2024 discussed above will probably be important with regards to the applicable law beyond the Paris Agreement.

3.3 The ocean as a space of sovereignty

From the perspective of PSIDS, one of the most severe consequences, and one of the most fundamental losses in terms of loss and damage, is sea level rise as it is threatening to make their limited territories on land uninhabitable. In academic literature and international media discourse, 'sinking island states' have gained an increasing attention over the recent decade, despite problematic assumptions such a narrative is based upon. The 'sinking islands scenario' is founded on the premise that once the landmass of the state is submerged, the state loses its sovereign entitlements and internationally recognised status as a state. This is because the state, according to modern international law, is an entity with a defined territory on land (Crawford, 2007; Rayfuse, 2013; Stoutenburg, 2015; Vaha, 2015).

While modern statehood is in many respects a contested idea, it is founded on legal principles regulating what kind of entities are (currently) considered states. According to the criteria on statehood in international law and state practice, to be considered a state, a political entity must possess a) a permanent population, b) a defined territory, c) an effective government, and d) the capacity to conduct international relations (Montevideo Convention, 1933; Crawford, 2007). While climate change and sea level rise threaten all of these in one way or another, it is the defined territory that is of particular significance when we look at climate change as an existential threat to PSIDS.

From the perspective of state sovereignty, sea level rise has an impact on statehood in two significant ways: first, it may lead to inundation of land, and second, the inundation of land has an impact on maritime boundaries through shrinking baselines. As stated in the International Law Association's 2018 report, the question of baselines goes beyond the law of the sea and encompasses several other important elements of international law (ILA, 2018, p. 2). Changing baselines create a legal and political challenge to the international state system because the state is defined as an entity with a geographically defined territory and any territory at sea is dependent on the territory on land. Territory, therefore, has been traditionally understood only as a territory on land – as it makes sense to argue that the state cannot exist without land because the human embodiment requires a land to stand on.

At the same time, the idea of the state connected exclusively on territoriality on land is problematic in many respects and especially in the context of Pacific Islands. State sovereignty focusing on land undermines and even ignores the territorial embodiment and relationship the islanders have with space, time and place (Koro et al., 2023). It further undermines the future of PSIDS as sovereign states with the world's largest territorial oceanic entitlements.

3.3.1 Various sovereign statuses in the Pacific

The Pacific region is divided into Pacific Islands Countries and Territories (PICTs) with various sovereign statuses according to contemporary international law. This chapter focuses mainly on independent sovereign Pacific states (PICs). French outre-mer (overseas) territories of New Caledonia, French Polynesia and Wallis and Futuna, or the American territories of American Samoa, Guam, Mariana Islands and Hawaii are not covered in the report. It is important to mention that while all countries and territories are not covered by this report by case studies, they face similar challenges of climate change. They also share history, geography, culture, identity and relation to the ocean, and together with sovereign PICs form the 'sea of islands' as famously framed by Epeli Hau'ofa (2008).

It is equally important to recognise that the processes of colonisation and decolonisation have left the Pacific with these different sovereign statuses, which are not unimportant when we consider the ability and capacities of different countries and territories to respond to the challenges of climate change, or to participate in ocean and climate governance. The variety of political statuses in the Pacific is reflected at the regional and international levels, especially in the ways in which different countries and territories can participate in the decision-making processes or decide from whom and how they receive technical and financial assistance for climate adaptation and mitigation.

It is also important to keep in mind that even within the category of PICs, states differ from each other. Some PICs have close relationships with larger regional powers, such as the Federated States of Micronesia and the Republic of Marshall Islands (RMI), which are in the Compact of Free Association with the United States, or the Cook Islands and Niue, which are self-governing states under the Free Association with New Zealand. Therefore, the challenges regarding statehood and sovereignty cannot be universalised to all PICTs as these states and their citizens have different pathways, for instance, in terms of climate mobility (discussed in Chapter 17). PICTs also have varying political preferences and priorities in climate policies and ocean governance. One such prominent example will be explored in the final section in the form of deep-sea mining.

Furthermore, the states under PICTs category vary according to their geographical features, which have a great impact on the climate change challenges they face. Such geographical variations include whether the state is a low-lying atoll state (e.g., Tuvalu) or has significant highlands (e.g., PNG). Therefore, negative climate change impacts do not impact all PICTs and their people in a similar manner, although they are all affected by them. This is why multiple country studies and narratives are provided in this report that highlight the unique vulnerabilities, challenges and possibilities among PICTs (see country studies in volume two).

Finally, while this chapter focuses on sovereignty and governance in legalistic, state-centred terms of international law, it is important to note that the Pacific understandings of sovereignty do not necessarily correspond with the internationally recognised characteristics of the sovereign state.

3.3.2 Sea level rise and the contested rights of sovereign island states

As argued by Crawford and Reyfuse, the loss of one Montevideo criteria does not necessarily deprive the state from its status as a sovereign state (2012, pp. 246-247). States can, for instance, have long periods without effective governments. However, a permanent population on a defined territory are both considered fundamental criteria and thereby the loss of either creates what can be called a 'statehood dilemma' (Crawford & Reyfuse, 2012, p. 249). The question that the 'sinking island scenario' poses is whether the island states can continue to exist as states if they lose their land?

In his memoirs, Ambassador Nandan recollects how the question of inhabitability became central at the time of UNCLOS negotiations:

> ...for all the controversy, it is interesting to note that when Article 121(3)[4] was debated in the Third Conference, the language I proposed in the Second Negotiating Text was never improved or altered. The original idea was that for a rock to be able to support human habitation or economic life it must have its own sources of water and food (other than catching fish). Being able to sustain human habitation or economic life did not mean taking delivery of cases of food and Fiji water; it meant being self-sufficient.[5] Ultimately, I argued, and continue to argue, that common sense must apply[6] (Nandan, 2021, p. 140).

In addition to the Montevideo criteria, statehood also relies on international state practice and especially on the act of recognition of sovereign status by other states in the UN system. As a criterion for statehood, recognition becomes problematic when it is used to prevent statehood of peoples that otherwise would qualify as states but inhabit a territory within a territory of an already sovereign state. The Indigenous West Papuans have called for independence from Indonesia since the 1950s, resulting in a violent conflict between the region and the metropolitan state. One could argue that West Papua qualifies (or at least could qualify) as a state according to the Montevideo criteria. The struggle of West Papuans for independence has been acknowledged by some PICTs, but not by all. Internationally, there have been fewer calls for recognition of West Papuan independence and the territory is not, for instance, on the UN list of non-self-governing territories (United Nations, 2024a).

Despite its political limitations, the recognition has become an important strategy for PICTs in their policies against sea level rise and the 'statehood dilemma'. In what follows, we consider two ways in which PICTs have innovatively interpreted international law and the practice of state sovereignty and recognition to their advantage. First, we look at the Pacific Island Forum Leaders' declarations on securing maritime boundaries and continuous statehood. Second, we explore Tuvalu's approach to seek a bilateral recognition from world states to guarantee its permanent sovereignty.

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4. Article 121(3) of UNCLOS states: 'Rocks which cannot sustain human habitation or economic life of their own shall have no exclusive economic zone or continental shelf'.

5. Important questions of human inhabitability in terms of food and water security are covered in Chapters 9 and 12.

6. Here, Ambassador Nandan's stand is challenging the idea that a mere uninhabitable rock in the ocean would satisfy the requirement of being an island and thereby provide for maritime entitlements that the island state had before sea level rise.

3.3.3 Regional approach: The PIF Declarations on Preserving Maritime Boundaries and State Continuity

To secure their sovereignty, PICTs have taken some bold steps to guarantee their maritime boundaries regardless of sea level rise and changes in baselines. In 2021, the Pacific Islands Forum adopted the Declaration on Preserving Maritime Zones in the Face of Climate Change-Related Sea-Level Rise. A great concern for many PICTs is that climate change will irreversibly affect their legal entitlements regarding maritime territories. Territorial sea and EEZs are significant sources of income and subsistence to PICTs. As explained by Singh,

> ...from an UNCLOS perspective, global warming and the rise of sea levels will impact existing baselines and lead to the alteration of the maritime limits from the territorial sea to the EEZ which will give rise to a new set of difficulties on demarcating fresh boundaries (2022, p. 85).

Acknowledging that the consequences of sea level rise were not considered at the time UNCLOS was negotiated, the 2021 Declaration recalls the rights of island states to their maritime zones and calls for urgent collective action to secure them. According to the 2021 Declaration, UNCLOS imposes no affirmative obligation to keep baselines and outer limits of maritime zones under review nor to update charts or lists of geographical coordinates once deposited with the Secretary-General of the United Nations (PIFS, 2021b).

Building on the 2021 Declaration, the Pacific Islands Forum Leaders' Meeting in the Cook Islands in 2023 adopted a second declaration on climate change and state continuity. While the 2021 Declaration concentrated on maritime zones, the 2023 Declaration on the Continuity of Statehood and Protection in the Face of Climate Change-Related Sea Level Rise takes significant further steps to declare that the statehood and sovereignty of Members of the Pacific Islands Forum will continue, and the rights and duties inherent thereto will be maintained, notwithstanding the impact of climate change-related sea-level rise. The leaders further affirm that the international law is based on the presumption of continuity of statehood and therefore does not contemplate 'its demise in the context of climate change-related sea level rise' (PIFS, 2023). In its 2023 report, the International Law Commission's (ILC) Study Group on sea level rise notes that there is no evidence of a new, evolving customary international norm providing for permanent baselines. The Study Group at the same time acknowledges, however, that what appears to be evolving is the new trend of practices and views of States based on a good-faith interpretation of the United Nations Convention on the Law of the Sea (ILC, 2023, p. 93). With a direct reference to the PIF 2021 Declaration, the Study Group further notes that there is no explicit provision in the United Nations Convention on the Law of the Sea requiring State parties to update their baselines and outer limits of maritime zones in response to changes in coastlines as a result of sea level rise. Viewing baselines either permanent or ambulatory are therefore both compatible with UNCLOS. The ILC continues its work on sea level rise and its implications on state sovereignty throughout 2024 and this work will provide important further analysis for the Pacific region. The legal analysis of UNCLOS and its interpretation will be crucial not only for PICTs but for other island and coastal states in other regions as well.

Both the 2021 and 2023 declarations confirm the Pacific call for permanent maritime boundaries as well as for the continuous statehood of PICTs. Regardless of their future political and legal implications, the declarations raise global awareness of the consequences of sea level rise to vulnerable island and coastal communities and illustrate the political agency of Pacific states to interpret international norms to their benefit. The 2021 Declaration on Preserving Maritime Zones is in line with the idea of the Large Ocean States, famously introduced by Hau'ofa in his various writings (2008). In his work, Hau'ofa stressed how the language used in relation to smallness of big oceanic states diminishes the role and status of Pacific states in world politics, depicting them as inferior and vulnerable. This belittlement is vividly absent from both declarations, in which the Pacific Large Ocean States boldly interpret international law to their benefit, unapologetically rejecting the oft-offered reading that the current legal framework might lead them to lose their maritime entitlements and assets, even their self-determination and sovereignty as states. In doing so, one could argue, PICTs are not only securing their sovereign territory at sea, but also powerfully exercising their right to self-determination (as guaranteed in several UN human rights conventions) and, in doing so, reinterpreting requirements of sovereign statehood in the global arena.

It can be argued that the difficulty of international politics and law to grasp territoriality beyond land is related to the history of international law focusing on certain key characteristics of the modern state. Of course, it makes sense to require a political community to have some territory on land. At the same time, the modern conceptions of the state are arguably preoccupied with this terrestrial bias, forgetting, or ignoring other understandings of sovereignty, especially the perspectives of Indigenous peoples. Preoccupation with land overlooks the fact that for many states – especially island states – most of their territory is in fact formed by water and much of the identity of their citizens is inherently tied to the sea (Strating & Wallis, 2022; Vaha, 2021, pp. 113-132).

The PIF declarations and other work PICTs have done in this space – including Pacific Maritime Boundaries Programme of Pacific Community (Pacific Community, 2024) – provide for new interpretations of the sovereign entitlements of states. The declarations emphasise the role of the ocean in the self-determination of these entities, requesting the rest of the world to acknowledge and recognise the ocean as a fundamental part of the political, social and cultural existence of PICTs. The 2021 Declaration on maritime zones serves, at minimum, as a tool to unpack the contemporary 'key' characteristics of the state – especially regarding territoriality – beyond the sovereign state on land and is therefore an important initiative in times of climate crisis. By taking steps as a region to guarantee their maritime boundaries, PICTs have exemplified true ocean stewardship and political agency. By declaring their borders fixed regardless of changes to the baselines, PICTs have not only utilised the potential reading of UNCLOS but also contested notions of smallness and vulnerability and taken the first steps necessary to guarantee their future existence as sovereign states.

What must follow is a worldwide recognition and enhanced ambition to safeguard the rights and entitlements – the sovereign rights – of political communities that are put at risk by anthropogenic climate change. Acknowledging the importance of oceans to the self-determination of island communities is vital in this regard. Steps have already been taken in this direction by the Biden Administration, which in the declaration published after the meeting with the Pacific leaders in September 2022, announced that the United States of America acknowledges,

> The threats posed by climate change-related sea-level rise to regional security, peace, prosperity, and development. It is essential that maritime zones and the rights and entitlements that flow from them must be maintained without reduction, notwithstanding any physical changes connected to climate change-related sea-level rise, recognising that PICTs and other coastal States have planned their development in reliance on their rights to such maritime zones (The White House, 2022).

While establishing international state practice requires more states to join the United States, having the recognition by one of the most powerful states in the world, and important geopolitical actor, is significant for the future of permanent sovereignty of atoll states such as Tuvalu and Kiribati.

3.3.4 Bilateral recognition – Tuvaluan approach

The realisation that the slow onset impacts of climate change, and particularly those related to sea level rise, would result in atoll nations such as Tuvalu becoming submerged and uninhabitable within this century, has shaken the foundations of Tuvalu as a recognised independent sovereign state. Viewing climate change as an existential threat, the Government of Tuvalu has introduced unconventional practices and initiated its own pathway to ensure continuous recognition of the permanency of its sovereignty.

In 2021, Tuvalu launched The Future Now project, which emphasises securing the culture, identity, and sovereignty of Tuvaluans in the worst-case climate change scenario ('the sinking island scenario'). The Future Now Project entails four initiatives. First is promoting Tuvaluan cultural values that embrace ethical and moral principles relevant to and important for peacebuilding, maintenance of the rule of law and peace, and harmony between peoples and nations. These cultural values include olaga fakafenua (communal system), kaitasi (shared responsibility) and falepili (neighbourliness, reciprocity, care). Second is securing international recognition of Tuvalu's statehood as permanent and its existing maritime boundaries as fixed despite the adverse effects of sea level rise. Third is the vision to digitalise all administrative and governance services, cultural heritage and so forth to ensure the continuous existence of Tuvalu as a digital nation. Fourth and last is to encourage advocacy and representation that allows Tuvalu's foreign policy purview to be amplified at regional and international fora (Kofe, 2021).

Two of these initiatives draw our attention to the need to seek formal recognition of statehood on a bilateral basis and promote international recognition through customary international law. As of 2024, Tuvalu has already signed memorandums of understanding with more than a dozen of its diplomatic allies giving recognition of permanent statehood. The aim is to solicit the support of the international community of Tuvalu's existence in perpetuity as a recognised sovereign state at its current designated coordinates of territorial land and ocean space. A key to this is the need for an appropriate adaptation development plan that aims at maintaining the land and allows the people of Tuvalu to live in their ancestral home.

To this end, Tuvalu has developed its first technically feasible, science-based long-term adaptation plan known as L-TAP. The L-TAP is Tuvalu's flagship adaptation plan for survival, specifically designed to provide a safe elevated land territory that is large enough to accommodate the national population and secure its future. The land reclamation projects, such as the Tuvalu Climate Adaptation Project funded by the Green Climate Fund on the capital island Funafuti, are also a part of L-TAP, but global support and funding to scale it up is needed. It is important to note here that the conventional coastal protection methods such as normal seawalls, beach nourishment etc. have been proven unfeasible for low-lying atolls such as Tuvalu.

Supporting its bilateral approach, Tuvalu has also joined forces with countries such as RMI and Kiribati to launch the Rising Nations Initiative (RNI) in September 2022. The RNI seeks to amplify four interlinked demands of atoll nations to the international community.

First, the countries call for the international community to preserve the sovereignty and rights of Pacific atoll states. Second, the countries call for the creation of a comprehensive programme to build and finance adaptation and resilience projects to help the local communities sustain their livelihoods. Third, the countries are proposing the creation of a living repository to preserve their unique cultural heritage. Fourth, they seek support to acquire a UNESCO World Heritage designation (Global Centre for Climate Mobility, 2024).

Politically, Tuvalu has garnered support from like-minded countries and organised, for instance, a Breakfast Summit on the margins of the UNGA78 in 2023 to address the existential threats posed by sea level rise. The side-event was presided by the President of the General Assembly (PGA) and attended by over ten heads of state and government, ministers, representatives of civil society organisations and the private sector as well as philanthropists. The meeting led to the establishment of the Coalition for Addressing Sea-level rise and its Existential Threats, co-chaired by Tuvalu and Germany. Recognising the pressing need for action, the PGA convened the UN Informal Plenary in 2023, leading to Resolution 78/544 to hold a High-level Plenary Meeting of the General Assembly addressing the existential threats posed by sea level rise during the high-level week of UNGA79 (United Nations, 2024b)

Tuvalu's continued governance efforts to mitigate climate challenges also involve 26 amendments to its constitution, including a specific section on Tuvalu statehood underpinning its perpetual existence as a sovereign state, the permanency of its land area, maritime zone, and airspace notwithstanding the impacts posed by climate change related sea level rise. This is an unprecedented constitutional architecture in the supreme law of the country, reflecting the most significant and critical concerns of losing what Tuvaluans consider a God-given land. These amendments provide a legal basis for Tuvalu's climate governance and international advocacy endeavours and form a mandate bestowed by the people that must be upheld regardless of future changes in national leadership.

Furthermore, climate security concerns have resulted in Tuvalu's efforts to strengthen the current mobility pathways that allow dignified migration. In addition to the Pacific Access Categories with New Zealand and the Pacific Engagement Visa provided by Australia allowing Pacific countries, including Tuvalu, to access migration opportunities, Tuvalu has established a bilateral human mobility pathway with Australia. Known as the Falepili Union Treaty, the bilateral agreement is the first of its kind between Australia and a PICTs. The treaty offers, among other things, a special pathway for Tuvaluans to migrate to Australia and provides them with access upon arrival to medical and educational benefits that Australian citizens enjoy. One key provision of the treaty is the commitment for cooperation on security and stability in response to natural disasters, public health crises, and military threats. Under the treaty, Australia is obligated to offer support to Tuvalu upon its request. One of the most controversial aspects of the treaty pertains to the fact that Tuvalu will need to consult Australia on matters relating to security. This poses a challenge to Tuvalu's sovereignty as an independent state. Although the treaty's implementation plan is yet to be developed, and the treaty has raised some concerns of its intentions and processes leading to its adoption (see e.g., Kitara & Farbotko, 2023), Australia has reaffirmed its support to Tuvalu's interest of 'staying in their home with dignity' (DFAT, 2023).

This section has illustrated how Tuvalu has adopted a range of innovative legal and regulatory frameworks together with foreign policy initiatives that continue to be developed and extended as a response to climate change. They indicate the recognition for acceleratory mechanisms across diverse pathways of local and foreign partnership, as well as highlight the political agency and norm-entrepreneurship of the Pacific country.

3.4 PICTs, sustainability and ocean resource governance

According to UNCLOS, the ocean areas beyond the national jurisdiction of states are considered 'global commons'. What this means is that an open access and equal right of users must be guaranteed to enjoy 'the freedom of the high seas' (Reyfuse, 2013, p. 170). Problematic as the concept of global commons is – especially in the Pacific context in which the communities are considered the guardians and stewards of the ocean to which they have ancestral roots and entitlements – the ocean resource governance, internationally, relies on the idea of global commons and, consequently, on mitigation efforts to avoid what might be described as 'the tragedy of the commons'.

The tragedy of the commons famously describes a situation in which open access to a resource combined with undefined or incomplete property relations lead to over-use. It is based on an idea that individuals in a free market cannot be trusted to refrain from overgrazing; that the tragedy occurs rather naturally in such circumstances. From the perspective of environmental ethics, the tragedy of the commons is important as it illustrates the difficulty to respond to genuine collective action problems such as the protection of the atmosphere from air pollution. Individuals everywhere on the planet have an 'access' to air – the shared resource in this case – and use it according to their own interests (say, releasing emissions to advance the industrialisation of their societies), which has an impact on others (such as GHG emissions and global warming).

Fisheries offer a classic example of the tragedy of the commons. Most fish species are migratory by nature, and therefore move from territorial waters of one state to the high seas and further to the territories of other states. As only the EEZ and territorial waters until recently were under legislative protection of international and national laws, over-exploitation of migratory species has often occurred in the high seas. Some countries might want to maximise their economic revenue by overfishing within their territorial waters. Studies indicate that international regulation and at least some levels of privatisation (quotas) are needed to prevent the tragedy of the commons (overfishing) in the case of fisheries. To avoid the tragedy of the commons, collective measures must be taken to regulate and prevent the overuse of shared resources.

The tragedy of the commons is important from the Pacific perspective as the territorial entitlements of PICTs cover a great proportion of the world's oceans, yet the countries themselves have limited resources and capacities to protect and manage these waters. The Nauru Agreement of 1982 between eight Pacific countries is one successful example of coordination and resource management aiming at preventing the tragedy of the commons (for its development, see Aqorau, 2016). The section which follows provides three other examples of ocean governance of global commons in the Pacific context.

3.4.1 Marine resources: Traditional knowledge and the governance of the high seas

This section examines some regional approaches in sectors that are important for the region's sustainable economic development: marine resources, deep sea mining and marine transportation. Firstly, it looks at the Pacific influence in adopting the UN treaty on biological diversity of areas beyond national jurisdiction (the so-called High Seas Treaty, BBNJ). Secondly, it explores the contrasting views of Pacific countries to the future of deep sea mining and thirdly, it discusses the role of PICTs in developing the frameworks of maritime transportation.

In its resolution 72/249 of 2017, the UN General Assembly decided to convene an international conference to consider the earlier recommendations of the Preparatory Committee, established by UNGA resolution 69/292 in 2015, to elaborate the text of an internationally binding instrument on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ). The proposed international instrument was to expand the current regulations under UNCLOS regarding the high seas and their resource management. Due to the complexity of the process, the UN members convened five times before the treaty was finally adopted in June 2023.

PICTs were a strong presence at the BBNJ negotiations from the very beginning. A robust and ambitious international treaty protecting marine global commons was a priority for Pacific leaders, calling for 'the improvement of international ocean governance, meaning breaking away from the status quo of fragmented governance,' as stated by the Secretary-General of PIF Henry Puna before the fourth UN meeting (OPOC, 2022). Especially important for PICTs was the need to guarantee that the vast amount of traditional knowledge of the ocean and its resources held by the Pacific communities was recognised in the final treaty.

As demonstrated by Mulalap et al., (2020), there are several types of traditional knowledge relevant to the biodiversity treaty, such as connectivity, pathways, cultural practices and stewardship of the ocean, existing environmental management best practices such as tabu areas and acknowledgment of seasons, and forms of traditional navigation. All these have guaranteed the protection of biodiversity of the ocean and some of these will be further discussed in Chapter 8. As further demonstrated by Smith & Huffer (2021, p. 49), PICTs were systematically keeping these issues on the negotiation agenda, together with the importance of regional ocean management and governance for sustainability, 'given that resources such as fisheries and minerals and challenges such as pollution are trans-boundary in nature'.

The final text of the BBNJ recognises the importance of traditional knowledge in several ways. Under Article 2 on general principles and approaches, it is acknowledged that in order to achieve the objectives of the treaty, traditional knowledge of Indigenous Peoples and local communities should be used when relevant. In addition, parties would be guided by the respect, promotion and consideration of their respective obligations, as applicable, relating to the rights of Indigenous Peoples or of, as appropriate, local communities when taking action to address the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction.

Article 13 related to marine genetic resources, respectively, establishes that:

> Parties shall take legislative, administrative or policy measures, where relevant and as appropriate, with the aim of ensuring that traditional knowledge associated with marine genetic resources in areas beyond national jurisdiction that is held by Indigenous Peoples and local communities shall only be accessed with the free, prior and informed consent or approval and involvement of these Indigenous Peoples and local communities. Access to such traditional knowledge may be facilitated by the Clearing-House Mechanism. Access to and use of such traditional knowledge shall be on mutually agreed terms (United Nations, 2023b).

While the treaty is still new and not yet operationalised, it is safe to say that PICTs have been successful in having traditional knowledge recognised in the treaty throughout its drafting process (Smith & Huffer 2021, p. 54).

3.4.2 Minerals: Deep Sea mining, a divided region

Deep sea exploration provides another important example of the potential tragedy of the commons in relation to the oceans. Under Part XI of UNCLOS, the 'Area' for deep sea exploration and extraction was established. The Area and its mineral resources are protected under UNCLOS as the 'common heritage of mankind' (Article 136). According to the Convention, the Area covers all seabed, oceans floor and subsoil thereof that are beyond the limits of national jurisdiction. As the common heritage of humankind, the seabed and its use are strictly regulated:

a. No State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor shall any State or natural or juridical person appropriate any part thereof. No such claim or exercise of sovereignty or sovereign rights nor such appropriation shall be recognised.

b. All rights in the resources of the Area are vested in mankind, on whose behalf the Authority shall act. These resources are not subject to alienation. The minerals recovered from the Area, however, may only be alienated in accordance with this Part and the rules, regulations, and procedures of the Authority.

c. No State or natural or juridical person shall claim, acquire, or exercise rights with respect to the minerals recovered from the Area except in accordance with this Part. Otherwise, no such claim, acquisition or exercise of such rights shall be recognised.

The 'Authority', respectively, here refers to the International Seabed Authority, established under Article 156, and consists of all Parties to the Convention. Any exploration of the Area must be approved by the Authority (Article 157) and all activities exercised in the Area must benefit 'the mankind as a whole' (Article 140) as well as conducted exclusively for 'peaceful purposes' (Article 141). By defining the Area and its minerals as the common heritage of mankind, UNCLOS emphasises its importance to the ecosystem but also pre-emptively aims at preventing the tragedy of the commons in relation to deep sea exploration and exploitation. UNCLOS stresses the importance of protecting the marine environment (Article 145) as well as human life (Article 146) in any potential use of the seabed.

Over the last years, interest in seabed exploration has increased globally. Seabed minerals are considered essential in green energy transition. In 1994, the UN member states adopted the implementation agreement with respect to Part XI of UNCLOS, stating the conditions under which the member states can initiate seabed activities. In 1997, the government of Papua New Guinea granted the world's first exploration licence for underwater polymetallic sulphides. The licence was granted to the mining company Nautilus Minerals Ltd. The PNG government further granted the company its first mining licence in 2011. It is reported that PNG lost US$120 million in the process, as the business model, as well as mining plans, were flawed and the offshore mining never began (Filer et al., 2020).

Deep sea mining is an important matter regarding the governance of the ocean in the Pacific, not the least because the countries in the region do not have a unified stand on it. Nauru, Kiribati, and the Cook Islands have approved licences and Tonga has not rejected the possibility. Vanuatu, the Federated States of Micronesia, Fiji, Palau, Samoa and Papua New Guinea (with a change of heart) have called for a moratorium to allow more time to do research on potential risks. Tuvalu has rescinded its initial approval of deep-sea mining exploration in its waters. In 2022, a group of Pacific parliamentarians united under the Pacific Parliamentarians Alliance on Deep Sea Mining, called for a moratorium. Recalling the high seas as the common heritage of humankind, the parliamentarians asked the Pacific leaders to join the more cautious ranks opposing such activities, as well as to provide support for those Pacific governments that have decided to explore this alternative (PPADSM, 2022).

3.4.3 Emissions: Marshalling the way in the shipping industry

The maritime industry, especially shipping, plays a vital role in the daily lives of Pacific Islanders through transportation and trade but is also one of the industries that is collectively responsible for increasing emissions of greenhouse gases (IMO, 2023). It also is a major source of ocean pollution through oil spillage and other blackwater and greywater discharges. The accumulation of discharges from ocean-going vessels coupled with increasing traffic over the Pacific Ocean is detrimental to marine life. Hence, while the shipping industry facilitates trade and supports the economies of PICTs, it also has potential negative impacts on marine life and biodiversity, which can eventually affect the livelihoods of Pacific Islanders.

PICs are some of the largest flag states in the world, meaning that they allow foreign ships, mainly merchant vessels, to operate under their jurisdiction. Merchant vessels will have the nationality of PICs since they are licensed under the law of the flag states and, in consequence, RMI is the third largest shipping registry in the world (Ruwet et al., 2023, p. 185). The shipping registries of PICTs function as the administrators, overseeing the operation of vessels registered under their national flags. The International Maritime Organisation (IMO), one of the 15 special agencies of the UN, has put in place certain regulatory frameworks such as the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) and the London Convention and Protocol of 1972/1996 to assist member countries in their efforts to decarbonize and reduce pollution from the maritime sector.

In 2018, the IMO adopted its initial strategy to reduce greenhouse gas emissions (IMO 2018). The strategy was the first to accommodate contrasting interests of shipping industry and the coalition of states calling for more ambitious climate action.

The high ambition coalition of states at IMO negotiations was led by the RMI. According to Ruwet et al. (2023), much of the success of RMI at IMO negotiations can be credited back to the personal diplomatic skills of Tony de Brum, who also played a crucial role in the Paris Agreement negotiations (Ruwet et al., 2023, p. 188). It must be noted, however, that the regional efforts to decarbonise the shipping industry have also been relevant, and sustainable transportation was one of the key areas of the PIDF (Ruwet et al., 2023, p. 191). At the IMO, Tuvalu, Kiribati, Vanuatu, and the Solomon Islands have all actively participated in developing the strategy (Ruwet et al. 2023). In 2023, the IMO adopted an updated strategy on reduction of GHG emissions to operationalise the initial strategy. The IMO GHG Strategy represents a framework for member states in which they set out the future vision for international shipping, the level of ambition and guiding principles to reduce greenhouse emissions as well as propose mid- and long-term measures (IMO, 2023).

Nationally, PICTs are working on adopting and integrating the international conventions to domestic laws and implementing national policies. Ratifying and operationalising international laws are especially important to PICTs because of the significant number of merchant vessels under their flags.

Paradoxically, while PICTs are advocating for climate action globally, their economies are highly dependent on fossil fuel to keep domestic and foreign ocean-going vessels in operation. The IMO is working together with the governments of PICTs through its Technical Cooperation Committee and Department of Projects and Partnerships to implement maritime GHG decarbonisation efforts. The projects include the GloLitter Project in collaboration with the Government of Norway and the UN Food and Agriculture Organisation, and the GHG SMART Program, which was jointly implemented with the Republic of Korea. These pilot projects are specifically designed for small island states to address ocean litter from the maritime and fisheries sectors and to decarbonise the maritime sector. The effectiveness of these projects is yet to be confirmed as their lifecycles are short and national maritime administrations in PICTs are not necessarily equipped with financial and human resources to follow through and keep the various projects and initiatives running.

3.5 Conclusion

This chapter has demonstrated the ways in which PICTs have been able to have their interests protected and voices heard in the frameworks of global climate and ocean governance. The aim of this chapter has been to illustrate some key areas of the ocean/climate nexus that are important for PICTs and through different governance examples show how PICTs have engaged with international, regional and national mechanisms, laws and practices to ensure their interests are protected. While the frameworks of global politics remain in many respects colonial and Eurocentric, including those of climate and ocean governance, PICTs have had important successes in navigating these structures with innovative proposals and a unique agenda. The Pacific communities have been recognised as the custodians of the oceans and through global stewardship they have had an impact on mitigating the tragedy of global commons in many important ways. That said, one should not diminish the limits and challenges that exist, especially internationally, in the climate and ocean governance. Despite the international agreements and treaties, some of which have been discussed in this chapter, global responsibilities are still unfairly distributed, and uniquely vulnerable PICTs have not (yet) been able to get all their demands recognised at international level. This has directed PICTs to find regional and national alternatives, which however can still, as part of international norm, be challenged by other states.



> ‘Communities in Tuvalu need to be trained and attend workshops on climate change to have access to more knowledge on the impact of climate change’

Leiti Fasiai
Community participant
Funafuti
Tuvalu
(POCCA research team interview, 2023)

Part of the Tuvaluan community during the POCCA consultation in Funafuti, Tuvalu (Photo: POCCA team, 2023).

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Chapter 4

Regional Climate and Ocean Strategies, Policies and Frameworks – a Stocktake of Current Status

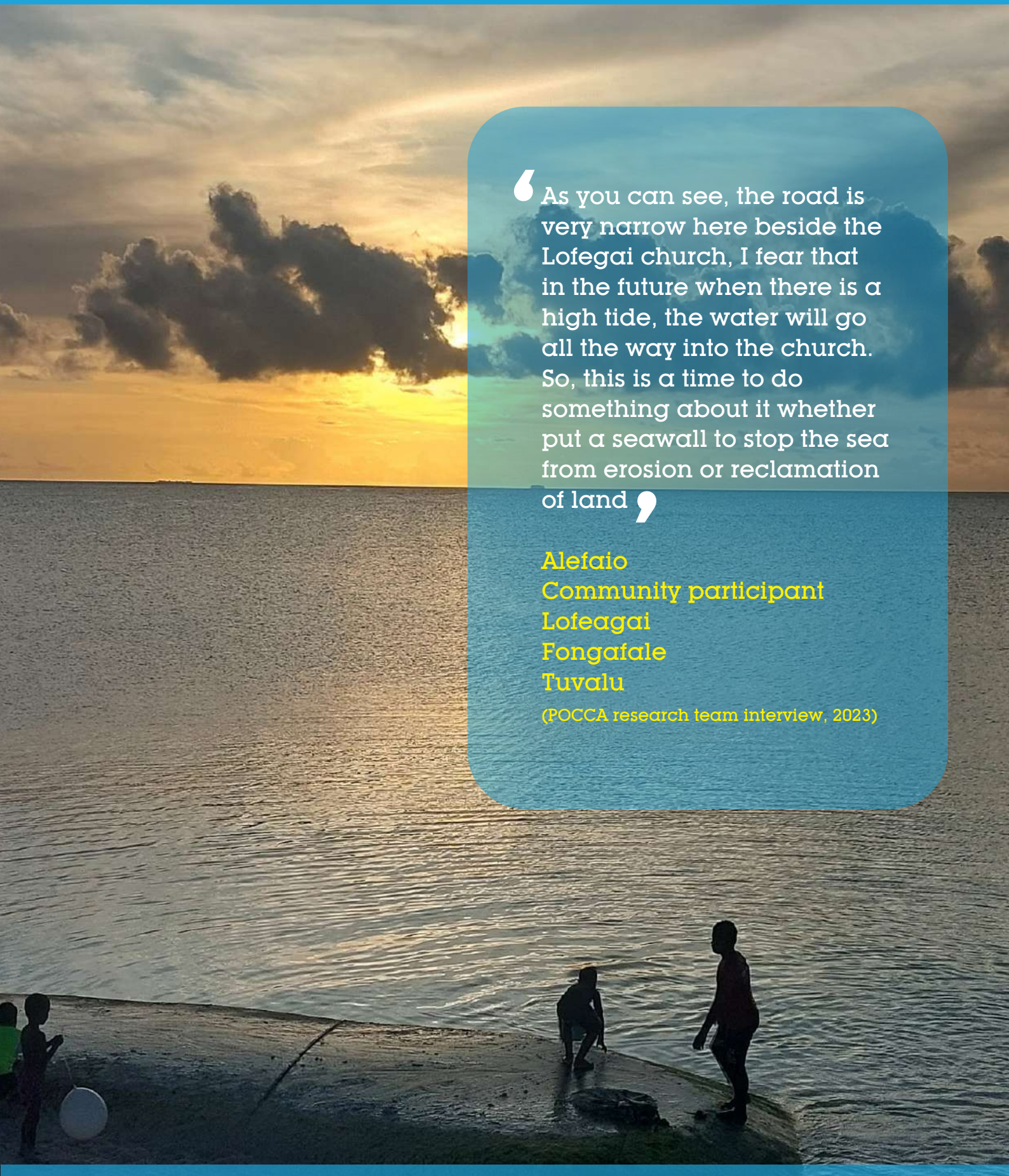
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POCCA community consultation in the Marshall Islands (Photo: POCCA team, 2023).

Abstract

The chapter provides a stocktake and region-wide social mapping of the climate-ocean strategies, policies, and frameworks at the regional, national, and local levels in the Pacific. Several declarations, frameworks, agreements, policies, and strategies have been created and implemented. Some of them were framed within the region while others were the result of engagement with external stakeholders. This chapter analyses how these instruments were created and implemented. It also examines the nature of these instruments and how they have shaped the climate-ocean agenda. This assessment provides important information on regional and national initiatives, their level of effectiveness, and lessons learned.



> "As you can see, the road is very narrow here beside the Lofegai church, I fear that in the future when there is a high tide, the water will go all the way into the church. So, this is a time to do something about it whether put a seawall to stop the sea from erosion or reclamation of land"

Alefaio
Community participant
Lofeagai
Fongafale
Tuvalu
(POCCA research team interview, 2023)

Part of the reclaimed area in Funafuti, Tuvalu (Photo: POCCA team, 2023).

4.1 Introduction

This chapter provides a stocktake and mapping of climate-ocean frameworks, policies, and strategies at the regional, national, and community levels in the Pacific region. Some of these were framed within the region while others were the result of external partnerships such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Sendai Framework for Disaster Risk Reduction. The chapter also examines the nature of competition, collaboration, and consensus amongst regional players and how these have shaped the climate-ocean agenda. This will give us an idea of what initiatives have been taken, their level of effectiveness, lessons to be learnt and potential avenues for future research and policy making. It further discusses the institutional arrangements at sub-national, national and regional levels established to implement the strategies, and draw on the lessons learned from them to better inform community initiatives for resilient development.

4.2 Global climate-ocean frameworks, policies and strategies

This section outlines global climate-ocean frameworks, policies, and strategies, including the UNFCCC, United Nations Office for Disaster Risk Reduction, and United Nations Sustainable Development Goals.

4.2.1 United Nations Framework Convention on Climate Change (UNFCCC)

The UNFCCC was adopted in 1992 and came into force in 1994. The convention sets out the basic legal framework and principles for international climate change cooperation with the aim of stabilising atmospheric concentrations of greenhouse gasses (GHGs) to avoid dangerous anthropogenic interference with the climate system (United Nations Framework Convention on Climate Change, 1994).

For effective implementation of the convention, parties adopted the Kyoto Protocol in December 1997. It committed industrialised countries and countries in transition to a market economy to achieve quantified emissions reduction targets for GHGs. The first commitment period under the Protocol covered the period from 2008 to 2012. In 2012, the Doha Amendment established the second commitment period from 2013 to 2020. Further, in December 2015, parties adopted the Paris Agreement, which requires all parties to determine, plan, and regularly report on the Nationally Determined Contribution (NDC) that it undertakes to mitigate climate change.

Parties also submit aggregate progress on mitigation, adaptation, and means of implementation, which are reviewed every five years through a Global Stocktake. The first Global Stocktake took place in 2023 at COP28 in Dubai (UNFCCC, 2023). The Pacific Island countries were not present when the final text of the Global Stocktake (i.e., the COP28 agreement) was passed. Samoa's lead delegate representing the Alliance of Small Island States (AOSIS) criticised the agreement stating that 'The course correction that is needed has not been secured' and the deal could 'potentially take us backward rather than forward' (quoted in ABC News, 2023). The agreement calls on all states to transition away from fossil fuels but lacks an explicit commitment to phase out or phase down fossil fuels (Morton et al., 2023).

4.2.2 The United Nations Office for Disaster Risk Reduction

The United Nations Office for Disaster Risk Reduction was created in December 1999 and oversees the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030. The UNDRR brings governments, partners, and communities together to reduce disaster risk and losses to ensure a safer, more sustainable future. It also supports countries in the Sendai Framework implementation, monitoring and sharing what works in reducing existing risk and preventing the creation of new risk. The Sendai Framework works hand in hand with the other 2030 Agenda agreements, including the Paris Agreement on Climate Change, the Addis Ababa Action Agenda on Financing for Development, the New Urban Agenda, and ultimately the Sustainable Development Goals.

The Sendai Framework further recognises that the State has the primary role to reduce disaster risk but that responsibility should be shared with other stakeholders including local government, the private sector and other stakeholders. This is how global frameworks are aligned to Pacific regional and national frameworks and action plans for both climate change and disaster risk reduction.

4.2.3 UNDRR Regional Office for Asia and the Pacific

The UNDRR Regional Office for Asia and the Pacific (ROAP) supports disaster risk reduction efforts across the Asia-Pacific region. ROAP works with governments, United Nations Country Teams, regional and international organisations, and other stakeholder groups, to protect people from disasters, build resilience and support sustainable development. ROAP covers a total of 39 countries and 13 territories. It is based in Bangkok, Thailand, with a sub-regional office in Suva, Fiji, a liaison office in Kobe, Japan, and an office for North-East Asia in Incheon, Republic of Korea (The United Nations Office for Disaster Risk Reduction, ROAP, 2023a). UNDRP ROAP works with the following Pacific Island countries: Fiji, Kiribati, Marshall Islands, FSM, Nauru, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. Country-specific reports are available online (The United Nations Office for Disaster Risk Reduction, 2023c).

4.2.4 Analysis of DRR inclusion in national climate change commitments report

A study was conducted to assess the level of integration of climate change adaptation and disaster risk reduction across six critical aspects – institutions, policies, operations, data management, knowledge management, and finance – in ten selected countries as case studies: Benin, Ethiopia, Fiji, Guyana, Kiribati, Malawi, Saint Vincent and the Grenadines, Sudan, Sri Lanka and Uganda.

The results showed significant integration of Disaster Risk Reduction (DRR) into National Adaptation Plans (NAPs) and Nationally Determined Contributions (NDCs) in most of the countries. All the countries used various datasets and models while developing NAP and NDCs. However, only a few countries have conducted a detailed vulnerability or risk assessment. Based on this analysis, a set of practical recommendations were provided as an entry level for integrating climate change adaptation and disaster risk reduction measures (UNDRR, 2021).

The DRR and climate change adaptation (CCA) in the region also indicated that despite a low level of integration at the operational level, countries are making efforts to develop Joint National Action Plans (JNAPs) for disaster risk management (DRM) and CCA, as well as move towards integrating their institutional platforms for DRR and CCA.

There are challenges and barriers to integration, including effective governance processes to make it workable. Despite the challenges, the rationale for integration includes easing the burden of programming assistance; minimising duplication and reducing potential conflicts in policy development; and making efficient use of scarce resources. There is also increasing recognition, especially at the community level, that there is little practical difference between DRR and CCA.

4.2.5 United Nations Sustainable Development Goals

The United Nations Sustainable Development Goals (SDGs) were developed to achieve a better and more sustainable future for all. They address global challenges, including those related to poverty, inequality, climate change, environmental degradation, peace and justice. Of the 17 goals, which are interconnected, three deal directly with climate change and are relevant to this chapter: SDG 13, SDG 14 and SDG 17.

SDG13: Climate action

The global temperature has already risen 1.1°C above the pre-industrial level, with glaciers melting and the sea level rising. Impacts of climate change also include flooding and drought, displacing millions of people, sinking them into poverty and hunger, denying them access to basic services, such as health and education, expanding inequalities, stifling economic growth and even causing conflict. By 2030, an estimated 700 million people will be at risk of displacement by drought alone (United Nations, 2023a; Challis et al., 2024). Taking urgent action to combat climate change and its devastating impacts is therefore an imperative to save lives and livelihood, and key to making the 2030 Agenda for Sustainable Development and its 17 Goals – the blueprint for a better future – a reality.

In 2020, concentrations of global greenhouse gasses reached new highs, and real-time data points to continued increases. As these concentrations rise, so does the Earth's temperature. In 2021, the global mean temperature was about 1.1°C above the pre-industrial level (from 1850 to 1900). The years from 2015 to 2021 were the seven warmest on record. To limit warming to 1.5° Celsius above pre-industrial levels, as set out in the Paris Agreement, global greenhouse gas emissions will need to peak before 2025. Then they must decline by 43 per cent by 2030 and to net zero by 2050. Countries are articulating climate action plans to cut emissions and adapt to climate impacts through nationally determined contributions. However, current national commitments are not sufficient to meet the 1.5°C target (United Nations, 2023a).

SDG 14: Life below water

Goal 14 is about conserving and sustainably using the oceans, sea, and marine resources. Healthy oceans and seas are essential to human existence and life on Earth. They cover 70 per cent of the planet and provide food, energy and water. The ocean absorbs around one quarter of the world's annual carbon dioxide (CO2) emissions, thereby mitigating climate change and alleviating its impacts (United Nations, 2023b).

SDG 17: Partnerships

Goal 17 is about revitalising the global partnership for sustainable development. The 2030 Agenda is universal and calls for action by all countries – developed and developing – to ensure no one is left behind. It requires partnerships between governments, the private sector, and civil society. It reflects a conviction that the Sustainable Development Goals can only be realised with a strong commitment to global partnership and cooperation (United Nations, 2023c).

4.3 Regional climate-ocean frameworks, policies and strategies

This section outlines regional climate-ocean frameworks, policies, and strategies, including the Framework for Resilient Development in the Pacific, 2050 Strategy for the Blue Pacific, the Taputapuatea Declaration on Climate Change; the Suva Declaration on Climate Change; the Boe Declaration on Regional Security; the Nadi Bay Declaration on the Climate Change Crisis in the Pacific; the Kainaki II Declaration for urgent climate action now; Tuvalu Declaration on Climate Change for the Survival of Pacific Small Island Developing States; Pacific Islands Forum Leaders' Ocean Statement, and the Pacific Islands Forum Leaders' Declaration on Preserving Maritime Zones. Some of these frameworks are linked to global frameworks discussed above.

4.3.1 Framework for Resilient Development in the Pacific (FRDP)

The FRDP was set up under the auspices of the 2016 Pacific Islands Leaders Forum with the goal of reducing Pacific people's exposure to climate and disaster risk, support low carbon development, and improve disaster response and reconstruction. It is an integrated approach to address climate change and disaster risk management. The FRDP provides high level strategic guidance to different stakeholder groups on how to enhance resilience to climate change and disasters in ways that are embedded in sustainable development. To implement and drive the FRDP strategies forward, the Pacific Resilience Partnership (PRP), consisting of a range of stakeholders (including governments, regional organisations, civil, society, and academia), was endorsed by the Leaders Forum in 2017. The FRDP advocates for the systematic adoption of inclusive and participatory processes including different stakeholder groups, women, and men, and in particular the most vulnerable members of society to ensure that measures are not only effective but also equitable in meeting the needs of all members of the community. The framework thus acts as a mechanism to counteract the verity that climate change and disasters selectively impact lives and livelihoods, and often disproportionately affect those least able to cope (Pacific Community, 2016).

4.3.2 2050 Strategy for the Blue Pacific

Pacific Island Countries have strong connections to the ocean. They refer to themselves as Large Ocean States based on their exclusive economic zones (EEZs), which makes them custodians of large areas of the Pacific Ocean (Pacific Islands Forum, 2014). As explained by the former Prime Minister of Samoa:

> ...exercising a sense of common identity and purpose linked to the ocean, has been critical for protecting and promoting the potential of our shared Pacific Ocean (Pacific Islands Forum, 2017b).

Pacific Islands Forum Leaders endorsed the development of the 2050 Strategy for the Blue Pacific Continent in Tuvalu in 2019. The Leaders noted that escalating climate change related impacts coupled with the intensification of geostrategic competition, is exacerbating the region's vulnerabilities. As such, the aim of the 2050 Strategy for the Blue Pacific is to protect and secure the Pacific people, their homes, and prospects. This will be achieved by regional collective action, that is, Pacific Island Countries working together as one Blue Pacific Continent (Pacific Islands Forum, 2022a). The Sub-Committee on the 2050 Strategy for the Blue Pacific is leading the work on the 2050 Strategy and is chaired by Fiji and Vanuatu, with the inclusion of CROP agencies as observers (Pacific Islands Forum, 2022a).

4.3.3 Taputapuatea Declaration on Climate Change

The Taputapuatea Declaration on Climate Change is the Polynesian Leaders' Group (PLG) climate declaration which signaled what Polynesian countries want from the 2015 Paris Agreement. It states that

> ...climate change and its adverse impacts are poisoning our sea, making our lands infertile and threatening the foundation of our identity as Polynesian peoples. Our children's future is in doubt if the cause of climate change is not addressed and if we are unable to adapt to its impacts (Polynesian Leaders' Group, 2015, p. 1).

It also calls for limiting global warming to below 1.5 degrees by 2100; receipt of climate resources from all available sources of funding to address capacity building and technology transfer to climate change and its adverse impacts; and loss and damage to be reflected in the legally binding agreement (Polynesian Leaders Group, 2015, p. 2).

The PLG further called upon all State Parties to the UNFCCC to:

a. Acknowledge territorial vulnerabilities and that the intensification of extreme weather events is caused by human induced climate change.

b. Continue to strengthen synergies between actions aiming at supporting Small Island States and Territories in terms of climate change and natural disaster adaptations through the creation of emergency assistance and early warning mechanisms.

c. Accept that climate change is a threat to territorial integrity, security, and sovereignty, and in some cases to the very existence of some of the islands.

d. Acknowledge the importance of the EEZs for Polynesian Island States and Territories whose area is calculated according to emerged lands and permanently establish the baselines in accordance with the UNCLOS, without taking into account sea level rise.

e. Understand the risks of population displacements which may result in moral, intellectual, physical, psychological, and cultural distress.

f. Consider the establishment of an international protection regime for populations displaced due to climate change.

g. Take account of the provisions of the UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage and the United Nations Convention on Biological Diversity.

h. Understand that it is essential to mitigate the impact of climate change on natural and cultural heritage.

i. Establish an international support mechanism to compensate the impacts resulting from the deterioration or the loss of natural resources and ecosystems.

j. Foster the development of a circular and low carbon economy that is more respectful of traditional ways of living.

k. Acknowledge that we are Large Oceanic States and Territories.

l. Allocate sufficient funding for the establishment of a regional cooperation strategy and its implementation for the conservation, management and monitoring of marine areas and ecosystems.

m. Provide technical and financial means for energy transition and prioritise investments in energy savings, energy efficiency and renewable energy production (Polynesian Leaders' Group, 2015).

4.3.4 Suva Declaration on Climate Change

The Suva Declaration on Climate Change was issued at the Third Pacific Islands Development Forum Leaders' Summit in September 2015 in Fiji. It urges all parties to the Kyoto Protocol to ratify and implement the Doha Amendment to the Kyoto Protocol. The Declaration further emphasises 'that requires all countries to cooperate with a view to accelerating the reduction of global greenhouse gas emissions on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities, with developed countries taking the lead with respect to mitigation actions and the means of implementation for combating climate change' (Pacific Islands Development Forum, 2015).

It also makes reference to the 2015 Paris Climate Change Agreement stating that it must provide in a balanced manner all the six elements identified in the Durban Mandate. Loss and damage must be included separately as the seventh element, and that the Agreement must ensure a truly shared global vision for a sustainable future (Pacific Islands Development Forum, 2015).

The Leaders of the Pacific Islands Development Forum called for:

a. The 2015 Paris Climate Change Agreement to limit global average temperature increase to below 1.5ºC above pre-industrial levels in order to transition towards deep-decarbonisation.

b. The 2015 Paris Climate Change Agreement to be legally binding;

c. The 2015 Paris Climate Change Agreement to establish explicit provisions that ensure the strongest possible efforts will be made to achieve and continuously enhance national and global mitigation action, including review of mitigation efforts every 5 years, with opportunities to recommit to stronger action as informed by science;

d. Loss and damage to be anchored as a standalone element that is separate and distinct from adaptation in the 2015 Paris Climate Change Agreement;

e. A special provision in the 2015 Paris Climate Change Agreement to fast-track urgent action required to assist the most vulnerable countries that are already experiencing existential threats from climate change;

f. An integrated approach to transitioning Pacific countries to low carbon transport futures, in particular sea transport given its central role in providing connectivity for Pacific Small Island Developing States, including a regional strategy to advocate for and monitor implementation of sector targets through relevant UN agencies commensurate with the 1.5°C threshold;

g. A new global dialogue on the implementation of an international moratorium on the development and expansion of fossil fuel extracting industries, particularly the construction of new coal mines, as an urgent step towards decarbonising the global economy;

h. Increased support for adaptation measures that address all vulnerable sectors including health, water and sanitation, energy, agriculture, forestry and fisheries;

i. Adaptation measures for Pacific Small Island Developing States to be 100% grant financed;

j. Support the establishment of mechanisms for the payment of ocean and ecosystem services;

k. Stronger regulations regarding climate proofing of infrastructure as well as revision or formulation of building and zoning codes;

l. The development of Pacific-based research and technology capacity as an essential foundation for innovation in our response to climate change;

m. Capacity building on formal and non-formal education, knowledge management, with a particular emphasis on national languages and communication of climate change;

n. Support to enable the greater involvement of community, civil society (including women, youth and persons with disabilities) and the private sector, in our climate change responses and initiatives (Pacific Islands Development Forum, 2015).

4.3.5 Boe Declaration on Regional Security / Biketawa Plus

The Boe Declaration on Regional Security was signed by the Members of the Pacific Islands Forum during the 49th Pacific Islands Forum which took place between the 3-6 September ,2018 in Nauru (Pacific Islands Forum, 2024a). The theme of the Forum was 'Building a strong Pacific - our people, our islands, our will'. The Declaration reaffirms that climate change remains the single greatest threat to the livelihoods, security, and wellbeing of the peoples of the Pacific (Pacific Islands Forum, 2024a).

It also identifies a number of threats in relation to human security, cybercrime and environmental destruction. As such, Pacific Leaders have expanded the concept of security to deal with a range of threats faced by their countries.

The Boe Declaration on Regional Security is also known as Biketawa Plus because it extends some of the security thinking of the Biketawa Declaration. The Biketawa Declaration outlines guiding principles for good governance and courses of action for a regional response to crises in the region' (Pacific Islands Forum, 2024b).

It provides a framework for coordinating response to regional crises and the first time it was invoked was during the Regional Assistance Mission to the Solomon Islands (RAMSI) when Australia and other Pacific countries intervened in the Solomon Islands in response to the political turmoil in the country from 1998 to 2003. The Biketawa Declaration was endorsed at the 31st Pacific Islands Forum Leaders summit in Kiribati in October 2000.

4.3.6 Nadi Bay Declaration on the Climate Change Crisis in the Pacific

Pacific leaders endorsed the Nadi Bay Declaration in 2019 during the fifth Pacific Islands Development Forum meeting. They called for more action on global commitments and expressed deep concern about the lack of comprehension, ambition, or commitment shown by developed nations of the world regarding the impending grave consequences that the current and ongoing climate crisis poses for vulnerable Pacific Small Island Developing States (PIDF, 2019).

The Nadi Bay Declaration made a number of strong proposals including:

a. Limits be placed to ensure that an increase in global temperature does not go beyond 1.5 degrees;

b. The relationship between the ocean and climate change is important in terms of managing carbon, the absorption of heat, and regulation of global climate system;

c. Serious effects of loss and damage on PICTs are inevitable;

d. Climate change poses the single greatest threat to the human rights and security of present and future generations of Pacific Island peoples;

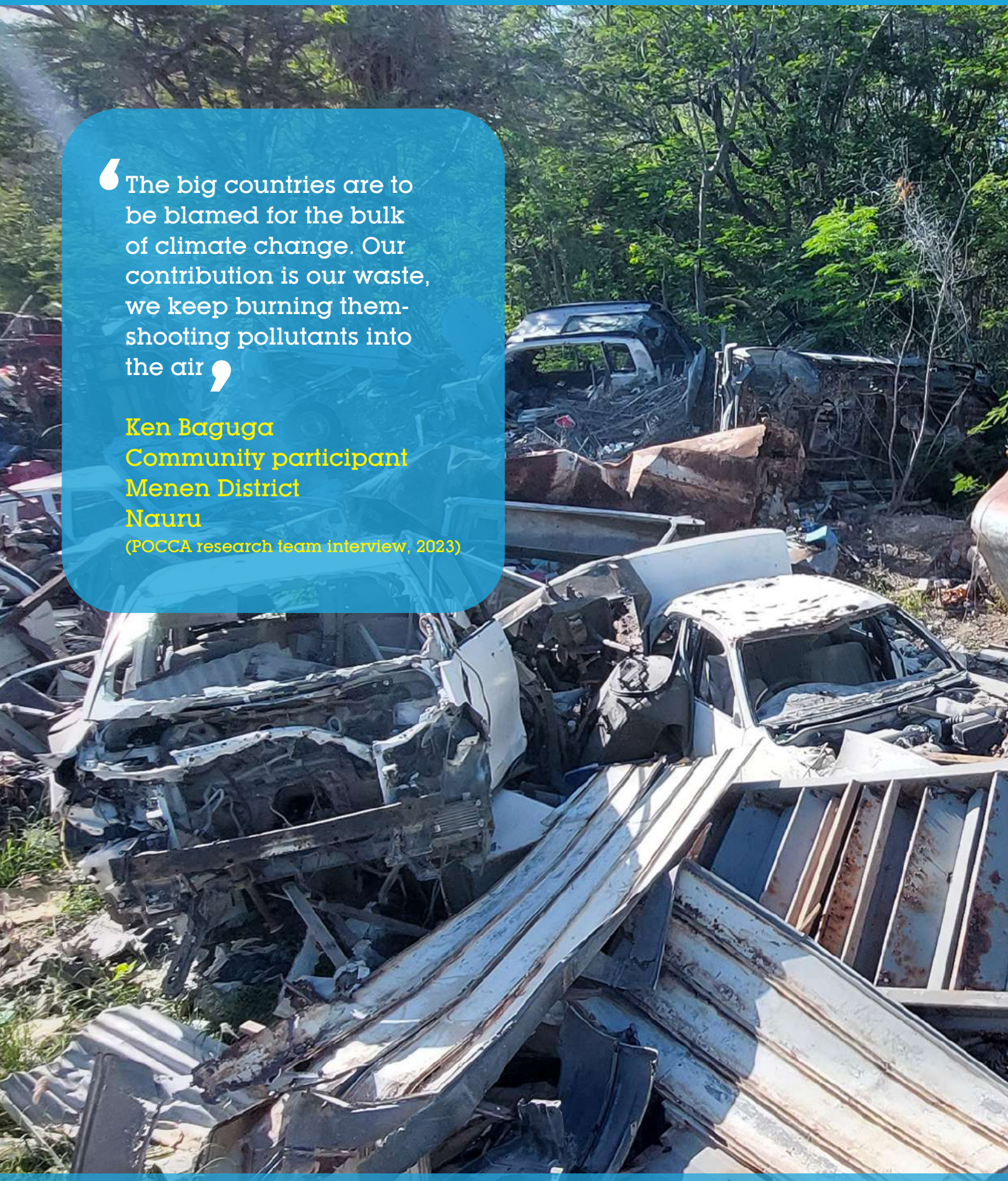
e. A UN Resolution is needed to establish a legal framework to protect the rights of people displaced by climate change including basic rights to life, water, food, and housing (PDF, 2019).

4.3.7 Kainaki II Declaration for Urgent Climate Action Now

During the 50th Pacific Islands Forum Leaders meeting in 2019, the Kainaki II Declaration for Urgent Climate Change Action Now was endorsed as they called on the international community to keep commitments made under the UNFCCC and to complete work needed to support the Adaptation Fund. The Declaration also called for increasing support and assistance for Pacific-led science-based initiatives, including support for modelling and risk mapping, the development of methodologies for understanding, projecting, and responding to climate change-related economic and infrastructure impacts, and capacity building for evidence-based decision making and project development. It also requested members of the G7 and the G20 to rapidly implement their commitment to phase out inefficient fossil fuel subsidies (Pacific Islands Forum, 2019).

In addition to this, the Declaration called for developing a work programme on oceans within the UNFCCC process; convening a workshop on the climate-ocean nexus in 2020; and creating two UN high-level posts - a special adviser on climate change and security appointed by the UN Secretary-General, and a special rapporteur who will review global, regional, and national security threats from climate change, appointed by the UN Security Council (Pacific Islands Forum, 2020).

The Kainaki II Declaration is the strongest statement that the Pacific Islands Forum has ever issued collectively on climate change. It was the first time the Forum declared that there is a 'climate change crisis' facing the Pacific Island states. Pacific leaders have set a new bar for the international community, as 'crisis' was not the agreed language in the Paris Agreement or in the UNFCCC process (Taylor, 2019).



> "The big countries are to be blamed for the bulk of climate change. Our contribution is our waste, we keep burning them- shooting pollutants into the air"

Ken Baguga
Community participant
Menen District
Nauru
(POCCA research team interview, 2023)

The impact of climate change on the environment and human is exacerbated by lack of land for disposing used cars. The picture from Nauru here is common around the small atolls in the Pacific (Photo: POCCA team, 2023).

4.3.8 Pacific Islands Forum Leaders' ocean statement

In 2021, Pacific leaders reaffirmed their commitment to sustainably manage, use, and conserve the ocean and its resources, as one Blue Pacific, guided by regional commitments and policy instruments. They further affirmed the Forum Foreign Ministers' decision to prioritise sustainable ocean management, use, and conservation for the Forum's international engagement and advocacy:

> We must collectively enhance our understanding of the ocean; strengthen the ocean science and policy interface, and focus on effective implementation of all commitments made and go further, to ensure a thriving Ocean now, and for the future. We note the important role of the Pacific Ocean Commissioner on advocacy and attention to Ocean Priorities, decisions and processes, including to monitor and report on progress in the implementation of regional Ocean commitments (Pacific Islands Forum, 2021a).

This was a build up to the 7th Our Ocean Conference hosted by Palau in 2022. The conference, titled *'Our Ocean, Our People, Our Prosperity,'* focused on combating climate change, promoting sustainable fisheries, creating sustainable blue economies, advancing marine protected areas, achieving a safe and secure ocean, and tackling marine pollution (Our Ocean 2022, Palau, 2022). Such events highlight the Pacific's role in ocean stewardship. They also signal Pacific leadership in tackling ocean and climate change, and help to build regional and international partnerships.

4.3.9 Pacific Islands Forum Leaders' Declaration on Preserving Maritime Zones.

In 2021, Pacific Islands Forum Leaders issued the Declaration on Preserving Maritime Zones in the Face of Climate Change-Related Sea-Level Rise. They declared that they would not review and update the baseline and outer limits of their maritime zones, also known as exclusive economic zones (EEZ), as a consequence of climate change-related sea-level rise. In addition, the rights and entitlements that flow from the EEZ shall continue to apply, without reduction, notwithstanding any physical changes connected to climate-related sea-level rise (Pacific Islands Forum, 2021b).

Figure 4.1 depicts the estimated exclusive economic zones of Pacific Island countries and territories. According to the declaration, the EEZ of the individual island states will not be lost but remain intact even if see levels rise and even if islands sink under water.

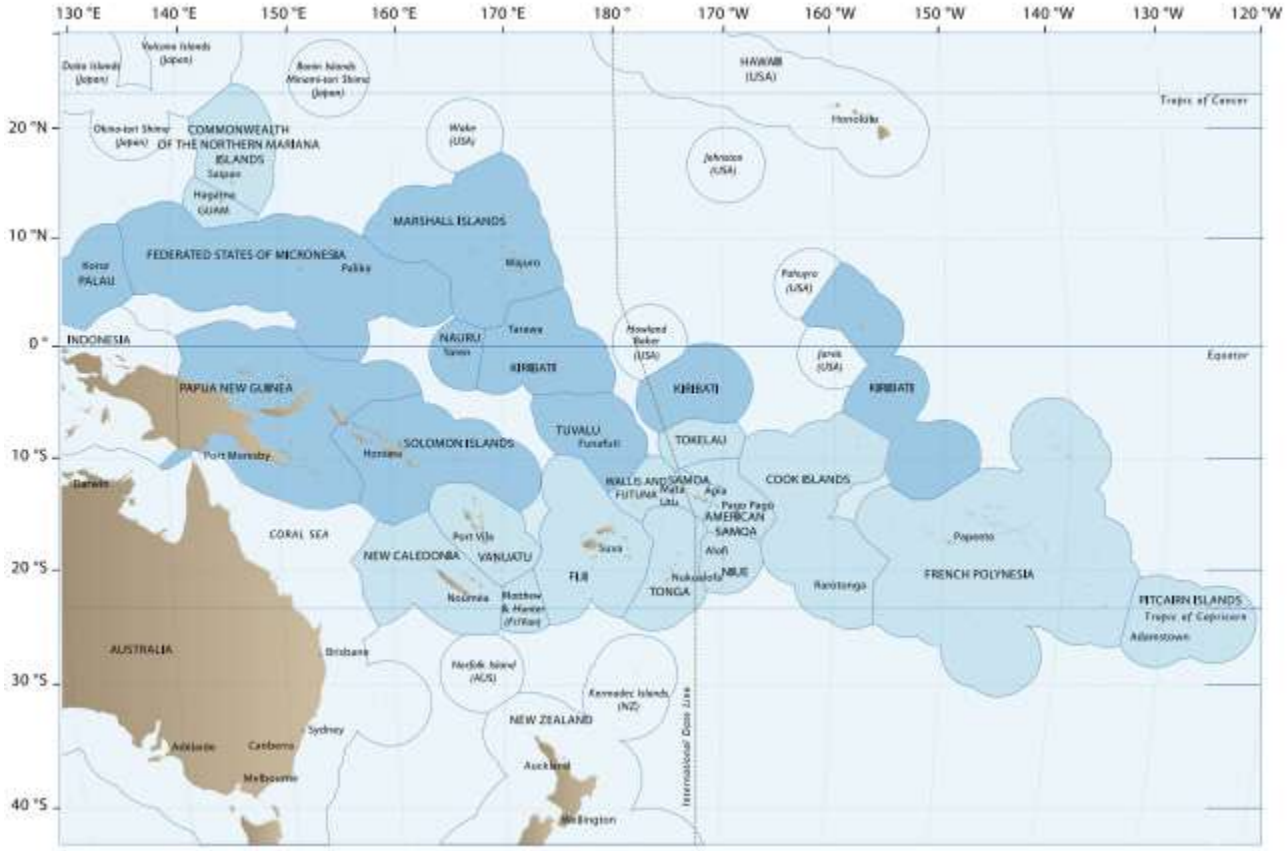


Figure 4.1: Estimated exclusive economic zones (EEZs) of Pacific Island countries and territories (Bell et al., 2013).

4.3.10 Framework for energy security and resilience in the Pacific

A new Framework for Energy Security and Resilience in the Pacific: 2021 – 2030 was developed in 2020 to guide the region's importation, production, use and management of energy. The framework focuses on actions to help the PICTs address their own energy sector priorities with a strong emphasis on improved energy sector robustness and resilience to adverse climate change and natural disasters, with the long-term goal of sustainable and affordable clean energy supply with 100% electricity access and low-carbon transport energy for all communities in the Pacific Islands. PICTs energy ministers developed and agreed to align the regional energy framework to the 2050 Strategy for the Blue Pacific Continent and to work with existing mechanisms rather than develop new or sector-specific approaches. The framework also provides opportunities to better develop Pacific women as energy professionals, which will be implemented through the Pacific Energy and Gender Strategy and Action Plan (Pacific Community, 2020).

4.3.11 Kioa Declaration

Kioa, an island in Fiji, where a community relocated from Tuvalu has been living since the 1940s, became a symbolic site where a number of leading Pacific climate activist organisations signed the Kioa Declaration in 2023, as a build-up towards COP27 in Egypt the same year. Those attended and signed the declaration were mostly civil society organisations who have been leading the charge in climate campaign in mobilising communities at the grassroots level as well as campaigning at the regional and global forums on behalf of civil society and marginalised communities. The organisations involved were the Kioa Council, Pacific Conference of Churches, 350.org Pacific, Pacific Climate Warriors, Greenpeace Pacific, Pacific Islands Climate Action Network (PICAN), Pacific Islands Association of Non-Governmental Organisations (PIANGO), Loss & Damage Youth Coalition Pacific, Caritas Oceania, Caritas Australia, International Center for Advocates Against Discrimination (ICAAD) and Rabi Youth Council. Also represented were other Pacific CSOs and representatives from Indigenous and frontline communities across the Pacific (Kioa Declaration, 2023).

The declaration focused largely on the plight of small and isolated communities and demanded decisive action to address the climate emergency through, amongst other things, greater action to maintain 1.5 degrees Celsius temperature goal; adaptation strategies and support for community initiatives; urgent progress on loss and damage; just and dignified climate mobility; equitable climate finance; climate-related ocean policies and inter-generational climate equity and justice (Kioa Declaration, 2023)

4.3.12 Pacific Islands Regional Ocean Policy and Framework for Integrated Strategic Action

This policy is intended to promote the Pacific region as an ocean environment in support of sustainable development. It is not a legal document, however its guiding principles are founded on international law, as reflected in the United Nations Convention on the Law of the Sea and other international and regional agreements. These guiding principles are: improving our understanding of the ocean; sustainably developing and managing use of ocean resources; maintaining the health of the ocean; promoting the peaceful use of the ocean; and creating partnerships and promoting co-operation (FFA, PIFS, SOPAC, SPC, SPREP, USP, 2006). The need for a policy is based on a collective awareness of the transboundary and dynamic nature of the ocean, the increasing number and severity of threats to its long-term integrity, and the reality that sustainable economic and social development will be dependent on wise use of the ocean and its resources. It is also based on an awareness of the potential for fragmentation of programmes and for conflicting commitments in different sectors as ocean-related activities increase. This requires increased regional collaborative arrangements among Pacific Island communities.

4.4 Regional institutional arrangements

This section outlines regional institutional arrangements to facilitate, implement and oversee the regional climate strategies previously discussed. The institutions and networks discussed here are the Pacific Resilience Partnership, Pacific Ocean Alliance, CROP Agencies, Office of the Pacific Ocean Commissioner, Pacific Conference of Churches, Climate Action Network, and Pacific Island Students Fighting Climate Change.

4.4.1 Pacific Resilience Partnership

In 2017, Pacific Island Leaders endorsed a set of governance arrangements for the Pacific Resilience Partnership (PRP) to support and facilitate effective implementation of the Framework for Resilient Development in the Pacific (FRDP), mentioned earlier. It is a network of stakeholders that drive resilience action at community, sub-national, national, regional and international levels. The PRP includes a number of entities including Pacific Resilience Meeting, PRP Taskforce, PRP Task Force Support Unit, and PRP Technical Working Groups. The PRP has supported and facilitated the implementation of FRDP since 2017 and stakeholders report on their programme implementation during the Pacific Resilience Meetings that are held bi-annually. The PRP consists of a range of stakeholders including governments, regional organisations, civil society and academic institutions, amongst others.

4.4.2 Pacific Ocean Alliance (POA)

In 2010, Leaders of the Pacific Islands Forum endorsed Our Sea of Islands, Our Livelihoods, Our Oceania, A Framework for a Pacific Oceanscape (FPO) to drive the implementation of the Pacific Islands Regional Oceans Policy (PIROP). The POA emerged from the FPO and prioritises partnerships in the development and implementation of ocean-related priorities at the national, regional, and international levels. The POA shares the overarching vision of the FPO which is 'a secure future for Pacific Island Countries and Territories based on sustainable development, management and conservation of our Ocean' (Office of the Pacific Ocean Commissioner, 2022).

4.4.3 CROP Agencies

The Council of Regional Organisations of the Pacific (CROP) was established in 1988 with the aim to improve 'cooperation, coordination, and collaboration among the various intergovernmental regional organisations to work toward achieving the common goal of sustainable development in the Pacific region' (see Pacific Islands Forum, 2022b). There are nine CROP agencies: Forum Fisheries Agency (FFA); Pacific Aviation Safety Office (PASO); Pacific Islands Development Program (PIDP); Pacific Power Association (PPA); The Pacific Community (SPC); Secretariat of the Pacific Regional Environment Programme (SPREP); Pacific Tourism Organisation (SPTO); The University of the South Pacific (USP); and Pacific Islands Forum Secretariat (PIFS).

Although the CROP agencies have diverse structures and functions, climate change is a common issue unique to their mandates, capacities and resources. In many instances they work together collaboratively, although there is also an element of competition between them.

4.4.4 Office of the Pacific Ocean Commissioner

The establishment of the Office of the Pacific Ocean Commissioner (OPOC) was mandated by the Pacific Islands Forum leaders in 2010. The task of the Pacific Ocean Commissioner, who is also the Secretary General of the Pacific Islands Forum Secretariat, is to work with a variety of actors (i.e. Pacific government leaders, international organisations, the private sector and civil society) to strengthen ocean governance; improve the understanding of challenges and opportunities in the region; build support for the region's efforts to sustainably develop, manage and conserve the ocean; strengthen coordination and collaboration between ocean stakeholders; and evaluate progress made against the Framework for Pacific Oceanscape and other ocean related policies and decisions.

The Pacific Ocean Commissioner is the regional champion that provides high level representation and commitment required for dedicated advocacy and attention to Pacific Ocean priorities, decisions, and processes at national, regional, and international levels.

The OPOC provides support to the Commissioner in such matters as the development of key messages and the promotion of regional ocean policy and regional ocean interests; the preparation of briefs and advice on cross and multi-sectoral ocean issues and integrated regional ocean governance issues; and the maintenance of a register of Pacific Ocean initiatives and projects to monitor progress and address gaps (Office of the Pacific Ocean Commissioner, 2022).

4.4.5 Pacific churches climate programmes: The Pacific Conference of Churches

The Pacific churches climate programme is led by the Suva-based Pacific Conference of Churches (PCC) which was formed in 1961. The PCC has 33 member churches and 10 councils of churches in 18 countries and territories across the region (2023a). The members come from a wide range of Christian denominations and has been one of the leading voices in issues of injustice, human rights, decolonisation, and climate change.

A key programme of the PCC is climate change. The PCC has led regional church leaders to COP meetings, helped governments relocate communities and design national relocation policies, and entered a Carbon Sequestration programme with the Fiji Ministry of Forests to plant a native forest as mitigation against increased carbon emissions (Pacific Conference of Churches, 2023b).

4.4.6 Pacific Islands Climate Action Network (PICAN)

The Pacific Islands Climate Action Network is a regional alliance of civil society organisations working on climate change issues in the Pacific Islands region. It has brought together civil society actors across the Pacific Island countries, advocating for climate justice and environmental integrity. PICAN aims to unite civil society under a common voice to increase the influence and impact of their advocacy demands on Pacific Island governments, leading non-Pacific governments to respond with more powerful and ambitious climate change policies and action at the national and regional level. As part of Climate Action Network International, the worldwide network of over 1,500 non-governmental organisations, PICAN works to ensure the Pacific Island civil society is represented at the international level (PICAN, 2023).

PICAN recognises the unique challenges that Pacific Island civil society organisations face in their work. These include remoteness, low population sizes, isolation from international networks, vulnerability to environmental, and economic shocks. To combat these challenges, the network has worked through a country node system which it believes can actively empower and enable civil society groups at local level. Four national nodes are currently in place (Kiribati, Tuvalu, Vanuatu, Solomon Islands). Over 160 organisations are currently affiliated to PICAN including such diverse groups as 350 Pacific, DIVA for equality, and Pacific Islands Development Forum). The network's current activities include facilitating and sharing of information and knowledge among civil society organisations; providing training and capacity-building opportunities; developing and sharing policy recommendations and position papers; organising and participating in regional and international meetings and conferences; supporting Pacific Island Countries in the negotiation of international agreements; and raising awareness of the impacts of climate change on Pacific Island communities and working to secure support for their needs (PICAN, 2023).

4.4.7 Pacific Islands Students Fighting Climate Change

Pacific Islands Students Fighting Climate Change is a youth-led organisation whose members are students from the Pacific Island Countries. The group began in March 2019 when 27 USP Law students from eight Pacific Island Countries decided to join together to begin a campaign to persuade the leaders of the Pacific Islands Forum to take the issue of climate change and human rights to the International Court of Justice (ICJ) (2023a).

Their core campaign seeks to convince the governments of the world to ask an Advisory Opinion from the ICJ regarding the legal obligations of states to ensure the protection of the climate system and other parts of the environment, and the legal consequences of the failure of states to protect the environment for present and future generations. The organisation is also committed to educating and activating all Pacific Island youth to become aware and take action to help prevent and fight against climate change.

In 2023, the Pacific Islands Students Fighting Climate Change developed a comprehensive Youth Climate Justice Handbook (2023b) for an advisory opinion on climate change and human rights. The Handbook aims to be the single most authoritative legal document that would guide the youth and civil society campaign in the second phase of the campaign. It also aims to contribute to the preparations of states and intergovernmental organisations in their submissions before the ICJ.

The students' proposal was supported by Pacific states which campaigned for support by other countries around the world and on 29 March 2023, the United National General Assembly unanimously adopted a resolution to seek the opinion of the ICJ on states' obligations regarding climate change (UN, 2023c).

4.5 Implementation of global and regional frameworks

This section discusses the implementation of global and regional frameworks in the Pacific region. It also assesses the region's relationships with partners including Green Climate Fund, Loss and Damage Fund, World Bank, Asian Development Bank, European Union, United States Agency for International Development (USAID), World Health Organization (WHO), and United Nations Development Programme (UNDP), and their role in addressing the existential threats of climate crisis in the Pacific Islands.

4.5.1 Accessing climate finance in the Pacific Islands Countries and Territories (PICTS)

The climate finance landscape for PICTs is complex and involves many players. Countries can access climate finance either directly through bilateral donors and multilateral development banks or through multilateral CFs (e.g., the GCF) (Atteridge & Nella, 2017).

More and more, multilateral CFs are becoming a major source of finance for large adaptation projects, which necessitates working within a system of accredited and implementing entities—the so-called climate finance architecture. Climate finance architecture refers to the system of public funds and institutions that help countries implement climate mitigation and adaptation projects. The current complexity of the climate finance architecture is a consequence of CFs being created in response to different needs and gaps at different points in time (Twaites & Niranjani, 2017; Tiedemann et al., 2021).

Some of the PICs have embarked on significant investments in climate adaptation, while others lag.

For example, Tuvalu's approved climate adaptation funding exceeds 200 percent of GDP, largely due to a major coastal protection project with the GCF. Kiribati, Nauru, Marshall Islands, and Vanuatu and have all secured over 30 precent of 2019 GDP in climate adaptation funding over the period 2014–19. Other countries lag behind, with Papua New Guinea and Fiji having secured less than 10 percent of their 2019 GDP in funding over the same period (2014–19). On a per capita basis, Tuvalu and Nauru have secured the most funding (Chen et al., 2017).

Some PICs rely primarily on bilateral partners for climate finance, which are overwhelmingly in the form of grants. For climate adaptation for example, in Papua New Guinea and Vanuatu more than 60 percent of funding was bilateral, primarily from Australia and the European Union. Palau and Kiribati also received the majority of their financing from bilateral sources, primarily Japan. Other PICs relied predominantly on multilateral sources, some almost entirely (Marshall Islands, Micronesia, Nauru, and Tonga) (Government of the Republic of the Marshall Islands, 2014; Chen et al., 2017; IMF, 2016; Twaites & Niranjani, 2017).

4.5.2 Green Climate Fund

The Green Climate Fund is a critical element of the Paris Agreement. It is the world's largest climate fund, mandated to support developing countries raise and realise their Nationally Determined Contributions ambitions towards low-emissions, climate-resilient pathways.

The Green Climate Fund invests across four transitions: built environment; energy and industry; human security, livelihoods, and wellbeing; and land-use, forests, and ecosystems. It employs a four-pronged approach: transformational planning and programming by promoting integrated strategies; catalysing climate innovation by investing in new technologies, business models, and practices; facilitating investment to mobilise finance at scale by using scarce public resources to improve the risk-reward profile of low emission climate resilient investment; and mainstreaming climate risks and opportunities into investment decision-making to align finance with sustainable development (Green Climate Fund, 2023).

The Fund uses part of its finance to help mobilise financial flows from the private sector to compelling and profitable climate -smart investment opportunities. A core principle is to follow a country-driven approach, which means that developing countries lead programming and implementation. Country ownership of financing decisions enables developing countries to turn Nationally Determined Contributions into climate action. The GCF implementation and challenges in the Pacific are examined in more detail in Chapter 18 on climate finance in the Pacific (See Chapter 18).

4.5.3 Loss and Damage Fund

Loss and damage refer to the negative consequences that arise from the impacts of climate change, like rising sea levels, prolonged heat waves, desertification, the acidification of the sea and extreme events, such as bushfires, species extinction and crop failures. As the climate crisis unfolds, these events will happen more frequently, and the consequences will become more severe. The Loss and Damage Fund (LDF) was endorsed during COP28 in Dubai and the purpose was to provide financial resources to address economic and non-economic loss due to extreme weather in 'developing' countries which are deemed vulnerable (UN, 2024).

It is important that a LDF fills the gaps that current climate finance institutions such as the Green Climate Fund do not fill. Combined adaptation and mitigation finance flows in 2020, fell at least US$17 billion short of the US$100 billion pledged to developing countries. A Transitional Committee has been established to provide recommendations for the set up and operations of the fund. The Committee will also recommend which countries should receive funding and who should be paying into the fund. The operational details of this fund are yet to be decided.

4.5.4 World Bank

The World Bank developed a Climate Change Action Plan that aims to advance the climate change aspects of the World Bank's Green, Resilient, and Inclusive Development (GRID) approach, which pursues poverty eradication and shared prosperity with a sustainability lens. The World Bank will support countries and the private sector to maximise the impact of climate finance, aiming for measurable improvements in adaptation and resilience and measurable reductions in GHG emissions. The Action Plan also considers the importance of natural capital, biodiversity, and ecosystems services and advocates for increased support for nature-based solutions, given their importance for both mitigation and adaptation. The Action Plan focuses on integrating climate and development; identifying and prioritising action on mitigation and adaptation opportunities; and using those to drive the World Bank's climate finance and leverage private capital (World Bank, 2021).

The World Bank has been involved in climate adaptation and disaster risk management in the Pacific for a number of years. Its activities cover a range of areas including disaster and climate risk assessment; innovative risk financing mechanisms; risk reduction measures, including early warning systems and enhancing resilient housing and infrastructure; rapid response and damage assessments following disasters; and climate-related prior actions in Development Policy Operations (DPOs) (World Bank, 2023).

Part of its long-term climate policy in the Pacific is to support the 2050 Strategy for the Blue Pacific Continent. The World Bank's Climate Change Action Plan 2021-2025 is geared towards supporting the ocean and blue economies and its resources and the Pacific is a significant location for this policy focus. In the Pacific it has invested in disaster and climate risk assessments as well as risk reduction in community development, water and coastal management, transport and agriculture. Some specific projects include 'climate proof' key transport infrastructure and coastal resilience building in Samoa. This included helping to rebuild damaged roads and providing seeds, tools and livestock to affected farmers. Another example is partnership with farmers in Vanuatu to introduce climate resilient livestock. The World Bank also assisted in a water security project in Kiribati in collaboration with GEF, Australia and New Zealand (World Bank, 2023).

4.5.6 Asian Development Bank

The Asian Development Bank (ADB) developed a Climate Change Operational Framework 2017-2030 whose vision is enhanced actions for low GHG emissions and climate-resilient development in Asia and the Pacific (Asian Development Bank, 2017).

This vision supports the objective of the Paris Agreement to limit average temperature increase to below 2 degrees Celsius, with aspirations of limiting it to 1.5 degrees Celsius. To achieve this, the CCOF2030 is structured around a series of linked principles, actions, and institutional measures (Asian Development Bank, 2017, p. viii).

The CCOF2030 is guided by a number of principles including: supporting ambitious climate objectives articulated in the nationally determined contributions and other climate plans; accelerating low greenhouse gas emissions development; promoting climate change adaptation; integrating climate change adaptation and disaster risk management; and linking climate actions to the wider sustainable development agenda (Asian Development Bank, 2017, p. ix-x). Furthermore, CCOF2030 is centred in the following actions: supporting institutional development and policy frameworks conducive to ambitious climate action in developing member countries; facilitating access to public and private, domestic, and international climate finance; promoting the use of climate technologies in operations; developing knowledge solutions and capacity development support; and strengthening partnerships and networks (Asian Development Bank, 2017, p. x).

ADB's climate change engagement in the Pacific is through its Climate Change Implementation Plan for the Pacific. This enables ADB to provide a range of technical and financial support, together with capacity development, for economic growth in response to climate change. ADB is one of the accredited institutions which PICs need to partner with to access global climate finance. This is problematic because of the loan component added to the climate fund and also the focus of ADB on growth rather than equity and wellbeing at the local level.

4.5.7 European Union

Under the European Climate Law, European Union (EU) countries must cut greenhouse gas emissions by at least 55% by 2030. In December 2019, EU leaders agreed that the EU should achieve climate-neutrality by 2050. This means that EU countries will have to drastically reduce their greenhouse gas emissions and find ways of compensating for the remaining and unavoidable emissions to reach a net-zero emissions balance. The European Council underlined that the transition to climate neutrality brings opportunities for economic growth, market and jobs, and technological development (European Council, 2023).

a. The EU developed a European Green Deal that aims to transform the EU into a modern, resource-efficient and competitive economy, ensuring: no net emissions of greenhouse gasses by 2050; economic growth decoupled from resource use; and no person and no place left behind. These are applied in a number of areas including climate, energy, environment and oceans, agriculture, transport, industry, research and innovation, finance and regional development; and new European Bauhaus (European Commission, 2023).

b. The EU has expanded its climate policies into the Pacific through funding of a number of projects in some countries or region-wide climate programs such as the Pacific Adaptation to Climate Change and Resilience (PACRES), which we shall see in the next section.

4.5.8 Pacific Adaptation to Climate Change and Resilience (PACRES)

The Pacific Adaptation to Climate Change and Resilience (PACRES) project works to increase resilience across 15 PICTs by providing opportunities and resources for capacity building, education, resilience qualifications, and training. This allows Pacific peoples to strengthen their capacity to mitigate and adapt to climate change through knowledge sharing and learning.

Funded by the European Union, PACRES consists of the Pacific Community (SPC), Pacific Islands Forum and the University of the South Pacific which work together to share information, research results and knowledge about climate action and strengthen their capacity to mitigate and adapt to climate change (SPC, 2023).

With the objective to scale up Technical and Vocational Education and Training (TVET), programmes are currently being implemented by the PACRES team on regional Qualification in Resilience; provision of TVET tools; Community of Practice (COP) activities to train villagers to be better prepared for natural disasters and study tour.

SPC is also implementing a grant facility to scale up adaptation pilots in Vanuatu, Papua New Guinea, Timor Leste, Solomon Islands, and Samoa. The grants currently fund 14 active pilots involving local governments, civil society organisations, and non-governmental organisations. The pilots cover various areas from protection of urban open spaces and enhancing local food security, enhancement of natural vegetation of riverbeds to shoreline protection by restoring degraded mangroves and raising awareness on climate change and adaptation in communities.

The PACRES Pacific Community (SPC) component is EUD$2.5M and covers 15 PICTs: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Timor Leste, Tonga, Tuvalu, and Vanuatu (Pacific Community, 2022).

4.5.9 United States Agency for International Development

The United States Agency for International Development (USAID) - was created in 1961 with the aim to lead the US government's international development and humanitarian efforts. In order to mitigate climate change and address its impacts, USAID partners with more than 45 countries to implement ambitious emissions reduction measures, protect critical ecosystems, transition to renewable energy, build resilience against the impacts of climate change, and promote the flow of capital toward climate-positive investments. The agency also integrates climate considerations across its portfolio to protect development progress.

USAID developed a new Climate Strategy that will guide their work through 2030. Whereas the previous 2012-2018 Climate Change and Development Strategy was focused on specific climate change mitigation and adaptation measures, the new Strategy takes a 'whole-of-Agency' approach that calls on all corners of USAID to play a part in their response. The agency will work on the ground with partner governments and local actors to set the global trajectory toward a resilient, prosperous, and equitable world with net-zero greenhouse gas emissions (USAID, 2022, p.1).

In the Pacific USAID has been mostly active in the former US territories in Micronesia but recently, it reopened its offices in Fiji and Papua New Guinea after they were closed down in the 1990s at the end of the Cold War. US aid was largely used as a strategic tool of influence against the Society Union during the Cold War period. One of USAID's largest project in the Pacific is the Climate Ready Project (CRP), which covers a number of countries including Federated States of Micronesia, Fiji, Kiribati, Republic of the Marshall Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. The focus of this programme is to ensure that policy frameworks and capacity were in place to effectively access and manage the additional funds as well as achieve tangible progress toward the implementation of an increased number of adaptation interventions. This was to ensure that countries became more resilient to climate and disaster risks.

The funding is geared towards existing process and structures for climate mitigation and adaptation which support National Adaptation Plans (NAP) as well as building capacity for accessing climate funding through accredited institutions (USAID, 2023). Through the CRP, USAID has a partnership with The University of the South Pacific (USP) to run courses relating to project management, cost benefit analysis, preparation and adaptation to climate impact and resilience to government, CSO and private sector organisations (USAID, 2013). In addition, USAID also runs the Pan-American Fund which in recent years has provided small grants to Pacific communities to develop their resilience and adaptation strategies to climate change.

4.5.10 World Health Organisation (WHO)

The World Health Organisation (WHO) was established in 1948. WHO aims to translate global health initiatives into regional plans that respond to the needs and challenges of countries in the region (World Health Organization, 2022).

WHO supports countries in building climate-resilient health systems and tracking national progress in protecting health from climate change, as well as in assessing the health gains that would result from the implementation of the existing Nationally Determined Contributions to the Paris Agreement, and the potential for larger gains from more ambitious climate action (World Health Organization, 2023a). In the region, WHO works with Palau, Papua New Guinea, Fiji, Samoa, Kiribati, Solomon Islands, Tonga, Tuvalu, Marshall Islands, Vanuatu, and Federated States of Micronesia (World Health Organization, 2023b).

4.5.11 United Nations Development Programme (UNDP)

The United Nations Development Programme (2022a) is focussed on international development with the aim to eradicate poverty and reduce inequality. Their work is concentrated in three focus areas: sustainable development, democratic governance and peace building, and climate and disaster resilience. Their UNDP Pacific Office (2023) is located in Fiji and assists Pacific Island countries to advance the global 2030 Sustainable Development Agenda tailored to each country's priorities.

The UNDP has been involved in a climate security project in the Pacific in the context of the SDG 13 on climate action. The aim is to help build resilience and secure a sustainable future through capability development and supporting their governments in their climate strategies. An important aspect of this approach is inclusion of diverse players such as women, disabled people and youth. The UNDP Pacific risk project is aimed at empowering atoll states and regional actors in the Pacific to address climate-related security risks; strengthening the overall understanding and risk management of critical climate-related security risks and challenges; and enhancing advocacy and related capacities of Pacific Island Nations to combat climate change, focusing on the climate impact on peace and human security (UNDP, 2023b).

The Pacific Catastrophe Risk Insurance Pilot (PCRI) provides insurance against tropical cyclones and earthquakes. Countries can choose varying levels of coverage and in the event of a disaster of sufficient magnitude, receive a rapid pay-out based on modeled physical damage (Mahul et al., 2015). The PCRI is part of the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) and currently involves five Pacific Island countries: the Cook Islands, the Marshall Islands, Samoa, Tonga, and Vanuatu. Support for the programme comes from the World Bank, Government of Japan, the Secretariat of the Pacific Community (SPC), the Asian Development Bank, Global Facility for Disaster Reduction and Recovery (GFDRR) and the European Union (Tigre, 2013).

During the first season of the programme, five countries (Vanuatu, Tonga, Marshall Islands, Solomon Islands and Samoa) purchased tropical cyclone and/or earthquake catastrophe risk insurance. A disaster risk financing and insurance in the Pacific 10 insurance pay-out was made to Tonga within two weeks of Tropical Cyclone Ian in January 2014 (Mahul et al., 2015).

The Cook Islands joined the pilot in its second season (World Bank, 2014b). The second pay-out made by the programme came in March 2015 when Vanuatu received USD 1.9 million in compensation for damage caused by Tropical Cyclone Pam (World Bank, 2015b). The pilot programme has shown that pooling risk across multiple Pacific Island countries can reduce the cost of reinsurance by up to 50% compared with purchasing comparable coverage individually, due to risk diversification and economies of scale (World Bank, 2014b; World Bank, 2014a). Capacity building activities undertaken as part of the pilot have also strengthened institutional capacity on public financial management of natural disasters (World Bank, 2014b; World Bank, 2014a).

4.6 Local community initiatives and programmes

Coastal protection using sea walls and breakwater structures against sea level rise and beach erosion are popular in the Pacific. Unlike small Islands in the Caribbean or Indian Ocean, breakwater structures in the Pacific also includes mangroves. This is because many islands have been occupied for millennia by Indigenous communities with extant Indigenous environmental knowledge, such as the use of mangrove as water barriers, for coping with adversity (Granderson, 2017). Adaptation practices used in Pacific Islands are mostly based on community Indigenous knowledge and skills passed down over generations. For example, in French Polynesia (Tahiti) the traditional practice of elevated houses with floors built 1.5 m above ground level are used and subsidised by the government as part of risk prevention

Pacific Islands have also focused increasingly on Ecosystem Based Approaches (EbA) and other nature-based solutions that build on their Indigenous knowledge and skills and that bring benefits both for the ecosystems and communities (Giffin et al., 2020). For instance, in Fiji Indigenous knowledge has informed EbA initiatives by identifying native vegetation suitable for strengthening the coastal environment to reduce coastal erosion and flooding in the villages (Nalau et al., 2018b).

Whole-of-island approaches, like Lomani Gau on Gau Island in Fiji, try to foster integrated management practices that are based on shared governance of resources and on understanding the interlinkages between sectors and ecosystems (Remling & Veitayaki, 2016). In many Pacific Islands, relocation (both planned and autonomous) is an adaptation option of last resort due to high economic and sociocultural cost (McNamara & Des Combes, 2015). Two case studies of community relocation in Fiji (Denimanu and Vunidogoloa villages) recommend that participatory inclusion of all social groups in the relocation planning process, including in planning for livelihood sustainability in new locations, should be ensured in future planned community relocation to foster positive adaptive outcomes (Piggott-McKellar et al., 2019).

The experiences and lessons learned from the community risk management and adaptation initiatives has the potential to inform sub-national and national level planning and policy formulation.

4.7 National frameworks and strategies

In response to international commitments under global frameworks like UNFCCC and national needs, the PICTs have developed their national development plans which include both adaptation and mitigation actions. Under UNFCCC, the five Pacific LDC's (Kiribati, Samoa, Solomon Islands, Tuvalu, and Vanuatu) have developed the National Adaption Programme of Action (NAPA) whilst other countries developed the National Adaptation Plan. The NAPA identifies urgent and short-term adaptation needs for immediate implementation whilst the NAP identifies medium and long-term adaptation needs. It also develops and implements strategies and programmes to address adaptation needs (UNFCCC, 2011). For Fiji, the NAP is a continuous, progressive, and iterative process to ensure a systematic and strategic approach to adaptation in all government decision making, which will facilitate institutional coordination, resource mobilisation, and ultimately effective adaptation actions. The five Pacific LDCs are also now developing their NAP. Some PICTs, for example Tonga, have developed Joint Action Plans (JNAP) for climate change and disaster risk management. The current JNAP is the JNAP2 2018-2028 (Government of Tonga, 2018). In December 2015, Parties to the UNFCCC adopted the Paris Agreement in December 2015 – an Agreement, which requires all parties to determine, plan, and regularly report on their nationally determined contribution (NDC) on climate change mitigation. Parties also submit aggregate progress on mitigation, adaptation, and means of implementation, which are reviewed every five years through a Global Stock take. The NAP and the NDCs priorities are included in the country's national development strategies. For example, the Solomon Islands National Development Strategy 2016-2035 objective four specifically focuses on resilient and environmentally sustainable development with effective disaster risk management, response, and recovery (Solomon Islands Government, 2016). Vanuatu's National Sustainable Development Plan 2016–2030 also called 'the People's Plan', is an inclusive plan of action on economy, environment, and society with the aim to strengthen adaptive capacity and resilience to climate change and disasters. It emphasises the rights of all Ni-Vanuatu, including women, youth, the elderly and vulnerable groups (Republic of Vanuatu, 2017).

4.8 National and sub-national processes

Climate Change and Disaster Risk Management (CCDRM) have been integrated into government and community level development planning. At the subnational level this is occurring through collaboration with the Government Ministries responsible for local government and community planning (UNDP, 2014). For example, in Tonga climate change and risk integration in community development planning is led by the Ministry of Internal Affairs in partnership with an NGO called Mainstreaming of Rural Development Innovation Tonga Trust (MORDI-TT). They have created more than a hundred risk informed Community Development Plans (CDPs) which inform subnational and national development planning. Tonga has incorporated community Indigenous knowledge, and skills in the CDPs and undertaken some of their own development themselves (Government of Tonga, 2018).

4.8.1 Vanuatu case study

Vanuatu has taken on the integrated approach to address climate change and disaster risk reduction by establishing the National Advisory Board on Climate Change and Disaster Risk Reduction (NAB) in 2012. The NAB is Vanuatu's supreme policymaking body for climate change and disaster risk reduction (programmes and initiatives) and comprises of government, CSO stakeholders, and private sector (Nachmany et al., 2015).

Vanuatu is a small island developing state that is highly vulnerable to the impacts of climate change and associated natural disasters (Gero et al., 2013; SPC, 2015; IPCC, 2018). Natural disasters affect thousands of people and their properties and exacerbate existing development challenges in the country. Climate change also impacts critical ecosystems that island communities depend on for their food security and livelihoods. Ocean acidification and associated impacts such as coral bleaching, food and water security issues, sea level rise, heavier rainfall during the wet season resulting in flooding, drier hot seasons resulting in droughts, pose socio-cultural and economic risks (PCCSP, 2015). To build a more resilient future for the country, requires a strong partnership between national and sub-national governments, private sector, civil society organisations, communities, development agencies and donor partners. The Vanuatu National Advisory Board on Climate Change and Disaster Risk Reduction was established in 2012. The NAB is Vanuatu's supreme policymaking body for climate change and disaster risk reduction (programs and initiatives) and comprises of government, CSO stakeholders, and the private sector (Nachmany et al., 2015). The NAB is the advisory and policy-making body for all climate change and disaster risk reduction programmes, projects, and initiatives in Vanuatu. It was set up to oversee the development and implementation of climate change and disaster risk reduction policies, guidelines and initiatives and to provide advice on international and regional climate change and disaster risk reduction obligations, making its functions vital for climate change and disaster risk initiatives in Vanuatu (SPC, 2015).

Before mid-2012, two separate government bodies were responsible for climate change and disaster risk reduction work in Vanuatu. These were the NACCC and the National Task Force on Disaster Risk Reduction (NTF). During this time, it was identified that there were numerous areas where the roles and responsibilities of NACCC and the NTF overlapped. To address these overlaps and encourage efficient coordination, and to improve the use of national resources, governance and vision, the National Disaster Management Office (NDMO) and the Vanuatu Meteorological and Geo-Hazards Department (VMGD) were merged into one institution.

During these initial stages, the NAB was co-chaired by the Director of the Vanuatu Meteorological and Geohazards Department (VMGD) and the Director of the National Disaster Management Office (NDMO). Members were nominated by the co-chairs and appointed only during NAB meetings.

The NAB functions were evaluated in 2017 through assessment of policy drivers, organisational performance, delivery expectations (current and proposed), organisational risks and constraints and/or limitations. The evaluation was undertaken using a 'Problem Driven' approach to identify issues and risks and to propose options for resolving these issues.

Policy drivers for the NAB include the National Sustainable Development Plan 2016 – 2030, the Ministry of Climate Change Adaptation Corporate Plan 2016 – 2018, and the Climate Change and Disaster Risk Reduction Policy 2016 – 2030. The third sub-pillar of pillar 2 (pillar 2.3) of the NSDP is for Vanuatu to be 'a strong and resilient nation in the face of climate change and disaster risks posed by natural and manmade hazards'. At the core of the NSDP is the ambition for Vanuatu to have 'enhanced resilience and adaptive capacity to climate change and natural disasters. Currently, the NAB is well placed to achieve this ambition as it sits within the Ministry of Climate Change's Corporate Services Unit to directly liaise with the Prime Minister's Office to ensure that all climate change and disaster risk reduction initiatives are sufficiently aligned with the NSDP (Vanuatu Ministry of Climate Change Adaptation, 2015).

The specific role of the NAB ideally positions it to facilitate multi-tiered risk governance through the current integrated structure and using sound and independent decision making with regards to allocating initiatives and resources and ensuring a wide reach.

Research suggests that the technical capacity of national institutions that play a major role to ensure national readiness in anticipation of shocks contributes to determining how resilience manifests at the national level (UNDP, 2010; UNDP, 2011; UNDP, 2017b). Simultaneously, stability, adaptability and performance are critical for any institution involved in climate change and disaster management efforts (UNDP, 2010; UNDP, 2011). The stability of an institution is, in part, determined by its ability to identify, analyse and manage risks allowing it to adapt to different national circumstances (UNDP, 2011). Adapting and responding to changes in national priorities and needs and the ability to analyse current national situations to predict future needs, is another determinant of a sound national institution. Performance of national institutions including institutional capacities and human resource management and upskilling is also important for high performing national institutions.

4.8.3 NAB Alignment with regional and international frameworks

The NAB is strategically aligned with regional and international frameworks on climate change and disaster risk reduction. At the regional level, the NAB is aligned to the Framework for Resilient Development in the Pacific 2017 – 2030 (FRDP), a framework developed to support the integration of climate change and disaster risk reduction initiatives.

The United Nations Framework Convention on Climate Change (UNFCCC) and the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) are international frameworks that the NAB is aligned to with specific roles adhering to the ideals of these frameworks. Nationally, the NAB is well placed and aligned with the National Sustainable Development Plan 2016 – 2030 (NSDP) and the National Climate Change and Disaster Risk Reduction Policy 2016 – 2030 (NCCDRRP). Alignments at both the regional and international levels are linked to the goals and the aims of the frameworks as well as the identified expected outputs and activities.

4.9 Some policy implications

- Because it has defined Pacific people's responses to environmental challenges for generations, Indigenous knowledge must be incorporated into sub-national, national, regional and global frameworks, policies and strategies on climate change, especially in relation to adaptation strategies and engagements with communities.

- There is a need for vertical alignment of community and sub-national action plans into the national, regional, and global frameworks, policies, and strategies with emphasis on bottom-up approaches to ensure meaningful participation of communities.

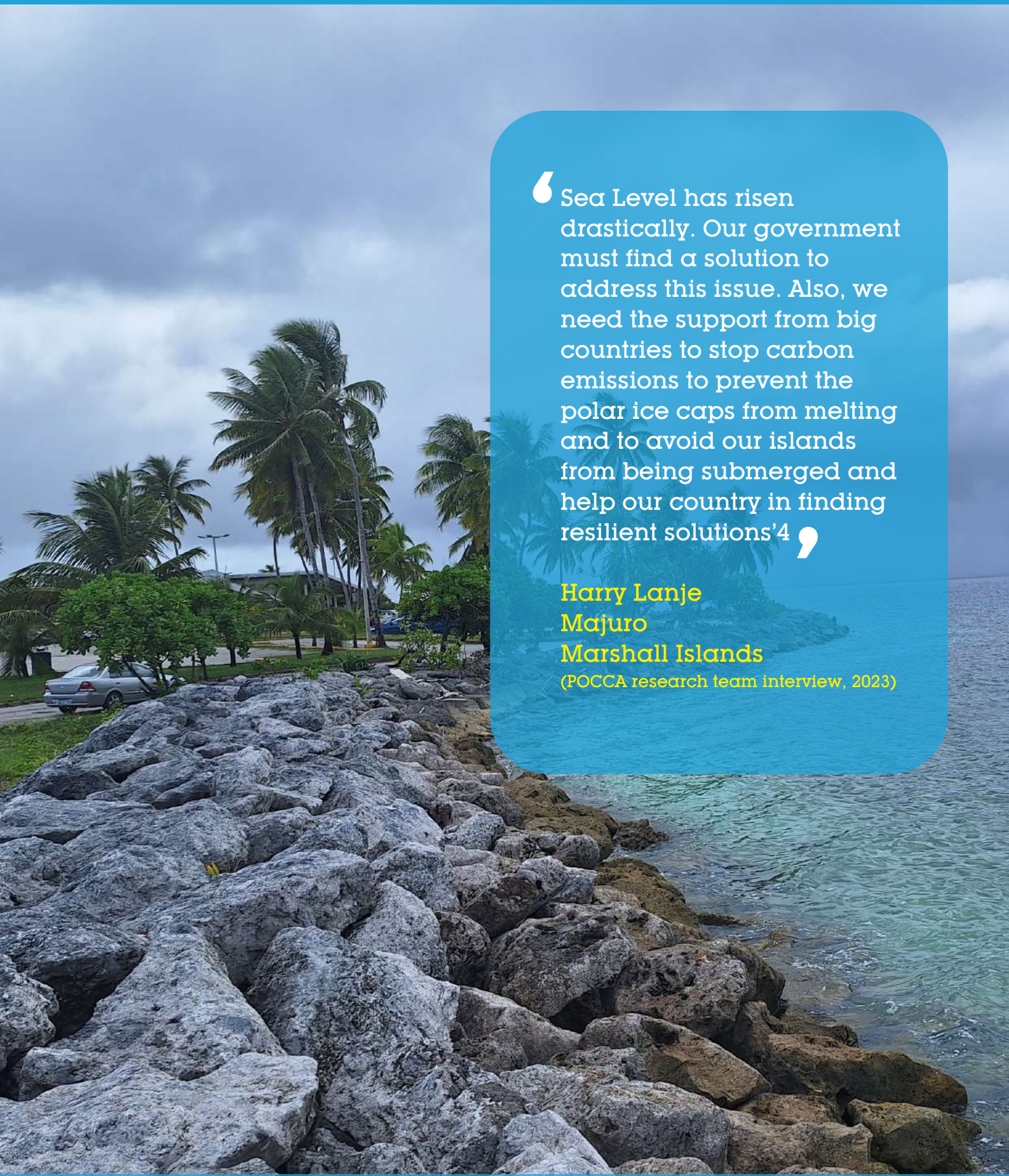
- Climate change strategies and delivery systems must be geared towards local needs to ensure maximum impact.

- Pacific climate frameworks must not be used as Trojan horse for the implicit agenda of external institutional and ideological interests which may try to influence how the climate fund is used or who the project contractors should be. Climate funds should be depoliticised and the survival of people at the frontline of climate change in the Pacific should be the primary focus.

- Partnership between international, regional, and national stakeholders should be based on mutual respect and not money-driven paternalism (the 'golden rule' syndrome: one who pays makes the rules). Regional and national stakeholders should be bolder and more critical in negotiations.

- For future sustainability, regional and national climate frameworks and strategies must have built-in provisions for the use of local expertise and where there is none, there should be provision for training.

- Institutions such as UNDP should redefine the term risk in a more locally relevant and nuanced way.



> ‘Sea Level has risen drastically. Our government must find a solution to address this issue. Also, we need the support from big countries to stop carbon emissions to prevent the polar ice caps from melting and to avoid our islands from being submerged and help our country in finding resilient solutions’4 ’

Harry Lanje
Majuro
Marshall Islands
(POCCA research team interview, 2023)

Part of a seawall in the Marshall Islands built by the community to mitigate sea level rise (Photo: POCCA team, 2023).

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Chapter 5

'We are the Moana': Climate Risks, Narratives of Vulnerability and Indigenous Pacific Resilience

Authors

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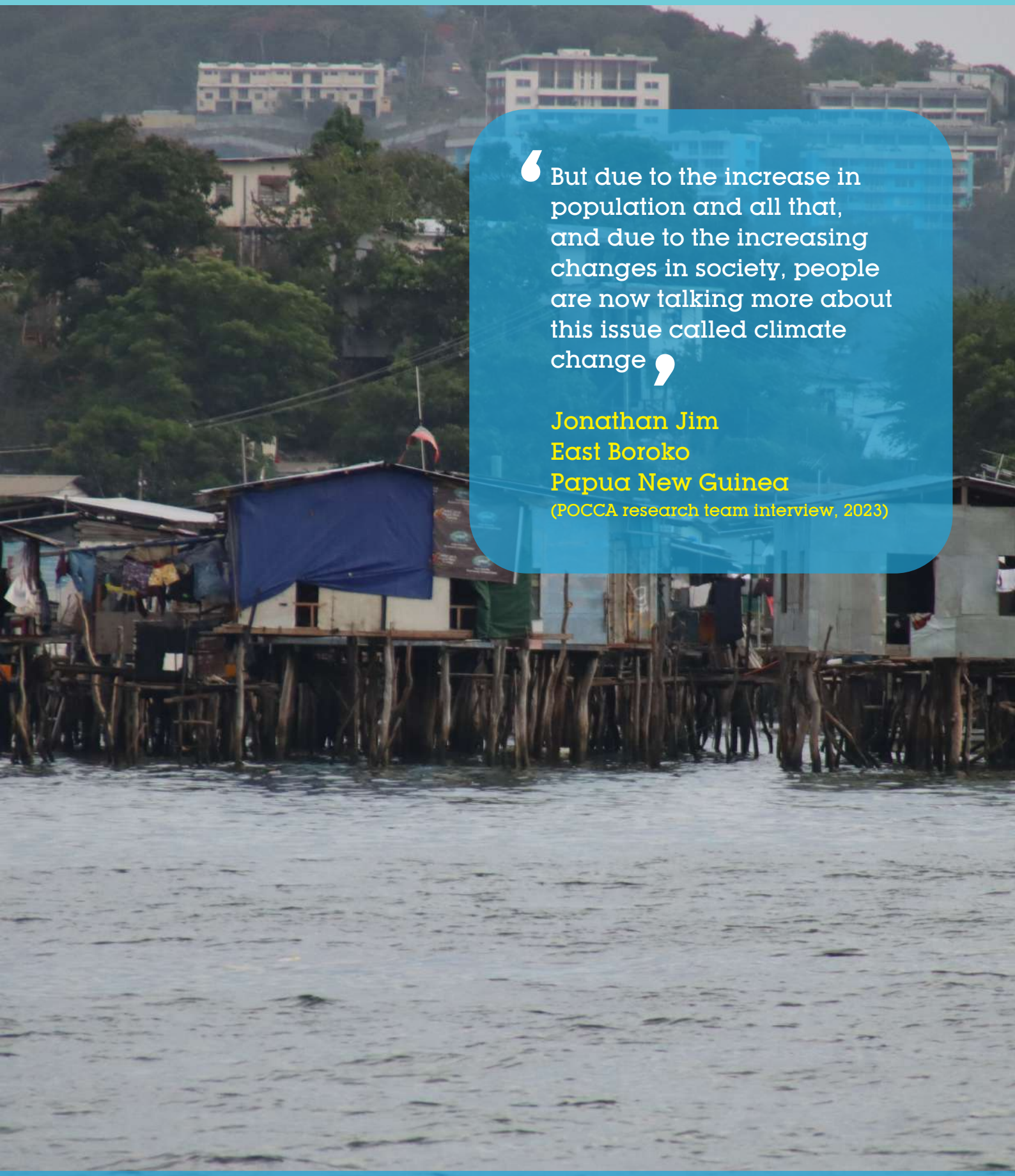
Fishermen in Honiara, Solomon Islands with their catch, which has been diminishing size and declining in stock due to climate change and over fishing (Photo: POCCA team, 2023).

Abstract

This chapter introduces narratives of vulnerability and Indigenous Pacific resilience as precursors to understanding climate risks to help set the contextual scene for subsequent chapters. Emphasis is made on highlighting key narratives which underscore perceptions of resilience. It discusses elements of historical/residual legacies and how these influence present perceptions, as well as Indigenous led approaches to reclaim these narratives in support of efforts to shape future adaptation/resilience opportunities. It then highlights inter-related but distinct thought-provoking themes and cases of integrated approaches to inclusion and representation of local, Indigenous knowledge in resilient initiatives and decision-making. The importance of monitoring and evaluating adaptation through Indigenous lenses are discussed to contextualise the significance of such frameworks in relation to inclusivity, sovereignty, uptake of adaptive practices and sustainability at local scales. Lastly, the chapter presents key gaps and takeaway messages in the context of implications/opportunities for policy development.

Glossary of key terms

Fa'amatai	The traditional chiefly system of governance in Samoa It is based on the authority and leadership of the matai, or chiefs, who are responsible for decision-making and managing family and village affairs
Feagaiga	Sacred covenant between entities
Falepili	Falepili is a Tuvaluan word for the traditional values of good neighbourliness, care and mutual respect. It is the name given to the recent climate change related agreement signed between Tuvalu and Australia.
Fanua	Samoan word for land
Fenua	Tahitian word for land
Fonua	Tongan word for land
Lulu	Samoan for owl
Tapu-a-fanua	Sacred boundary
Tuaoi	Boundary
Vanua	Fijian word for land
Wantok	PNG Tok Pisin, Solomon Island Pijin, Vanuatu Bislama



> ‘But due to the increase in population and all that, and due to the increasing changes in society, people are now talking more about this issue called climate change’

Jonathan Jim
East Boroko
Papua New Guinea
(POCCA research team interview, 2023)

Expanding informal settlements in Port Moresby, Papua New Guinea, despite the looming threat of sea level rise (Photo: POCCA team, 2023).

5.1 Introduction

Moananuiākea (the Pacific Ocean) is central to this chapter. Pacific peoples are intrinsically connected to the ocean itself (Hau'ofa, 2008). The ancestors of Pacific people crossed what they refered to in different ways as moana, solwara, wasawasa, etc. and settled in widely dispersed islands using limited resources. In the process, they developed systems of social ecological resilience or the ability to bounce back quickly from disruption over generations, Pacific peoples have passed down sustainable models for human-in-nature social ecological systems that continue to be crucial to addressing climate risks, stressors and impacts today. Living legacies of social ecological resilience offer back-to-the-future models which exhibit dynamic response and innovation not just in the face of uncertainty and disruption but also because of it. The holders of this knowledge and those who live it are precious sources of know-how and resilience who can provide opportunities as partners to help guide dynamic response and innovation. They are key factors in the successful design and implementation of adaptation, disaster risk management (DRM) and disaster risk reduction (DRR) initiatives, where both Indigenous and Western knowledge systems can work in tandem.

Chapter 15 of the Working Group II Contribution to the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) (IPCC AR6, 2022), titled 'Small Islands', emphasises the importance of resilience, Indigenous and local knowledge (IKLK) working in collaboration with Western knowledge and the vital need to work with Indigenous and local communities. This contributes to contemporary knowledge systems which weave together aspects of both Indigenous and western knowledge, providing more holistic pathways for addressing climate change challenges in the 21st Century and beyond. In many ways, this chapter departs from the AR6 and related research, as it elaborates on, illustrates and expands upon Indigenous Knowledge and Local Knowledge (IKLK) as a key factor of resilience and what it means for, and to, Indigenous Pacific peoples.

This chapter discusses immediate threats to Indigenous resilience in the form of climate effects, stressors and risks, narratives of vulnerability and human rights issues. It then discusses Pacific cultural legacies of social ecological resilience, including human-in-nature systems and initial examples of their ongoing relevance and utilisation. It then provides case studies that counter mainstream vulnerability narratives that epitomise dynamic and innovative responses to climate change, while evidencing living legacies of Indigenous Pacific resilience. These examples are aimed at complementing case studies presented in other chapters of this report. Human rights, such as those that underwrite the IPCC's work, are also discussed as a prelude to subsequent sections which highlight opportunities and local cases where IKLK is being integrated in adaptation and resilience development decisions, as well as later discussions on human rights in other chapters.

Given its scope and focus, this chapter emphasises the stories, experiences, and work of local Indigenous Pacific people.

Thus, the aim of this chapter is to assess various aspects of resilience in the Pacific Island Countries and Territories (PICTs) in the face of climate change and to make recommendations for approaches that enhance resilience amongst local communities. The chapter proposes to provide an initial discussion on climate effects, risks, and stressors, discuss implications for Indigenous peoples and what resilience means to Indigenous communities and people, highlight current Indigenous responses that demonstrate resilience, and ways in which IKLK is being integrated into contemporary science-based climate risk evidence. The chapter also identifies key risks and challenges as well as opportunities for working with Indigenous communities and people to help ensure that IKLK is represented in decisions and agreed pathways to effectively address climate change and its impacts.

The chapter takes an interdisciplinary approach that incorporates a mixture of literature, law, policy, science and data as well as the experience and stories of Indigenous Pacific peoples, communities and governments working on the ground to maintain and develop resilience for their communities. The chapter authors have expertise and experience in the fields of climate hazards and risks, disaster response,

geo-surveying, geography, psychology, law, policy, monitoring, and evaluation frameworks. Members of our team share genealogical heritage with the Indigenous peoples of Fiji, Samoa, Papua New Guinea, Hawai'i, Tahiti, the Cook Islands, and Niue and undertook this research in a spirit of aloha/aroha/alofa/'ofa, reciprocity, utility, meaningful engagement, respect, and gratitude for the communities that they have worked with and learnt much from.

5.2 Risks, vulnerability and Indigenous Pacific people: An overview

5.2.1 'Belittling' and the narrative risks of vulnerability

The climate crisis entails narrative risk. Climate vulnerability has been defined as the

> ...propensity or predisposition to be adversely affected (by climate change) and encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt (IPCC AR6, Summary for Policymakers, p. 5).

While many Indigenous Pacific people are adversely affected due to climate change, the constant association between Pacific people and vulnerability is problematic. What have been called 'narratives of vulnerability' and aspects of 'imaginaries of the Anthropocene' undermine the very idea of Indigenous and local Pacific communal resilience.

Narratives of vulnerability about Indigenous Pacific peoples and the environment are not new. Generations of multidisciplinary academics have blamed Indigenous Pacific people for environmental disaster, genocide, and ecocide. The collapse of Rapa Nui (Easter Island) in the Eastern Pacific is often held up as an example of what not to do in terms of sustainability. Environmental revisionists (see Ponting, 1992; Diamond, 2005) have associated Indigenous Pacific people with cautionary tales of 'ecological suicide' including mismanagement of resources, forest destruction, topsoil degradation, cultural decline, and self-destruction (Peiser, 2005). Such depictions conjure an 'imagery' that is 'overwhelming' and gives 'an impression of utter failure'. Rapa Nui has become a metaphor, a worst-case scenario for what may lie ahead of us in our own future (Peiser, 2005, p. 515).

Such imagery remains prevalent despite science telling a much different story of Rapa Nui people demonstrating resilience and thriving on a remote island of Polynesia with limited resources before becoming victims of genocide, racist colonial narratives (Peiser, 2005) and demographic and cultural collapse (that) followed European contact and resulted from the devastating effects of disease and slave trading (Hunt & Lipo, 2009, p. 604). In contrast to 'dying race' myths, a 2016 study examining the diet of the pre-European population of Rapa Nui found evidence of 'environmental adaptation and resilience' and soil management to overcome poor soil fertility, improve environmental conditions, and create a sustainable food supply (Jarman et al., 2016), strongly countering myths of ecocide and highlighting structured, complex and dynamic forms of resilience.

Current victimisation narratives are similarly problematic. Various climate change documentaries currently portray Indigenous Pacific people as victims, or the proverbial poster child, of the crises. While many documentaries and media stories seemingly advocate for Pacific peoples and condemn climate change impacts, Pacific peoples are frequently portrayed as victims (Belford et al., 2017; Fair, 2020), refugees and migrants (Chang, 2023; Durand-Delacre, 2022) made vulnerable by climate change rather than as demonstrating resistance (Weatherill, 2023),

initiative-development, self-determination (Teaiwa, 2018), and sovereignty (Bambridge et al., 2021). Pacific people are rarely depicted as the source of climate solutions (Shea et al., 2020).

Narratives of vulnerability contain echoes of colonialism and even racism. Pacific people (and their islands) have been narrated as 'isolated' and 'primitive' 'environmental refugees' in documentaries since the United States government filmed Marshallese people after displacing them with nuclear detonations in their islands in 1954 (De Loughrey, 2017, p. 237). Like the dying race narratives about Indigenous peoples in settler states in the nineteenth century (Hemi, 2016), various portrayals of Pacific people in the popular imagination and media adopt the kind of extinction narratives in documentaries about the loss of non-human species.

While such language may draw attention to the plight of Pacific people, it may also encourage fatalism, scepticism, alienation, and self-fulfilling or failing prophecies.

Worse, it 'de-temporalises, de-politicises, and de-individualises those affected by it,' threatening to redistribute agency, rendering those affected as hapless victims of an imminent catastrophe that cannot be averted (Straß-Senol, 2021, p. 243). Such narratives represent a neo-colonial belittling of Pacific people (Hau'ofa, 1994) and 'downplay their resiliency and action' (Shea et al., 2020, p. 89). Such misrepresentations also perpetuate racist tropes and delegitimise Indigenous actors while masking socioeconomic legacies of colonisation (Belfer et al., 2017, p. 58).

Narratives of vulnerability undermine opportunities to learn from and work with Indigenous and local Pacific peoples, draw on IKLK and build and strengthen local capacity and capability. The AR6 repeatedly recognises that the success of adaptation programs in small islands relies on building local capacity and that initiatives which are community-led, locally relevant and culturally resonant are more likely to be successful. Ironically, Carmona et al (2023) have suggested that the IPCC AR6 may also portray Indigenous peoples as vulnerable, thereby challenging the idea that local and Indigenous Pacific communities can lead, generate solutions for their own peoples and address climate change from the outset. Human rights risk and multiplication.

Climate risks and impacts also entail human rights risks. Chapter 15 of the IPCC AR6 recognises numerous observed impacts on small islands including the frequency and intensity of 'tropical cyclones, storm surges, droughts and changing precipitation patterns, and sea level rise (SLR)' leading to further impact on 'health and wellbeing, water and food security… culture', ecosystem damage including coral reefs, freshwater systems and endemic species decline (IPCC AR6, p. 2045). Projected impacts from climate and ocean-related change include coastal flooding and low-coastal and reef island erosion, coral bleaching and mangroves, freshwater stress and habitability, and food insecurity. Future risks include degradation of health and wellbeing… loss of cultural resources and heritage', and, ultimately, the 'ability of land to support human life and livelihood', and migration (AR6, p. 2046).

Options, limitations, and opportunities for adaptation include 'strong social safety nets and social capital that support responses and actions', 'legal reform', 'improving justice (and) equity', education, and 'embedding (IKLK) as well as cultural resources into decision-making' (AR6, p. 2047). Most of these impacts, risks and opportunities are assessed as high confidence.

These impacts, risks and opportunities have various implications for the United Nation's (UN) framework of human rights and will impact Indigenous Pacific peoples as everyone, no-one, someone and Indigenous rightsholders. These basic human rights are consistently reiterated in nine core UN conventions and treaties and in other resolutions and declarations recognising 'peremptory norms of the highest order' such as equality and non-discrimination and self-determination (Anaya, 2009; Anaya, 2010; Dorough & Sambo, 2014; Hemi, 2016; Hemi, 2021) since the UN Declaration of Human Rights 1948 and restated more recently in the Convention on the Rights of Persons with Disabilities 2006 and UN Declaration on the Rights of Indigenous Peoples 2007 (UNDRIP). These legal instruments outline rights belonging to everyone, prohibitions against things that no-one should experience, rights specified for particular groups (someone) whose rights are frequently denied or violated including women, children, racial, cultural, linguistic and religious minorities and human beings with disabilities, and Indigenous peoples. Via these iterations of human rights, Indigenous Pacific peoples have concurrent claims to a plethora of rights that will be impacted by the climate crisis from 'everyone' equality to education and the 'highest attainable standard of health' (Art 25 ICESCR), to no-one non-discrimination and protections from racism and other forms of discrimination (ICERD), and someone protections for language and cultural rights (Art 27 ICCPR; Minorities Declaration).

The UNDRIP emphasises the individual and collective human rights of Indigenous people. It also recognises specifically Indigenous individual and group rights that are impacted by climate crisis, including:

- Equality (Art 1) and non-discrimination (Art 2) including for women and girls (Arts 4-5)
- Self-determination as peoples (Art 3), economic, social and cultural development (Arts 4 & 5) and decisionmaking (Art 18)
- Education (Art 14 & 15), health (Art 24) and other socioeconomic areas
- Maint(enance), protect(ion) and develop(ment) of past, present and future manifestations of their cultures' (Art 11(1)); revitalisation and transmission of traditional knowledge (Art 13); Indigenous science and technologies (Art 31)
- Land (Arts 25-26, 32); environment (Art 29)

Self-determination underwrites most of UNDRIP's rights and belongs to 'peoples' (Hemi, 2016).

Indigenous peoples have rights as cultural, linguistic, and religious minorities. The reiteration and recognition of these rights specifically for Indigenous peoples are a direct response to colonisation and its ongoing impact on the rights situation of Indigenous peoples around the world (Hemi, 2016). These rights are seen as being the bare minimum for the realisation of other rights, necessarily reiterated in UNDRIP almost verbatim from previous declarations and conventions because they are not being realised for Indigenous peoples (Anaya, 2010).

One of the concerns expressed in Chapter 15 of AR6 is that adaptation actions are often incremental and do not match the scale of extreme or compounding events (AR6 p 2047).

This chapter indicates that there is high confidence in predictions of cascading impacts on coral reefs, freshwater systems, marine and terrestrial ecosystems (AR6, p. 2045). Similarly, extreme and compounding events, resulting impacts and risks will also compound human rights denial and illustrate the phenomenon of organic multiplication.

Organic multiplication occurs when the realisation of one human right is so closely tied to the realisation of another that they are inextricably connected and the denial or realisation of one will impact the denial or realisation of another right and many rights (Hemi, 2016; Hemi, 2021). This relationship accounts for the concomitant nature of the spectrum of rights impacted by the climate crisis – that is, the potential for multiple rights and associated duties and responsibilities in public and private law, across jurisdictions, including human rights and Indigenous rights, to exist concurrently – as the New Zealand Human Rights Commission submitted to the Supreme Court of New Zealand in Smith v Fonterra Cooperative Group et al., (2022). The multiplication aspect encompasses the causal and logarithmic impact that realisation or denial in one area of human rights has across multiple and many areas of human rights. In its pervasiveness, climate change is an organic multiplier of individual and collective everyone, no-one, someone and Indigenous rights (Hemi, 2016; Hemi, 2021). Similarly, the realisation of human rights may so profoundly improve the human rights trajectories of individuals and communities that intergenerational organic multiplication of realization or denial occurs. Rights to health and education are just two examples.

The right of all human beings to the 'highest standard of health attainable' (ICESCR, Art 13) is consistently recognised in multiple resolutions, conventions, and treaties, including those discussed above. Climate directly impacts health via extreme weather events and heat-related illness, indirect effects via water security, food security, vector-borne diseases, respiratory illnesses, and also diffuse effects in terms of mental health, non-communicable disease, health system issues and population pressures.

Thus, extreme weather events caused by climate change may immediately increase traumatic injuries and premature death (WHO in Pacific Island Countries, 2015), but the trauma of these experiences may also produce the type of chronic stress and higher allostatic load for individuals and families that results in physiological changes to neurological, cardiovascular, and other systems. Insidiously, the intergenerational impacts of such trauma may result in epigenetic changes, molecular wear-and-tear, telomere-shortening and premature death in subsequent generations (Feletti et al., 1998; Boullier & Blair, 2018; Liu & Alameda, 2011; Chae et al., 2020; Yehuda & Lerner, 2018; Brave Heart, 2003; Singh, et al., 2019; Geronimus, 2006). A kind of physiological 'weathering' (Geronimus, 2006) insidiously defies conventional guarantees and conceptions of equality and non-discrimination. Poor health has a total impact on human wellbeing as it also threatens basic civil and political rights, including the right to life itself (Art 6 ICCPR). For Indigenous people, health and wellbeing are also certainly impacted by the disruption of the transmission of Indigenous knowledges, the loss of Indigenous knowledge about, or access to, medicinal plants and sustainable food practices, and by the health and wellbeing of ridge-to-reef ecosystems. Similarly, planetary health, health equity and sustainable development have all been linked to Indigenous voices and knowledge systems (Ratima et al., 2019).

Education is closely related to most, if not all, UN Sustainable Development Goals (SDGs), including reducing poverty, supporting economic growth, preventing inequality and injustice, and improving health (UNICEF, 2023). It is another human right that can foreclose or enhance the realisation of other rights. The right to vote is virtually useless if a citizen cannot read the voting ballot – and increasingly if individuals do not have critical digital skills. The climate crisis is already multiplying denial in its impact on school attendance, school infrastructure damage, injuries, absenteeism, dropouts, the ability of communities to employ teachers, and the inability of parents to pay for school fees, transportation, and other costs of education (WHO, 2015; UNICEF, 2019). Long term we see the same impact on education that we do in health – that is, almost logarithmic rippling effect across the life trajectory of individual lives but also of families and communities. In this way, climate action will also be so closely connected to the realisation of various human rights across generations that there is an organic multiplying relationship between the two.

Women and girls are vital organic multipliers too – women that are educated tend to have children who are educated, live above poverty line, and live beyond the age of five (UNICEF, 2006; Hemi, 2021). Similarly, when a drought-resistant ulu (breadfruit) tree that has kept a family in an outer island going through previous droughts cannot do so now (2021), mothers and grandparents will go without food so that children can eat (UN Women, 2014).

Likewise, responsibilities for subsistence-level food production and water retrieval can keep girls from attending school – for example, in the highland Naitasiri communities of Fiji (Dumaru, 2010). When Pacific girls are denied an education because of water duties or period poverty (Asian Development Bank, 2023), all the benefits to Indigenous and local communities that flow from educated women will be further out of reach for their communities (UNICEF, 2004; UNICEF, 2007). The IPCC AR6 recognises that there is a lack of data about the role that women play in the success of adaptation initiatives (IPCC AR6, 2022). By contrast, the UN has long recognised that development initiatives that educate and empower women in communities are more successful (UNICEF, 2004; UNICEF, 2007). As many subsequent chapters of this report illustrate, women are crucial in everyday resilience building, not least because they are holders, practitioners and transmitters of Indigenous knowledge and local knowledge.

Thus, women, education and health, climate crisis and climate action, may bridge rights or act as gatekeepers (Hemi, 2016). Where the climate crisis negatively impacts health, education or any of the SDGs, it must be seen as an organic multiplier of denial. Indigenous women and girls must be seen as intergenerational multipliers and key factors in resilience building. Realising human rights for them must be seen as integral to realising human rights for all. As such, the position and voice of Indigenous women and girls in climate crises and action requires careful consideration.

5.2.2 Messy, super wicked risk

Wicked challenges also present certain risks. The complexities created by climate change extend beyond organic multiplication. Climate change is a well-known example of a 'wicked problem' (Camillus, 2008; World Bank, 2014), and even a 'super wicked problem' (Levin et al., 2012). 'A wicked problem has innumerable causes, is tough to describe, and doesn't have the right answer' per se (Camillus, 2008). Such problems have been called 'messes' because '(e)very problem interacts with other problems and is therefore part of a set of interrelated problems, a system of problems' or 'mess' (Ackoff, 1974). Such problems demonstrate complexity, consequences that are difficult to imagine, considerable uncertainty or ambiguity, significant resistance to change and sometimes, problem solvers being out of touch with problems and potential solutions (Horn & Weber, 2007). Such problems cannot be solved through conventional solutions, entail a degree of 'social disagreement' (Fitzgibbon & Mensah, 2012), with solutions requiring complex interactions between law, politics, and economics (Lazarus, 2008).

Climate change demonstrates all of the above characteristics as well as features that make it a super wicked problem, namely time running out, those who cause the problem seeking to remedy it, weak central authority to address it, and 'policy responses (that) discount the future irrationally' (Levin et al., 2012). The compounding effect of multiple wicked challenges further magnifies and exacerbates immediate risks, narrative risks and human rights risks of climate change in the Pacific. The coronavirus pandemic demonstrates this.

As if magnifying organic multiplication, the coronavirus pandemic has added another layer of wicked risk, exacerbating human rights concerns and 'set(ting) back' the development agenda in the Pacific. For instance, the pandemic exacerbated poverty as COVID-19 restrictions reduced infection and mortality rates but 'devastated' economies (UN High Commissioner & Pacific Community, 2020; Nizarat, 2021). Like climate change, COVID-19 has defied national boundaries and jurisdictions, tested and bested national health systems, capacity, budgets and economies. It has mutated to resist vaccines and imposed necessary but strict restrictions unknown in many democracies for generations. It is associated with weathering phenomena (Geronimus, 2021) and it has had particular impacts on women and girls (United Nations, 2020).

Neither the impacts of COVID-19 nor that of climate change are so-called 'black swan' events – that is, unanticipated events that suddenly and dramatically create paradigm shifts (Taleb, 2007). Predictably, those most impacted by these compounding factors were women (United Nations, 2020), children, the elderly, those with disabilities, the poor and marginalised, and Indigenous peoples. In the first year of the pandemic, the world became more aware of digital exclusion and divide, the weight of childcare carried by working women (Hemi, 2021), the number of Pacific people and others working in primary care and other roles where they were more frequently exposed to the disease, and Pacific people experiencing mental health issues at statistically uncharacteristic rates (Grey et al., 2021).

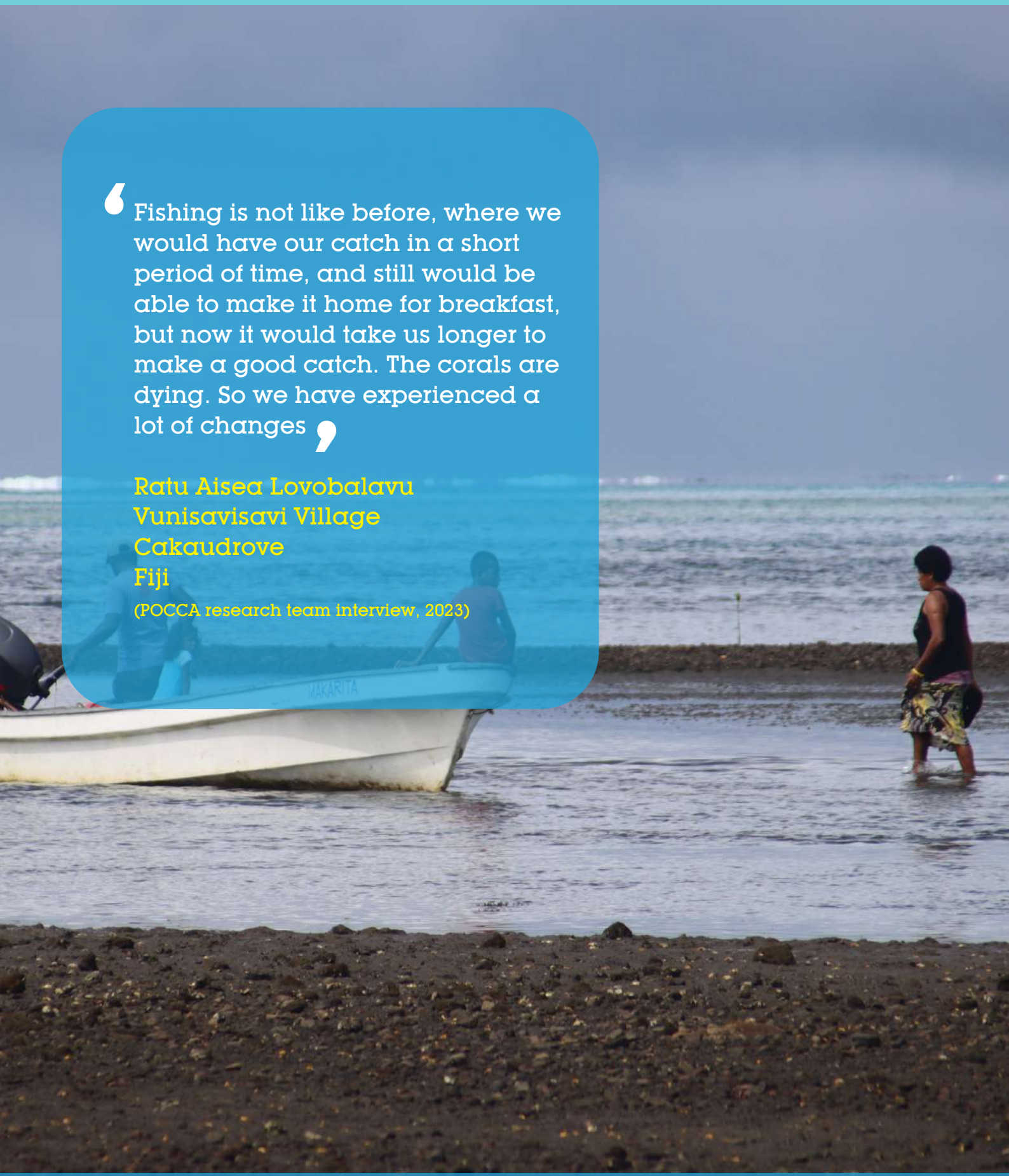
Wicked complexity thus requires that we look across systems and at what is happening on the ground. This is especially the case when developing and applying contemporary science-based models and their inherent uncertainties to inform local, site-specific, adaptation decisions which affect those living on the ground. A simple, yet socio-politically complex approach to incorporating ground-up traditional knowledge into government climate adaptation policy and decision processes (be it Indigenous or non-Indigenous ground-up knowledge), is to enable pathways that include these knowledge systems into contemporary science methods and government decision support tools (e.g. geospatial maps, resources and loss metrics, disaster resilience intelligence systems). This helps to safeguard a balance between ground-up and top-down approaches in formulating the evidence bases used in adaptation and resilience decision making (see section 5.5 for case study examples).

5.2.3 Residual colonialism, racism, and other systemic risks

Finally, underneath the multiple layers of complexity already mentioned, residual colonialism and its effects pervade systems almost like a hidden software. Across the Pacific, the mo'olelo (story or history (Hawai'i) of colonisation's impact on wellbeing, self-determination and resilience is eerily similar, including resilience narrative. During colonisation, Indigenous resilience was impacted by language and knowledge loss, land alienation, high rates of mortality through infectious disease, and other ills. Racist pseudoscience (Bishop Museum, 2021; Fawcett, 2021), blackbirding (Horne, 2007), environmental exploitation and destruction (Teaiwa, 2015), and paternalistic colonial management (Salesa, 2011) came long before the Dawn Raids in New Zealand. Late 19th and early 20th century law, policy and decision making that forced Indigenous Pacific peoples to speak English, abandon practices like medicine, voyaging and hula, and to treat women and children like chattels (Mikaere, 1994), created poorer outcomes for all in health, education, and other areas of wellbeing (Hemi, 2016).

Historical trauma from the effects of early colonisation continues to impact the present like a replay on a loop (Hemi, 2021). Across present systems, persistent gaps and disparities in outcomes for the same groups in education, health, criminal justice, employment, housing and many other outcomes are evident. Like canaries in the coalmine, the disproportionate numbers for Pacific people signal that something in systems is not quite right. Colonisation can appear to be historic but microaggressions, low expectations, lack of access, political underrepresentation, and the gritty, uncomfortable reality of the same people and communities consistently experiencing the worst outcomes repackage the past. Education, health, and other systems that are currently straining from climate change and COVID-19 were previously underserving Indigenous Pacific people (Hemi, 2021). Similarly, responses to vector-borne and heat-related diseases and the realisation of human rights will be impacted by wicked issues around health workforce development and mobility relating to levels of educational attainment and equity (Yamamoto et al., 2012; Boniol et al., 2021; Rumsey et al., 2014).

All of these factors – narratives, human rights issues, wicked challenges and systemic issues – constitute layers of risks in addition to immediate climate risks, stressors and impacts that will impact Indigenous resilience, perhaps, like vulnerability narratives, from the outset. Such risks are not the entire story, however, with subsequent sections highlighting the initiatives and opportunities which are helping to reclaim and reshape Pacific resilience narratives in the present, contemporary, world.



> "Fishing is not like before, where we would have our catch in a short period of time, and still would be able to make it home for breakfast, but now it would take us longer to make a good catch. The corals are dying. So we have experienced a lot of changes"

Ratu Aisea Lovobalavu
Vunisavisavi Village
Cakaudrove
Fiji
(POCCA research team interview, 2023)

A family from Vunisavisavi village, Fiji heading out to catch fish despite depleting fish stocks as acknowledged by the villagers (Photo: POCCA team, 2023).

5.3 Voyaging and other legacies of social ecological resilience

Pacific people are heirs of social ecological and other resilience paradigms and narratives where they are rightly seen as sources of solutions and agents (rather than reactive or passive objects or victims), and stewards and knowledge-holders within 'human-in-nature systems' where uncertainty and disruption can generate dynamic responses and innovation (Winter et al., 2018). Pacific Island communities have, in fact, always lived on islands impacted by drought, tsunami and tropical cyclones. They have always had to survive and thrive on islands with limited resources (Winter et al., 2018; Iese et al., 2021). Over millennia, Pacific peoples developed Indigenous knowledge and local knowledge (IKLK) systems, including cultural principles, social structures, practices, and ecosystems, that have enabled survival, thriving and resilience in these circumstances. Given existential threats and challenges especially facing atoll island communities, there is a need to draw on climate-related IKLK systems and their practices. In contrast to narratives of vulnerability, living legacies of social ecological resilience are consistent with adaptation programme implementation success and human rights realisation, which ultimately are key elements of climate resilience.

The AR6 report recognises the increasing need to recover IKLK including resilience related knowledge and using them to inform viable strategies and where necessary, in combination with modern (referred to in this chapter as 'contemporary') scientific knowledge. It also encouraged efforts to explore, with appropriate methodologies, and recover these Indigenous knowledge systems and technologies that have been adopted and used by Pacific Island communities in meeting the enduring environmental challenges of the region. This includes knowledge relating to food preservation, farming and house building techniques, relations with environment including practices of Indigenous ecological stewardship. Increasingly references are now made to Pacific knowledge systems and practices that have contributed to the resilience of Pacific communities (Nunn & Miura, 1997; Research Briefs, 2021). Based on research in the Pacific Island Countries, Nunn and Mimura noted the prevalence of a 'tradition of resilience' in the face of extreme sea level rise.

The AR6 report assigns a high confidence rating to the following approaches to addressing risks and building resilience in small islands:

- Ridge-to-reef ecosystem management
- Increasing landscape connectivity
- Terrestrial management
- Integrating IKLK with Western science to provide integrated approaches to climate change.

These approaches are closely associated with living legacies of Pacific IKLK, including legacies of voyaging and social ecological resilience.

5.3.1 Voyaging, wayfinding and the moana

The Indigenous peoples of the Pacific today are the descendants of voyagers and learners. The Pacific Ocean covers one-third of the earth's surface. The late Sir Ranginui Walker once wrote that the Pacific is '995 parts water and five parts land' (Walker, 2004, p. 24). When the ancestors of modern-day Pacific peoples first began pushing eastwards from Papua New Guinea, they were able to leapfrog from one island to another, something accomplished by line of sight. This strategy soon became impossible due to expanding distances between islands (Howe, 2006). Thus, they developed a form of navigation based on wayfinding that relied heavily on spatial reasoning, observing one's environment and a large reservoir of knowledge from oral traditions. These voyagers crossed vast stretches of the Pacific using rising and setting constellations as maps, reading water, wind, frigate birds and pilot whales (Howe, 2006; Schiffman, 2017; Low, 2019), developing mathematics (Ball, 2013; Tingley, 2016) and relying on a vast virtual library of astronomy, meteorology, ecology, medicine, navigation, engineering, history, and genealogy passed down from generation to generation (see, for instance, The Kumulipo: Beckwith, 2000). Language acted as the vehicle for volumes of knowledge stored in memory but also as another repository of that knowledge, particularly given the challenges and even impossibility of translating Indigenous concepts into other languages (Hemi, 2021).

Wayfinding is, at a fundamental level, the ability to 'travers(e) between two locations using environmental or spatial cues such as direction signs or a map' and closely linked to cognitive mapping, or how people learn, store, process, and use spatial information about a place (Hutchinson, 1988). This is also the notion that people hold a map-like database in their minds to which they can add and use to tackle geographical tasks' (Rogers et al., 2013), and entries for 'wayfinding' and 'cognitive mapping. Traditionally, Pacific wayfinding involved 'build(ing) up impressive mental maps and work(ing) with rational reckoning and logic to determine position, distance, time and so forth' but also 'draw(ing) knowledge from many sources' including multi-sensory observation, intuition, 'presence and stillness,' and 'creative intelligence' (Spiller et al., 2015, p. 7).

The development of science, technology, engineering, mathematics, and other fields necessary to settle the Pacific has been likened to the STEM development required to land a man on the moon (Nainoa Thompson in Schiffman, 2017). Without books, laptops or even iPads, Pacific people studied the moving and constantly changing environment of the Pacific, adjusted, pivoted and demonstrated agility, while building trade empires, making political alliances over vast space and exchanging knowledge, even vast virtual libraries of knowledge. This knowledge base contained the know-how of survival and thriving – for instance, which crops were not only best suited for long journeys, but which breeds of certain plants were worth taking to the next island and which were most drought resistant (Meillieur et al., 2004).

Binary numbers, the basis of computing today, are usually first credited to a German mathematician 300 years ago but were actually being used by Mangarevan navigators 600 years ago (Ball, 2013). Discredited but once accepted theories of drift or the accidental settling of the Pacific (see for instance, Sharp, 1957) demonstrate hallmarks of racism and stand in stark contrast to the actual problem solving, imagination, innovation, vision, and collective efforts of the Indigenous peoples of Moananuiākea over time and geography – essential traits in Pacific people's legacies of resilience.

Today, Pacific people and communities continue to demonstrate key aspects of this legacy of voyaging, wayfinding and knowledge transmission. Pacific people and communities are agents in legal, education, innovation, and strategic approaches to climate change and other challenges impacting Pacific communities. Pacific governments and diplomats from states like, but not limited to, Kiribati, Tuvalu, and Samoa for example, are courageous and persistent voices advocating for the whole world in terms of climate change. Pacific people continue to seek education for their children, knowing that education holds the key for uplifting families and communities in the midst of climate change. Pacific people continue to be firsts and continue to wayfind through contemporary present-day systems during an uncertain time, when pandemics and climate change challenge their communities, when systems are not fair and when scapegoating often occurs.

5.3.2 Ahupua'a, dynamic responsiveness and other traditional forms of resilience

E mālama i ka wai. Take care of the water (Hawai'i).

Voyaging is only part of the story. These Ingenious peoples built thriving cultures on small islands that experienced 'catastrophic natural events' including 'hurricanes, tsunami, drought, flooding, (and) lava flows.' Perhaps not just despite these factors but because of how they responded to these factors, peoples 'develop(ed) socio-ecological systems around the anticipation of rapid recovery from environmental change'. Although some communities did exceed the 'carrying capacity' of their islands, others 'adapted to resource limitations and, therefore persisted' (Winter et al., 2018, p. 2). Throughout the Pacific, in many archipelagos made of small islands, persistent people thrived and survived as they managed resources.

Those who persisted developed systems like the moku system in Hawai'i where communities were organised into local socio-ecological units called ahupua'a that often ran from the mountains to the sea. Ahupua'a are 'human-in-nature system(s)' where 'biocultural elements' were essential (Winter et al., 2018b, p. 1). Lo'i kalo, for example, were wetland taro patches that required the right conditions for water, including the right flow and temperature to avoid diseases.

They also required communities to collectively maintain lo'i and to adopt two alternative methods of cultivating kalo – flooded-field and rain-fed systems, the latter more vulnerable to disruption and the former better able to dynamically respond to uncertainty (Winter et al., 2018). Cultural custom dictated who would look after the lo'i. Fermentation of pounded kalo, poi, extended the life and nutrients one would receive from this staple crop.

Ancient Hawaiian communities also understood that water needed to flow through the ahupua'a from ma'uka to makai – or from the mountains to the sea – in order for these ecosystems-polities-communities to thrive. Water was so important to the ecosystem that one of the fundamental rules was 'E malama i ka wai' – 'Take care of the water'. One of the most detrimental aspects of subsequent colonisation and imposed Western land tenure and management was that ahupua'a were divided up into individual parcels of private land where owners upstream could dam and divert water to the detriment of others.

Ahupua'a were not themselves isolated or siloed units. Each ahupua'a was part of a larger, 'nested' moku (island) and then 'archipelago-scale social-ecological system' characterised by 'biocultural resource management' laterally across ahupua'a that 'sustained an abundance of resources for more than a millennium' (Winter et al., 2018 p. 2). Thus social-ecological resilience was also characterised by biocomplexity and also abundance. Hawaiians called this abundance 'Āina momona, which literally means 'fat; fertile, rich' or 'fruitful' land.

'In the pre-contact era – prior to contact with Europeans in 1778 – the social-ecological system in Hawai'i was intensively managed to maximise resource abundance by attaining a stable state and such systems are seen as resilient where they have the 'ability to absorb disturbance without changing into a different state,' respond 'dynamic(ally)' to 'uncertainty and surprise,' and 'renew and reorganise' after disturbance (Winter et al., 2018, pp. 3-4 & 6 of 19).

In other places in the Pacific, ahupua'a-like ridge-to-reef ecosystem have long histories and continue to feed and sustain communities in different parts of the Pacific. In Fiji, for example, the term vanua can refer to land but it also 'encompasses a land-sea territory (including mountains, forests, rivers, beaches, reefs, etc.), the various beings (people, ancestors, spirits, fauna, flora, etc.) that dwell in this territory, and the socio-cultural settings and socio-political organisation that shape this territory' (Fache & Pauwels, 2022, citing Ravuvu, 1983; Tuwere, 2002; Nabobo-Baba, 2006). The goal of the ecosystem and community is sautu – or the kind of peace, wellbeing and abundance where the sautu of the land will impact the sautu of the ocean and vice versa (Fache & Pauwels, 2022). Similarly, in Samoa, cultural heritage, identity, and chiefly titles are closely tied to 'the fanua (land) and the sami (marine environment)' (Peau et al., 2022).

While some communities and families have reclaimed this heritage, others continue to live and practice millennia-old IKLK and practice, living off the land and ocean sustainably to maintain resilient ecosystem communities that respond dynamically to uncertainty and change.

This version of resilience resembles legal claims recognised as human rights and closely linked with the larger international legal framework for climate change.

Under international law, Indigenous Pacific peoples are seen as possessing fundamental rights to self-determination (Art 3), economic, social, and cultural development (Arts 4 & 5), decision-making (Art 18), and to 'determine and develop priorities and strategies for' development (Art 23). Indigenous Pacific peoples also possess human and Indigenous rights to practice, revitalise, maintain, develop (Art 11(1)) and transmit Indigenous knowledge to future generations (Art 13) through education (Art 14) and to do so in their own languages. These rights are directly descended from a fakapapa'a (genealogy of Cook Islands Māori) of human rights that go back to peremptory norms of equality, non-discrimination and self-determination (Hemi, 2016). They are also closely connected with environmental (Art 29) and spiritual rights (Art 25) to land in UNDRIP (Art 26). The Paris Agreement on Climate Change (2015) similarly connects the 'rights of Indigenous peoples and local communities' and 'intergenerational equity' with 'the importance of ensuring the integrity of all ecosystems' (Paris Agreement 2015, preamble). Article 7 of the Agreement recognises that adaptation action should be guided by the best available science and…traditional knowledge, knowledge of Indigenous peoples and local knowledge systems' and 'build the resilience of socioeconomic and ecological systems which includes sustainable management of natural resources (Paris Agreement, 2015, Art 7).

The next section focuses on specific cases which highlight initiatives, opportunities and practical approaches to help bridge the gaps between contemporary science-based and Pacific IKLK-based methods to help guide efforts to build and strengthen climate change resilience in these challenging times.

5.4 Living legacies of Indigenous Pacific resilience: Some case studies

> Social-ecological resilience is the capacity to adapt or transform in the face of change in social-ecological systems, particularly unexpected change, in ways that continue to support human wellbeing (Folke et al., 2016).

This chapter began with a discussion about narratives of vulnerability and other immediate threats to resilience. It discussed how narratives of vulnerability fundamentally undermine the very idea that Pacific Indigenous peoples are capable of resilience, are possessors of valuable knowledge about resilience and hold rights as 'everyone', 'no-one', 'someone' and Indigenous human beings in terms of resilience, while organic multiplication of rights denial or violation caused by climate impacts and risks constitutes actual vulnerability. The chapter then offered the alternative, homegrown conceptualisation, and legacy of Indigenous Pacific resilience, that is highly relevant and to human rights, climate action and adaptation, DRM and DRR initiatives.

This resilience is characterised by social ecological resilience and human-in-nature systems, knowledge development and transmission, dynamic responses, innovation, justice, and abundance, features that are also consistent with how resilience is described in the AR6. This includes the ability to rebound, capacity for transformation, inclusion of diverse forms of knowledge, effectiveness, the reduction of vulnerability, and intergenerational outcomes. Features of modern Indigenous Pacific resilience also feature:

- Decolonisation and indigenisation
- The enhancement of self-determination and other Indigenous rights
- Indigenous knowledge and local knowledge engaged
- Centrality of and solutions from the community

The chapter now presents distinct, but inter-related, descriptions and case studies of living legacies of Indigenous Pacific resilience, which are presented as stand-alone 'Boxes'. Despite various climate-related impacts and risks over past millennia, Indigenous Pacific peoples are still here. Their very existence against extreme adversity, compounding, cumulative human rights denial, and other challenges prior to considerations of climate crisis fundamentally demonstrates resilience. However, Pacific people have not been passive in the wake of (Western) colonisation. Fundamental aspects of Pacific Indigenous resilience today recall fundamental aspects of voyaging, learning and settlement of the Pacific. They are evidence of a dynamic, living heritage of wayfinding, agility, innovation, Pacific agency, and grassroots responses to climate change and other challenges. It also represents a precious body of knowledge, practices and way of life that can provide valuable lessons and foundation for continuing to build Pacific resilience in the present and in the future.

5.4.1 Case study 1: Normalising Indigenous science - Data and resilience in the digital world

It is becoming widely accepted in the Pacific that Indigenous science and perspectives should be at the forefront along with contemporary scientific methods in providing the context-specific evidence base and guidance on options to address the multitude of climate change adaptation challenges across the Pacific (Wise et al., 2014; Bryan-Tokalau, 2018; Hill, 2020; Lyons & Harkness, 2021; Lyons et al., 2021). While there is growing recognition that integrating IKLK of climate variability and change with contemporary scientific methodologies provides a more representative approach to enhancing climate change resilience, key challenges remain on how to transform IKLK climate science into usable formats that can be woven into contemporary approaches. For example, how can IKLK information on climate change impacts to a given resource or entity, be coded and ingested into quantitative climate hazard risk assessment (e.g., Williams et al., 2021) as well as loss and damage modelling applications (e.g., Paulik et al., 2023) – to help inform climate resilience investment and adaptation decisions? Several studies which document intimate local, Indigenous knowledge of climatic hazard risks and associated impacts mitigation interventions provide invaluable baselines for developing quantitative relationships that can be translated to usable forms in contemporary science methodologies (e.g., Lefale 2010; Ton et al., 2016; Williams, 2015). Furthermore, initiatives such as the Pacific Catastrophe Risk Insurance Program (PCRAFI), Pacific Risk Tool for Resilience (PARTneR) (Williams et al., 2024), Digital Earth Pacific (DEP), Weather Ready Pacific (WRP) initiative and POCCA to name a few, which contribute to fundamental datasets and resilience management tools compatible with the digital age, provide pathways and opportunities for progressing IKLK integration in decision-support applications that often rely on contemporary science and engineering evidence bases (e.g., early warning systems, emergency response, infrastructure investment options).

5.4.2 Case study 2: A social ecological approach to capability and COVID - Dynamic adaptation and resilience

Today, ahupuaʻa-like systems continue to feed and sustain communities in different parts of the Pacific. In Hawai'i, various communities and families have reclaimed this heritage. In many other places, people continue to live off the land, to maintain resilient ecosystem communities that respond dynamically to uncertainty and change.

Two of the authors have had the opportunity to work closely with the Cook Islands government on climate initiatives.



***Figure 5.1**: Some of the youngest visitors at the 2022 Cook Islands Science Expo examine zooplankton and phytoplankton under the microscope at the University of Waikato booth. Photo: Keaka Hemi, Oct 2022.*

In 2022, a team from the University of Waikato were privileged to participate in the first Cook Islands Science Expo in Avarua, on Rarotonga, with colleagues from New Zealand's National Institute of Water and Atmosphere, Manaaki Whenua and other New Zealand, Australian and American partners. A key highlight for several teams was when 'Aunty' Celine Dyer and other members of the Directorate of Climate team from the Office of the Prime Minister led a group into an ahupua'a-like tapere (Rarotonga) valley (Campbell, 2003) called Takuva'ine. This valley is still one of the main water-catchment areas for the island. As the group hiked up the valley, they were gifted rose apples, lemon grass and a type of spicy spinach grown. Along the path, they also saw plentiful i'i (*Inocarpus fagifer,* Polynesian chestnut (Rarotonga), meika (*Musa acuminata x balbisiana*, common banana (Rarotonga), and nū (*Cocos nucifera*, coconut (Rarotonga).

The repotaro (taro terraces, Rarotonga) and aravai (irrigation canals, Rarotonga)) were neatly arranged, well-tended and loved in an ecosystem that had been nurturing people for millennia. Beautiful, clean water flowed down carefully graded channels to and through stone-bordered, repotaro. These aravai and repotaro evidenced ancient engineering and a living heritage of millennia-old construction and infrastructure reminiscent of lo'i kalo in Hawai'i and the hard work of families over generations. The taro, the trees, the fairy terns and other life in the tapere were healthy and thriving. The valley felt almost happy as it embodied 'āina momona and abundance. Aunty Celine described abundance when she said that the valley ensured that no one needed to go hungry.

Many local people echoed similar attitudes of resilience in the face of wicked complexity. When asked what it had been like when the tourists could not come due to COVID restrictions, many people said that it had been hard at first, but then they just went back to growing their own food, fishing more and using their cars less. Across the island, most homes had yards that included coconut, kuru (*Artocarpus altilis*, breadfruit, Rarotonga), banana, pawpaw and taro plants. Attitudes such as these exemplify abundance thinking and dynamic resilience.



***Figure 5:2** A typical sight across Rarotonga. Photo: Keaka Hemi, Oct 2022.*

5.4.3 Case study 3: Utilising the centrality of the community - Society and intrinsic resilience

Established socio-cultural value systems remain significant for Pacific people when adapting to existential crises including dealing with climate change impacts. These are well recognised as social, community or cultural capital, which encompass membership of groups, relationships, and access to wider institutions of society (Carney et al., 1999; Chambers & Conway, 1992; Kwon et al., 2013). They also include 'social norms, rules and sanctions' (Diedrich et al., 2019, p. 386) and institutions such as family, community and the church. In essence, collective action, reciprocity, relationality, responsibility, and trust within these relationships are the basis for communal wellbeing (Petzold & Ratter, 2015).

The pooling of all forms of resources, material and immaterial, by associated people and assisting members is significant in many island communities and especially in crisis situations. For example, doing unpaid communal labour and providing voluntary services that benefit everyone are commonly practiced in many Pacific communities. This can involve the entire village or community taking turns to make food gardens or supply resources to support each other during crisis situations (Ratuva, 2014; Vunibola & Scheyvens, 2019). There are different local terms that are used to describe this fundamental aspect of unpaid communal work that benefits all. Some of these local terms include Fijian kerekere, requesting something that is needed or working together for the common good without needing to repay or to be paid and (Movono & Becken, 2018; Vunibola & Scheyvens, 2019), wok bung in Papua New Guinea which refers to working together in family groups or community groups without expecting payment (Koczberski et al., 2001) and ala ile pule ole tautua which refers to the path to leadership is service in Samoa (Ratuva, 2014).

There are many examples and instances, mostly unrecorded, of communal labour that contributed to greater good and resilience on many fronts. One of the author's colleague recorded how solesolevaki saved a Fijian Indigenous business from shutting down due to consecutive cyclones that occurred in 2016 (Vunibola et al., 2022). Tifajek Mudpool was on the brink of shutting down due to tropical cyclones with heavy rain and flooding. The wider community was not ready for the business to close because this business contributed significantly toward socio-cultural needs in the past. Therefore, 'community members came in numbers and provided solesolevaki to revive the business in cleaning and rebuilding infrastructures without being paid' (Vunibola, Steven & Scobie, 2022, p. 48). This voluntary repair work and rebuilding new infrastructure amounted to $30,000 as their contribution to help the Tifajek business to revive.

In Papua New Guinea and elsewhere in the Pacific, the wantok system (Haque, 2012; De-Ranzio 2000) is an important social safety net that people draw from during times of crisis. For example, during the recent Covid-19 pandemic, wantok networks provided critical support ensuring that people had food to eat and a place to stay when several lock downs were imposed.

Although many see this as an informal system of reciprocity (ISR) that people take advantage of and is often blamed for corruption in public offices (Walton & Jackson, 2020), the wantok network system has been an age-old social capital that families and communities draw support from during times of hevi (crisis, social burden) including in many climate change impact situations.

Another fundamental mechanism for resilience in the Pacific Island Countries that is usually overlooked in mainstream academic literatures is their spirituality. This refers to the strong connections that people have to their lands, mountains, river systems, totems, kinship, tribes and more recently lotu.

Lotu generally refers to the practice of Christian faith. Lotu is significant in PNG and prevalent in many Pacific communities. It is another important social mechanism that Pacific people draw support from. Lotu encompasses the totality of church practices which include daily recognition of Christian values of charity, volunteering, and serving the unable or disable members of the community, for example, the elderly and orphans (Havea, 2011). It also includes paying tithe and offering to support church work, and praying to God for providence, sustenance, mindfulness and change of conflict situations to peaceful living. To anthropologists, Christianity may have destroyed some important aspects of Indigenous culture, but the positive influence of Christianity in Pacific development, which does not attract significant attention in Pacific literature, make up a vital part of Pacific peoples' value systems. Many draw from lotu in order to adapt to and deal with challenges including those that are inflicted by climate change impacts (Steven, 2024).

5.4.4 Case study 4: Adaptation through Indigenous innovation

Most communities in the Pacific Islands are Indigenous to place and so the innovation necessary for adaptation is best implemented through existing social systems incorporating locally determined challenges, needs and values (Dumaru, 2016). Natural resource ownership in the Pacific Islands is for the most part communal, clan-based and interwoven with customary notions of tenure and Indigenous institutions. In this Indigenous Pacific context, a 'place-based' worldview dominates and continues to operate in spite of the colonial and neo-colonial influences over the past three centuries (Huffer & Rakuita 2008). Encapsulated in the Indigenous concept of vanua (Fiji), whenua (Aotearoa New Zealand), fonua (Tonga), fanua (Samoa), fenua (Maohi Nui/Tahiti), fanoa (West Kwara'ae, Malaita Solomon Islands), and te aba (Kiribati), terms meaning 'land' is central to a pre-colonial Indigenous development model based on the interdependence between nature and people 'and the various other institutions established for the sake of achieving harmony, solidarity and prosperity within a particular social context' (Ravuvu, 1983, p. 70).

A place-based vanua/whenua/fonua/fanua/fenua/fanoa/te aba orientation to adaptation is important because Pacific peoples' perceptions and ability to respond to climate change risks is embedded in cultural values, local languages, and customary governance processes. This means Indigenous knowledge and language in the adaptation process is an essential (Lefale, 2010).

Indigenous innovation in adaptation is enabled via community-based adaptation (CBA) processes via the incorporating varied sources of knowledge, traditional and modern, for local level adaptation (Limalevu et al., 2006; Dumaru, 2010). However, inclusive localised approach need not preclude the incorporation of modern sourced policy, scientific and engineering expertise which has the potential to introduce innovative and appropriate technology to enhance Indigenous communities' capacity to adapt (Dumaru, 2020; Gero et al., 2011). As such, the incorporation of views from (especially Indigenous language speaking) resilience practitioners from various sectors and levels of governance creates an inclusive decision-making process that is a defining feature of CBA.

The use of participatory learning and action (PLA) techniques, such as community mapping, participatory transect walks, community timelines and the seasonal calendar have successfully proven to generate Indigenous communities climate risk perceptions and effectively mobilised collective action in assessing, implementing and appraising adaptation projects (Dumaru, 2019). There are many reasons for using PLA techniques in adaptation and but key to these is for the facilitator to get local and Indigenous communities to realise they have the knowledge and the experience to assess and seek solutions to addressing local climate risk related problems (Reid et al., 2009). Such a process usually occurs at the initial stages of a CBA project with the facilitator helping local communities organise their thoughts around local climate vulnerabilities, and to generate a sense of confidence in speaking out before engaging with external technical agents in the adaptation planning process (Nakalevu, 2006; Huq et al., 2007; Reid et al., 2009; Dumaru, 2015).

5.5.5 Case study 5: Pacific-Indigenous disaster resilience in a contemporary world

Across the fields of climate change, disaster risk reduction, and disaster risk management, success is often measured in terms of 'resilience,' yet definitions of the term vary. In general, 'resilience' involves the ability to adapt and respond to risk; and ultimately, to navigate their way to the psychological, social, cultural, and physical resources that sustain their wellbeing, and their capacity individually and collectively to negotiate for these resources to be provided and experienced in culturally meaningful ways (Paton & Johnston, 2017).

When a shock or disturbance arises, a resilient individual or group is able to purposefully identify, access, and utilise available resources. Disaster resilience is a process of recovery and self-learning (Aldunce et al., 2015). It is the capacity to 'return to baseline functioning' after a disaster; yet it is also about advancing through 'learning and adaptation.' Some definitions of resilience focus on preparation: It is important to have a capacity to anticipate, prepare and plan in order to recover from the negative impacts of a hazard and to mitigate, prevent and minimise losses, suffering and social disruption (Aldunce et al., 2015).

Closely tied to this idea is self-reliance. Recognising the ambiguity of the term 'resilience' in the fields of disaster risk resilience, management, and climate change, this chapter argues for the importance of defining a Pacific-Indigenous perspective based on kinship and family-reliance as enacted through Pacific diasporic churches and community response (Alexander, 2013) as emphasised in chapter 15 of the IPCC AR6 report (Mycoo & Wairiu et al., 2022).

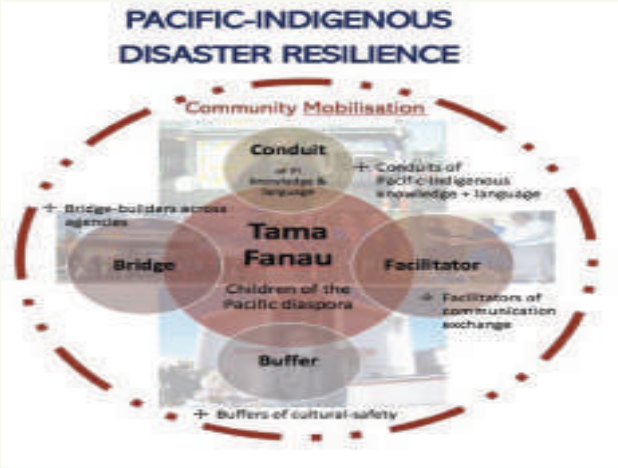


Figure 5.3: Pacific-Indigenous disaster resilience through Tama Fanau (diaspora). Image Source: S. Alefaio-Tugia.

This has far-reaching implications for many diasporic communities globally, as those born in the islands depend upon their kin or family for survival, and many are supported through the remittances that are mainstays for sustaining island economies (Browne & Mineshima, 2007). They prioritise family-reliance as opposed to self-reliance. Members of the diaspora are not outsiders, but an extension of kinship ties, and they help sustain their kin in home nations. Disaster response in a society such as Samoa whose fa'asinomaga (essence of life) is centered around 'others,' or 'others-centered,' (Alefaio, 2022) is organically and collectively resilient.

The mainstream conception of community resilience as the ability to overcome extreme events without significant outside assistance can therefore demonstrate a lack of understanding about cultural differences (Cutter et al., 2008).

Samoans, like many Pacific communities treat disasters as an inherent call to respond to their kin, regardless of their geographical location, given their shared tofi (inheritance) and fa'asinomaga. Tama fanau (children of the Pacific diaspora) are carriers of Indigenous knowledge through languages spoken and unspoken carried in their hearts. Figure 5.4 illustrates how Tama Fanau act as conduits, facilitators, bridgebuilders, and buffers during disaster response, thereby cultivating an inherent Pacific-Indigenous approach to disaster resilience.

The unique Pacific-Indigenous approach to disaster resilience cultivates effective community mobilisation that is culturally safe and responsive. It also is more immediate and flexible and outlasts international aid and government assistance (Le De et al., 2015). During disasters, Tama Fanau are facilitators of culturally relevant 'communication-exchange' as case study 1 shows. If the diaspora were better resourced, they would be able to provide more effective and sustainable support in the wake of disasters. This is evident in the Samoan tsunami and cyclone disaster, where remittances from the diaspora were more immediate, flexible, and longer lasting, allowing families to better recover.

Pacific diasporic sites of resilience

Despite atrocious historical injustices and challenging living circumstances, Pacific communities draw strength from their cultural values and beliefs to support each other, especially during times of disaster. For example, they garner fortitude and mobilise support for the collective good in Pacific diasporic churches. For the diaspora, church emulated island village culture and became more than a place of worship, as it also helped families maintain language, sustain culture, and receive social support. The transnational communities of Pacific diasporic families and villages demonstrate immense resilience in times of crisis, but they are inevitably impacted by the socioeconomic constraints of urbanized livelihoods. These include, gentrification, densely populated areas resulting in overcrowding, higher costs of living and increased poverty. The most impoverished communities of New Zealand essentially sustain their own island homelands through kinship reliance. They have done so through numerous disasters, including cyclone relief, the 2009 tsunami, the measles epidemic that gripped Samoa in 2019, and more recently, the COVID-19 outbreak in South Auckland (Ma'ia'i, 2020). While struggling to meet its own material, social, and cultural needs, the Pacific diaspora continues to respond to complex disasters, motivated by kinship or extended family responsibilities. However, economic disruptions and shrinking work opportunities are expected to lead to a significant fall in remittances, according to the International Monetary Fund (Alefaio, 2020).

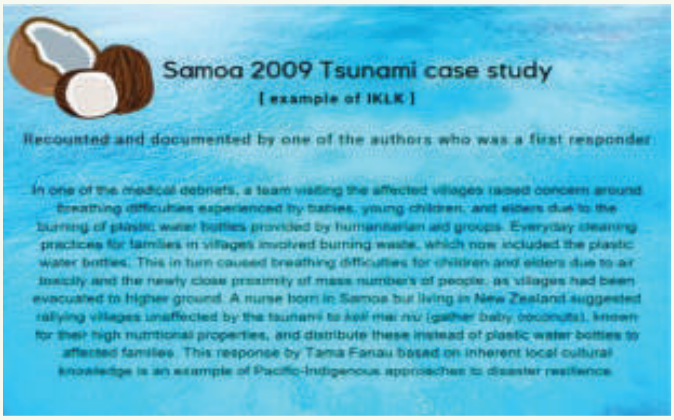


Figure 5.4: *Example of Pacific-Indigenous approach through Tama Fanau (diaspora)*

In this era of complex disasters, churches and communities become innovative sites of resilience that mobilise disaster response from the ground up. The eruption of Hunga volcano, Tonga (15 January 2022) was the most explosive volcanic event of the past 140 years. Volcanic ash generated by the explosive eruption became an immediate focus of response given heightened concerned about ash impacts on human and animal health, drinking-water, crops, soils, and fisheries. Ash hazard characterisation was therefore an important part of the immediate emergency response. Through a diasporic local community-institute partnership (NIUPATCH), a Tongan coffee farmer informed the team that volcanic ash has historically been utilised by farmers for their crops, as a result of this shared Indigenous Pacific information samples were analysed and were not acidic with very high concentrations of water-soluble sodium and chloride, and very low concentrations of fluoride and trace metals, confirming the IKLK. Led by Tongan community leaders in Auckland NZ, interpretation and communication of results to health agencies and emergency managers as a basis for public messaging was developed as showcased by the infographic designed by a Pacific doctoral student in design (see Figure 5.5). More importantly this bilingual Tongan-English infographic was placed in all food boxes that were utilised for the COVID-19 response by social enterprise Affirming Works in South Auckland and re-distributed to Tongan families affected by the disaster as immediate aid.

Altogether these examples demonstrate the innovative practises of disaster resilience grounded in IKLK. The risk to this innovation however lies with the costs of sending remittances to Pacific nations which are among the highest in the world (Alefaio, 2020). Immediate action in remediating this inequity is an obvious first step in going beyond the lines of superficial aid. Further, investing in improving the lives of transnational Pacific diasporic communities will have a direct impact on sustaining livelihoods of island nations.



Figure 5.5: Bilingual Tongan-English infographic developed in response to the Hunga, Tonga volcanic eruption (Luani, 2022)



> “Yes, we have experienced some losses due to climate change. A prime example is our fishing grounds, they have changed dramatically over time, as it affects us, it creates more hardships for us. In terms of intangible loss, there are few places where they are being affected, due to coastal erosion”
>
> Roman Laibwij
> Laura Village
> Marshall Islands
> (POCCA research team interview, 2023)

Showing the proximity of the reef barrier to land in the Marshall Islands offering no protection when king tides hit (Photo: POCCA team, 2023).

5.5 Importance of monitoring and evaluating adaptation and resilience from Indigenous perspectives

Monitoring and evaluating the effectiveness of climate adaptation is key to determining if and how resilience-building interventions impact Pacific peoples' and communities' wellbeing now as well as in the future (Pacific Resilience Partnership, 2020a). 'Resilience and wellbeing' are paired as one of five strategic pathways of the 2050 Blue Pacific Strategy that represents the desired outcomes and impacts such that the capacity of Pacific peoples, communities and nations to respond effectively to threats as well as sustaining free, healthy and productive livelihoods in a changing environment and climate. Monitoring and evaluating resilience and in relation to wellbeing from an Indigenous perspective helps avoid 'maladaptation', which is when climate adaptation investments disproportionately burdens, creates high opportunity costs or deepens dependency of Indigenous and local communities (Barnett & O'Neil, 2013).

Institutions in the PICTs constitute a blend of modern and customary values and practices, and it is within this context that adaptation and resilient development monitored and evaluated (PRP, 2020b). Pacific leaders often emphasise, as they did at the 2018 Forum Meeting in Nauru, that sustainable development in the region should be achieved on its terms and in a way that recognises the region's rich culture, national circumstances, and oceanic resources (PIFS, 2018).

The strengthening of Pacific leadership, voice and engagement to ensure recognition and alignment to Pacific cultures, values and priorities' is a strategic pathway of the Blue Pacific Strategy 2050 (PIFS, 2021).

The Monitoring and Evaluation Strategy of the Framework for Resilient Development in the Pacific (FRDP M&E Strategy) explicitly emphasises the need for methodologies and tools that capture local and Indigenous knowledge, processes, and worldviews to monitoring climate and disaster resilient development at multiple levels (Pacific Resilience Partnership, 2020b). For example, the Kakala Framework provides Pasifika communities with the means to articulate theories from their perspectives and to articulate Pacific world views in their thinking. (Fua, 2014). Talanoa, an Indigenous Pacific word that literally means 'conversation', is a recognised research method that engages people to story their issues, their realities, and their aspirations (Vaioleti, 1999). Pasifika communities have been utilising such methodologies and tools in the respective vernacular to communicate with and engage local and Indigenous communities. The FRDP M&E Strategy links the assessment of resilience to SDGs by framing the M&E of resilient development according to three assessment stages:

Process: refers to the resilience-building actions and interventions by institutions and governments to manage climate and disaster risks, usually via policies, plans, projects, or programs. These are the activities and actions listed in sub-national, national and/or regional policies and plans on climate and disaster risk reduction, climate mitigation and/or disaster preparedness, response, and recovery.

Outcomes: refers to the results of the implemented actions (policies, plans, projects, or other interventions) by institutions and governments that may have changed the vulnerability of people and communities to disaster and climate change. In general, these are the expected outcomes articulated in national resilience policies and plans of governments.

Impact: refers to the effects of changing vulnerabilities resulting from resilience-building actions and activities, on longer-term development goals such as the SDGs as well as national and local articulations of wellbeing (Pacific Resilience Partnership, 2020b).

The FRDP M&E strategy highlights the importance of using methodologies and tools that considers: local and Indigenous worldviews and perceptions of risk and resilience; and methods to systematically incorporate gender and social inclusivity considerations in the development of baselines and indicators, data gathering, synthesis and reporting processes (Pacific Resilience Partnership, 2020b).

5.5.1 Case study 6: PLA tools enabling Indigenous innovative adaptation and resilience in the Pacific

everal PICTs including Kiribati, Tuvalu, Solomon Islands and Vanuatu have chosen to use an integrated (multisector) vulnerability assessments (IVAs) to capture and incorporate community-level vulnerability information into their NAP processes (Dumaru, 2019). The IVA Framework was developed in 2016 by Pacific organisations in response to a perceived need to support a common, context-sensitive, coordinated, and integrated approach to assessing climate vulnerability and resilience at community, national and regional levels (SPC et al., 2016a, 2016b).

The IVA was developed by local and Indigenous Pacific resilience practitioners to support the integration of various knowledge sources (Western science and Indigenous and local knowledge) in vulnerability and resilience analysis across sectors (environment, health, water, place, etc.), governance levels (community, district, provincial, national) and actors (government, civil society, private sector) (Dumaru et al., 2017). The IVA's emphasis on community livelihoods and human security (e.g., translated in Fijian Indigenous language as sautu) 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, prioritising environmental security and regional cooperation in building resilience to disasters and climate change (PIFS, 2018).

Facilitated in the Indigenous language the IVA process engages the local communities in talanoa to address questions such as:

- What human security hardships are local communities facing and experiencing?
- What causes those hardships?
- What has and is being done to address these hardships?
- How effective have past response interventions been?
- How can these interventions be improved?
- How will climate change affect these human security challenges in the future?

The above questions are framed and addressed from the perspective of local women, men and youth via the use of participatory field tools.

The Pacific IVA process can be differentiated from other globally established social vulnerability and resilience assessments because it brings together the two core elements for informing adaptation planning: (a) a common framework for determining and assessing vulnerability baselines and (b) a community-engaging participatory approach to monitoring and evaluating adaptation outcomes that can be used as a common point of reference by a wide range of adaptation and resilience actors including communities, policy-makers, implementers and researchers (Dumaru, 2019). The Pacific IVA enable Indigenous innovation in adaptation by linking Indigenous and modern methodologies of knowledge sourcing that are both qualitative and quantitative, subjective and objective, well as methods that include talanoa, storying, customary histories alongside surveys, geographic information systems (GIS) and satellite imagery, documentation review (Dumaru, 2020).

5.6 Summary of key findings and policy implications

This chapter set out to lay the contextual foundation for understanding climate risks through the lens of Pacific Indigenous knowledge. Key emphasis was on highlighting narratives of vulnerability and their evolution as a basis for appreciating Indigenous perspectives of climate risks.

Key findings, challenges/gaps and opportunities identified within the context of this chapter include:

- The effects of climate change hazard risks impact on all facets of Pacific Island societies and contexts, and this is exacerbated by residual colonialism which continues to resonate in different forms at present (e.g. the 'developed' vs 'developing' compartmentalisation of countries in the global context).

- There remains ambiguity in disaster risk resilience, management, and climate change adaptive approaches/perspectives, which highlights a need for Pacific-Indigenous perspectives and context-specific understanding of resilience. For example, attributes of resilience which stem from family/community reliance (or kinship resilience) as opposed to self-reliance are not fully appreciated as a predecessor to resilience.

- New techniques to integrate and represent Indigenous knowledge/science into contemporary science-based models of climate hazards and cascading risks provide opportunities for producing more inclusive quantitative evidence-bases for informing adaptation/resilience planning initiatives.

- Overall, the legacies of Pacific Indigenous resilience are generally aligned with the international human rights framework, the SDGs and the goals of the UN Development Programme (UNDP).

- Key policy implications emergent from the findings include, but are not necessarily limited to:

  - » Invest in innovative approaches/studies for incorporating IK/TEK into contemporary science-based hazard risk modelling investigations.

  - » Pacific Indigenous resilience and response involving Pacific diaspora provide innovative ways for adapting to change.

  - » Community-village resilience provides culturally-responsive field innovations that are citizen-centric and driven.

  - » Research approaches whose focus is determined by community valued objectives, priorities and capacities and produces 'actionable' knowledge.

  - » An education strategy that integrates climate change and ocean literacy theory or 'classroom' learning into real-life work and living experiences.



> "For us now, trying to adapt to the changing weather and unpredictable cyclones is done with mixed emotions. When the weather starts to change rapidly, we ask our men to start cutting down breadfruit and coconut trees near our homes to reduce the chance of them falling and causing injury to people and damage to the houses, but you see this puts pressure on our staple crops, it affects the food we eat, as we are now cutting down breadfruit and coconut trees"
>
> Community Participant
> Nukunonu community
> Tokelau
> (POCCA research team interview, 2023)

For many pacific island communities, breadfruit trees are often an indicator of an incoming extreme weather event. This photo from Tokelau indicates that (Photo: POCCA team, 2023).

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Chapter 6

Pacific Agency and Perceptions of Climate Crisis: Empowering the People's Narratives

Authors

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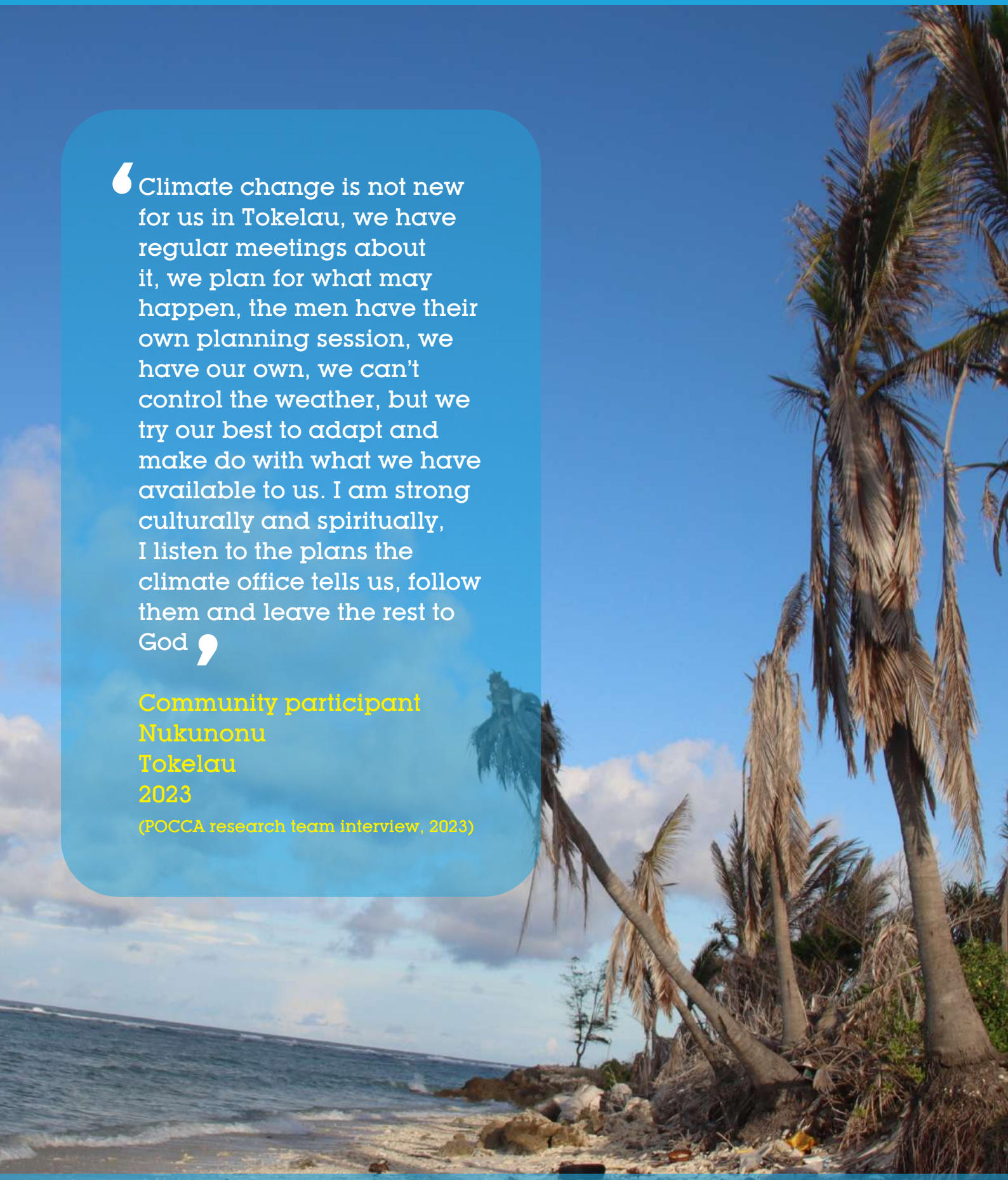
Majuro Atoll is the largest populated atoll in the Marshall Islands. Communities along the coast are often at risk from king tides as they have little to no protective measures in place (Photo: POCCA team, 2023).

Abstract

Over the years, research on climate change and its impact on the region has been wide ranging and much of these have been related to scientific and technical aspects of the climate and ocean as well as studies of impact on local communities. As the climate crisis deepens, the impacts are compounding, with growing risk of cascading consequences. The need for a much more integrated and holistic approach is required to link together various disciplinary approaches, cultural narratives, and policy discourses to strengthen our understanding of the unfolding crisis as well as deepen resilience across the Pacific region. This supports the proposal by the Framework for Resilient Development in the Pacific (FRDP), which aims to promote an integrated focus on climate change and disaster risk management through 'participatory' and 'equitable' approaches. One such approach is to capture and explore our peoples' perceptions and narratives of the climate crisis from different perspectives. This helps to mould the understanding around adaptation, mitigation and resilience building in the region. This chapter explores the crucial role of civil society in responding to the climate crisis, examining cultural, operational, and collective approaches. It also critically assesses and identifies educational pathways that can shape and inform ongoing climate crisis debates.

Glossary of key terms

Fa'amatai	The traditional chiefly system of governance in Samoa. It is based on the authority and leadership of the matai, or chiefs, who are responsible for decision-making and managing family and village affairs
Feagaiga	Sacred covenant between entities
Falepili	Falepili is a Tuvaluan word for the traditional values of good neighbourliness, care, and mutual respect. It is the name given to the recent climate change related agreement signed between Tuvalu and Australia
Fanua	Samoan word for land
Fenua	Tahitian word for land
Fonua	Tongan word for land
Lulu	Samoan for owl
Tapu-a-fanua	Sacred boundary
Tuaoi	Boundary
Vanua	Fijian word for land



> "Climate change is not new for us in Tokelau, we have regular meetings about it, we plan for what may happen, the men have their own planning session, we have our own, we can't control the weather, but we try our best to adapt and make do with what we have available to us. I am strong culturally and spiritually, I listen to the plans the climate office tells us, follow them and leave the rest to God"
>
> Community participant
> Nukunonu
> Tokelau
> 2023
>
> (POCCA research team interview, 2023)

A receding shoreline in Nauru (Photo: POCCA team, 2023).

6.1 Introduction

In order to contextualise and understand the contemporary perceptions, narratives and voices of the Pacific people in relation to climate change, we must recognise the fact that Oceanic communities have developed complex forms of knowledge production, experiences and observation of environmental changes and weather patterns for centuries. They have developed practical ways of adaptation, innovative responses to disasters as well as continued development of resilient mechanisms. In addition, their perceptions and narratives are based on their responsibility and obligation towards the protection of the environment. Significant to this is the centrality and interconnections between the ocean, sky, land, animals, and people. For Pacific cultures, land is not just a physical space but a vital component of identity and heritage. The land is seen as an ancestor, a source of life, and a part of the community. This connection is often expressed in the term vanua (in Fiji), fonua (in Tonga), or fenua (in Tahiti), which encompasses the land, the people, and their relationships. Ownership and stewardship of the land are communal, reflecting a deep sense of responsibility and belonging.

As this chapter explores, Pacific people's perceptions and narratives of climate change, are thus informed by place, context, and experience, holistically embedded and based upon cultural, physical, and spiritual affiliations.

The connection to land, environment, and cosmology in Pacific Island cultures is profound and deeply embedded in their worldviews, social structures, and daily practices. For instance, Samoans and Fijians have a ritual of burying the pute/umbilical cord after a child is born into the fanua/vanua (land). It signifies the sacred Va relation between human life and their environment, it obligates people to take responsibility, to harness peace and maintain balance between humans, the environment, and the cosmos (Efi, 2022). Such rituals go beyond symbolism, in fact it signifies a spiritual continuity where the environment and humankind are one. The Pacific voices on climate change often echo the sacred connection between land and the ocean related in a symbiotic way—this connection shapes cultural practices, social structures, and responses to contemporary environmental issues.

This chapter focuses on Pacific agency, perceptions of climate change and empowering people's narratives.

6.2 Complexities of perspectives

Complex and nuanced, climate change perspectives are vast and diverse, particularly among Pacific peoples (Hau'Ofa, 2008; McNamara & Gibson, 2009; Perumal, 2018; Steiner, 2015). By analysing and understanding these perspectives, we provide a lens to better interpret how Pacific peoples are engaging with climate change discourse and spaces. Although much work has been done on the impact of climate change on our Pacific peoples and their communities (Cochran et al., 2013; Howes et al., 2018; Nurse et al., 2014; Mycoo et al., 2022; WorldBank, 2020), there is still greater work that needs to be conducted around how climate change is being understood, navigated, and engaged with by Pacific peoples and the reasonings behind this. Literature suggests that Pacific climate narratives are rarely presented by those in the Pacific (Bryant-Tokalau, 2018; McNamara & Gibson, 2009; Ledderucci, 2021; Sandilands, 2014), indicating the lack of agency many Pacific communities have when communicating their own stories and lived experiences, particularly on a global scale (Farbotko & Lazrus, 2014; Shea et al., 2020; Steiner, 2015;). Although our Pacific communities are challenging this reality (Fair, 2019; Janif, 2016; McNamara & Farbotko, 2017), mainstream Western frameworks, approaches and Eurocentric-led narratives permeate climate change discourses (Bravo, 2019; Lyons et al., 2020; Sultana, 2022; Tuana N, 2019), minimising the deeply intricate and multifaceted experiences and voices of Pacific peoples.

The ways in which perspectives are shaped and influenced over time is inherently tied to lived experiences (Crook & Rudiak-Gould, 2018; Marino & Lazrus, 2015; Perumal, 2018). As Indigenous people, there are a variety of unique and often overlooked complexities that contribute to these lived experiences (Enari & Taula, 2022; McGavin & Fozdar, 2017; Naepi, 2019). Furthermore, experiences of Pacific individuals and their communities, within a global community, may differ from those who are non-Indigenous, especially when addressing positions of power and privilege (Malo, 2000; Todd, 2015). The prevailing and ever intensifying impacts of climate change on Pacific people are beyond Western interpretations and perceptions.

An intersectional postcolonial approach provides some of the necessary tools to critically analyse dominant systems of power that many marginalised people are positioned outside of (Said, 1978; Spivak, 2015). By challenging the notions of the Western 'universal truth' (Rukundwa & Van Aarde, 2009), and addressing the problematic nature of 'the other' (Said, 1978), intersectional postcolonial approach helps to identify multiple and overlapping forms of inequality and oppressions that may impact those who face various layers of discrimination (Ochue, 2021).

Postcolonial theory represents a complex field of study, encompassing an array of matters that include issues such as identity, gender, race, racism, and ethnicity.

> It focuses on knowledge systems underpinning colonialism, neo-colonialism, and various forms of oppression and exploitation present today. In addition, postcolonial theory challenges epistemic violence: that is, it questions the undervaluing, destruction, and appropriation of colonized people's knowledge and ways of knowing, including the colonizer's use of that knowledge against them to serve the colonizer's interests. Postcolonial theory, therefore, offers a critique of imperial knowledge systems and languages and how they are circulated and legitimated and how they serve imperial interests (Lunga, 2008, p. 193).

A postcolonial approach provides a theoretical framing to this chapter as it seeks to critique the common history of institutions, ideas and values, founded on colonialism. With this in mind, a Pacific nuance to this postcolonial approach should be considered as colonial experiences and their legacies are varied. 'The colonial experience left a common unpleasant taste in the mouths of islands people: a common humiliation, a common feeling of deprivation and exploitation' (Crocombe, 1976, p. 13).

A Pacific postcolonial approach works to consider the diverse histories and ongoing realities of Pacific Island nations and their communities, emphasising the importance of Indigenous epistemologies, sovereignty, resilience, and resistance (Crocombe, 1976; Lawson, 2010)

Intersectionality plays a vital role in this Pacific nuance of the postcolonial approach.

> Intersectionality is a metaphor for understanding the ways that multiple forms of inequality or disadvantage sometimes compound themselves and create obstacles that often are not understood among conventional ways of thinking (Crenshaw, 1989, p.149).

It is important to highlight the ineffective 'single-issue analyses' (Crenshaw, 2013), that we frequently see when discussing Pacific people and climate change. In many cases, it is common to separately acknowledge the multiple issues Pacific communities are faced with due to the climate crisis. However, multiple forms of discrimination and injustices can exist and intersect with one another simultaneously and should be addressed accordingly (Shields, 2008; Rosette et al., 2018). An intersectional interweaving within postcolonial thinking also helps to address some common concerns of postcolonial theory, which critiques the often simplistic and two-dimensional view of oppressors versus oppressed. With this in mind, an intersectional postcolonial perspective works to expand the complexities and nuances that can be found in this piece.

6.3 Decolonising and Indigenising climate spaces and discourses

The experiences shared by Pacific peoples in Aotearoa, in this chapter demonstrate a multitude of issues and challenges that they face in climate change spaces and discourse. The impact of historical colonial violence and systemic violence on Pacific peoples (Ma'ia'i, 2021; McAllister et al., 2022) can be argued to play a significant role in how these challenges came to be, but more so, how they continue to be upheld and perpetuated. Mike Ross (Ngāti Hauā) draws upon the work of Moana Jackson who described colonisation as the process of replacing one house with another (Ross, 2020). Each house represents a society that is built on unique foundations to keep it stable. The foundations include aspects such as political systems, education, security, health, language, values, beliefs, history, and the environment. Each house possesses its own taonga and tikanga (treasures and customs).

Throughout many generations, the foundations are maintained, cared for, and even renovated (evolve) overtime. However, all the resources that uphold the foundations and structure of the homes are taken and used by European settlers and missionaries to build their own homes. Homes that would then replace the whāre (homes) that were originally there. The neighbourhoods changed and the settlers regarded their homes and neighbourhoods as superior (Ross, 2020). The action of colonisation then transforms societies in profound ways.

The connections between colonisation and climate change have been well documented and for the first time in its history, acknowledged in the 2022 IPCC report (Mercer, 2022), stating that 'historical and ongoing patterns of inequity such as colonialism' were considered as projected impact and risk (Pörtner et all., 2022, p.12). Importantly, bringing attention to the word 'ongoing' in this statement is crucial as it demonstrates that the impacts and harms of colonisation is not one situated in the past, but rather firmly apparent in the present. The historical relationship between climate change and colonisation reveals the positioning of Indigenous communities and their realities within the climate crisis.

> Climate change didn't start in the 60's or 70's, or finish with David Attenborough. It is an issue that goes as far back as slavery when people from the West pillaged the Global South to extract the raw materials, which was justified and facilitated by racism. People of colour in these countries were argued to be 'savages' which made the destruction of these communities' a palatable pill for Western Society to swallow (Allison, 2020).

Colonisation on a global scale ushered in oppressive power structures that shaped cultural, political, socio-economic, and scientific systems, laying a foundation for Western-European violence and expansion (Mahony & Endfield, 2018). The exploitation of natural resources such as oil, gold, and copper significantly increased global emissions, with Western-Europe obtaining 84 percent of the world's territories by 1900 (Parvanova, 2017).

Imperialism alongside colonial capitalism fueled this exploitative pursuit in the name of economic profit and power. The unequal and discriminative power dynamics and systems that arose through the process of colonisation has undoubtedly harmed Indigenous peoples, both past, present, and future if action is not taken (Williams, 2022). The extraction and exploitation of Indigenous place, particularly for Pacific peoples, is inherently connected to the people. Indigenous peoples do not just belong to a place; rather, they often see themselves as embodying the place itself. The terms whenua (Aotearoa), enua (Vanuatu), fonua (Tonga), and vanua (Fiji), for example, refer both to the land and to an ancestral connection to the land. Words for land and dirt are often synonymous with words for placenta (whenua, enua, fonua, vanua) and as such suggest that life and land are intrinsically connected (Tiatia-Seath et al., 2020).

An intersectional postcolonial approach often draws upon concepts such as 'decolonise' and 'indigenise' to not only highlight the history of colonial violence to a people but also addresses harmful systemic and institutional treatment of Indigenous peoples. As Moana Jackson described the replacement of a home, the process of decolonisation and indigenisation provides us with the knowledge, actions, and tools to rebuild these homes for the communities whom they were taken from. The definition most suited within this work describes decolonisation as a process, 'to free from the dominating influence of a colonising power, especially to identify, challenge, and revise or replace assumptions, ideas, values, and practices that reflect a coloniser's dominating influence and especially a Eurocentric dominating influence' (Merriam-Webster, n.d).

Ocean Mercier (2020) explains that this process may differ depending on a region's relationship to a colony such as Aotearoa and many nations in the Pacific for instance who are Commonwealth nations. The action of decolonisation aims to dismantle and disrupt colonial systems, institutions, ideologies, and frameworks that often harm and further marginalised Indigenous people. Moreso, decolonisation works to decenter colonial knowledge chains which have been embedded in much of our learning and teaching organisations and spaces.

Alongside the process of decolonisation comes the process of 'Indigenisation'. One definition of Indigenisation outlines it as 'change led by Indigenous people to bring Indigenous ways of knowing, being and doing into spaces that are not designed for those ways' (Gazette, 2019). Te Kawehau Hoskins & Alison Jones (2022) refer to Indigenisation as not to the inclusion of Indigenous people, values, and knowledge within a largely unchanged or superficially changed institutional structure, but to the normalisation of Indigenous ways of being and knowing.

Both decolonisation and indigenisation work interconnectedly to acknowledge and support Indigenous knowledge systems, traditions, and ways of thinking and being, aiding in the revitalisation and amplification of Indigenous voices and lived experiences (Alfred, 2009; Alfred & Corntassel, 2005). Unaisi Nabobo-Baba (2013) suggests that these processes are underpinned by conversations between the past and the present.

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By understanding and critiquing dominate power systems that influence the lived experiences of Pacific peoples and their communities, we are provided a deeper perspective of how Pacific peoples are navigating the climate crisis, a crisis which has deep colonial roots. As Pacific communities are at the forefront of the climate crisis, Pacific epistemologies and practises cannot be deemed inferior to Western frameworks and approaches, rather respected as imperative and progressive insights, and solutions to the continued fight against the climate emergency. What is needed is a re-centering of Pacific knowledge systems in response to Pacific specific experience, interpretation, and articulation of the climate crisis. This is not to valorize Indigenous Pacific knowledge nor to abandon western frameworks. The strategy for solution is the possible alignment of both and presentation in language that is stripped of embedded prejudices and power relations.

With all of this in mind, what does decolonisation and indigenisation look like for Pacific communities within the realm of dominant climate change spaces and decision making? First and foremost, and as previously discussed, these processes will be varied depending on the forms of colonisation that were inflicted in different Pacific Island states. From direct colonial rule experienced by Fiji and Samoa to settler colonialism in New Zealand and the Cook Islands, to military occupation in Guam and Hawai'i. The decolonisation journey will be considerably different, particularly for individuals and communities who are in diaspora. It is crucial to understand that the actioning of these processes cannot be one of performance and tokenism. In their work tilted *Decolonisation is not a metaphor,* Eve Tuck and K. Wayne Yang (2012) emphasise that the journey of disrupting and challenging colonial ideologies and systems will be one of comfortably.

Furthermore, as stated in the title, this process is not a metaphor. Rather, decolonisation and indigenisation require deep and meaningful direct action. The actioning of decolonisation and indigenisation will vary from people to people, community to community.

The work of organisations such as the Pacific Climate Warriors (PCW) can be seen as an example of how decolonisation and indigenisation can be practised in climate change spaces. This group is active in over 18 Pacific Island Nations and seek to empower Pacific peoples to not only understand the worsening impacts of climate change on the Pacific, but also take action in protecting their islands, cultures, and livelihoods (350 Pacific, n.d). The Pacific grassroots climate activists challenge dominant Western narratives that depict Pacific Island nations are vulnerable and helpless, with their stance that 'we are not drowning, we are fighting' (Morgan & Petrou, 2023).

It is the attempt to subvert this dominant Western discourse that we find an example of decolonising narratives. In Candice Steiner's work *Sea of Warriors: Performing an Identity of Resilience and Empowerment in the Face of Climate Change in the Pacific* (2015), the author analyses the navigation of Pacific people's identities of empowerment and resistance whilst at the forefront of the climate crisis. They draw upon The Pacific Warrior Campaign which on the second of March 2013, 350 Pacific worked with 15 Pacific Island Nations to showcase the strength of their people. In doing so, they held a Warrior Day of Action which included regions such as Marshall Islands, Fiji, Niue, Tokelau, Vanuatu, Kiribati, Tonga, Solomon Islands, Tuvalu, Samoa, and Palau (Steiner, 2013).

They performed war challenges, songs, and dances which symbolised their stand against the climate emergency. In 2014, the PCW came together again for the Canoe Building Day of Action in which they prepared canoes to voyage across the Pacific to Australia where they would protest against the new coal explorations that were occurring, which in turn would have devasting impacts to Pacific Islands (Steiner, 2015).

The Pacific Climate Warriors can be seen as a powerful group of grassroots activists and experts who draw upon their Pacific identity and culture to help guide their work in today's climate change resistance. The ways in which PCW not only interweave and share their traditions, cultural and practises within the climate justice system works, which is an example of indigenisation. In doing so, they hold strong in their message that there is deep significance in retaining agency in their stories and narratives, demonstrating the importance of their own communities, and lived experiences being at the forefront of climate change spaces and discussions. The Pacific Climate Warrior Campaign events '…provided opportunities for ordinary Islanders to make their voices heard through songs, dances, and other elements that highlight their pride in their cultures and their determination to overcome climate change' (Steiner, 2013, p.166).

The PCW group based in Aotearoa have highlighted the need for their presence and voices to be heard, particularly within Eurocentric climate change movements that are prevalent within New Zealand. On September 2019, over 80,000 people marched as part of the School Strike 4 Climate youth movement in Aotearoa. However, members of PCW did not feel as though their communities have been adequately acknowledged and presented in the movement. School Strike 4 Climate Auckland has avoided, ignored, and tokenised black, Indigenous and people of colour voices and demands, especially those of Pasifika and Māori individuals in the climate activism space, PCW said in an online statement, further describing it as a 'white-dominated' space (Fagaiava-Muller, 2021).

Paramount to the implementation of decolonisation and indigenisation actions within dominant Western climate change spaces and discourse is the conversation surrounding responsibility. In order to create waves of progressive change and move forward with a future in which all peoples, particularly marginalised communities, are respected, cared for, and provided a healthy, equitable and habitable planet to thrive, a collective effort is required. However, there is a deep and crucial need for the Western world to not only acknowledge, but begin to critique and dismantle the colonial systems, institutions, frameworks and ideologies that have historically and presently, continue to silence, harm, and threaten the livelihoods and existences of Pacific peoples along with other Indigenous peoples across the world.

With Pacific Island nations and their communities experiencing some of the most devastating consequences of the climate crisis, yet contributing the least to climate change, their voices, perspectives, and experiences should be amplified and interwoven into climate change solutions and decision making. In order to do so, dominant leaders within the realm of climate change need to address the harm that Western approaches and frameworks continue to influence and impact Pacific people and their communities. The intersection of their identities and position within the climate crisis remains inadequately considered within dominant climate change spaces and discussions. Actioning processes of decolonisation and indigenisation are key to a progressive future with Pacific communities who navigate the climate crisis.

This also includes resourcing more time, attention and funding into grassroots community organisations and groups that work with our Pacific communities. Alongside this, more meaningful attention and value should be placed on community consultation and perspectives, which would result in community guided policies that in turn actively work for the community, rather than a 'top-down- approach that is often misinformed and ineffective. Pacific individuals and the wider community should have accessible means in which they partake in the decision-making process which will highlight the importance of intersectional experiences and Indigenous Pacific knowledge sharing.

6.4 The politics of language and climate narratives

The theory of the politics of language explores how language and linguistic practices influence, and are influenced by, power dynamics within societies. Key aspects of this theory include language and identity and language and power, providing a framework for understanding the complex relationships between language, power, and society, highlighting how language choices and policies can have profound social, cultural, and political implications (Beaver & Stanley, 2023). Linguists, such as Franz Boas and Stephen May argue that the role of language and how it is framed have an influence on the perception of social phenomena. Furthermore, cultural and psychological framing in many ways shape and inform the representation of such phenomena (May & Hornberger, 2007) Perceptions and understanding of the climate crisis in the Pacific are influenced by the politics of language in relation to how issues are discussed at home, in public as well as in ways of teaching and the dissemination of information Indeed, with the availability and accessibility of information through mainstream and digital media plus the challenge of misinformation and disinformation, language becomes a central dimension of how people perceive, understand, and engage with the world around them (Norton & Hulme, 2019). Certainly, with climate crisis now a major global challenge, the power of language is crucial in framing research, media, civil society, education, diplomacy and the public discourse.

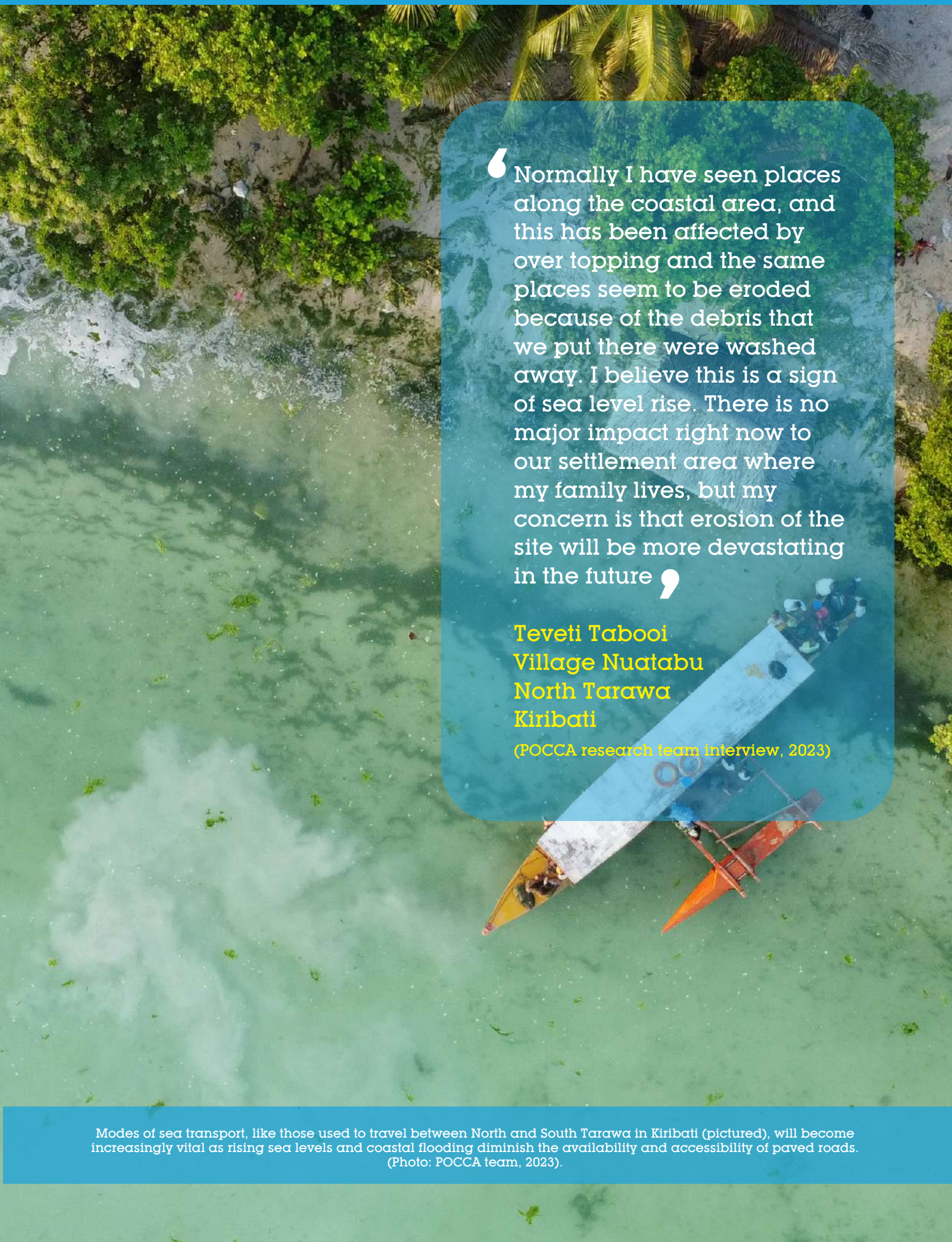
The language of climate change in the region through reports, awareness advertisements, workshops and research, places significant emphasis on the scientific explanation and approach. As a result, there is an emphasis on reducing gas emissions in light of the International Panel on Climate Change (IPCC) report. The IPCC provides the latest scientific data and interpretations to inform climate change mitigation and adaptation policies. While this is commendable in terms of physical science, there is no focus whatsoever on Indigenous knowledge and this is a major gap which this report tries to address. Loss and Damage also prioritises physical impacts of climate change in terms of their economic value (of homes and infrasture for example) while there is not much focus on the emotional and psychological losses of land, culture, identity and heritage (which are often categorised as non-economic). The language of physical damage and economics are dominant here in the Loss and Damage discourse.

Climate change can also be utilised as a political tool when politicians lobby for certain legislation as well as for electoral support during elections campaigns. The language used to frame climate change depends on the interests of politicians and the parties they belong to. In countries like Samoa, Vanuatu, Fiji, Kiribati, Tuvalu, to name a few, climate change has become a dominant issue in the political narratives. This is indeed the case in the region. Leaders of Pacific countries have spoken numerous times at the UN General Assembly and other international forums regarding climate.

Some like the Prime Minister of Samoa, Fiji and Vanuatu have hosted regional meetings on climate change mitigation and resilience of Pacific peoples and their communities. Often in these regional meetings the interplay between national and regional climate narratives becomes more pronounced as leaders try to either connect the two or just focus on their national narratives. It is also important to note that in recent years, at the regional level, the narrative by the Pacific Islands Forum leaders in the Boe Declaration is that climate change is 'the single biggest threat for the Pacific hence the politics of climate change language is crucial for future debates' (PIF, 2018). Because of the increasing need for greater action, the climate change language has shifted to climate crisis and climate emergency. It is important to note here the nuanced difference between language as a tool of communication and the content of the information which the language communicates as it bears implications on the meaning and impact of the statement and how the public perceive and understand it. The Pacific region has since changed its language to depict the reality of climate change impacts on people and communities, from climate crisis to 'the biggest existential threat.

The media plays a huge role in the climate discourse space, they also have the influence to provide information as well as disinformation and misinformation. Hence, climate change gets a mention on television on a daily basis for many of the Pacific Island countries as governments encourage people to recycle, reduce the use of plastics, banning the burning of rubbish and promoting the planting of trees and mangroves. An analysis of TV commercials in Samoa, the Cook Islands and Niue suggests governments are quite proactive in advising people of their responsibility towards achieving low gas emissions and sustainability. Interestingly, the culture of Pacific communities traditionally relied on a sustainable and carbonless way of life so it is nothing new to them. Despite minimal contribution to climate change, the Pacific region faces its biggest threat in the form of climate crisis across various areas including water and food security to name a few.

Harriet Mercer (2022) highlights that the IPCC has been producing the world's leading scientific climate reports since 1990. However, with over 30 years of data and analysis, 2022 was the first year that the IPCC mentioned the interconnected relationship between climate change and colonialism, and this shows why it is important to communicate various other hidden aspects of climate change.



> "Normally I have seen places along the coastal area, and this has been affected by over topping and the same places seem to be eroded because of the debris that we put there were washed away. I believe this is a sign of sea level rise. There is no major impact right now to our settlement area where my family lives, but my concern is that erosion of the site will be more devastating in the future"

Teveti Tabooi
Village Nuatabu
North Tarawa
Kiribati
(POCCA research team interview, 2023)

Modes of sea transport, like those used to travel between North and South Tarawa in Kiribati (pictured), will become increasingly vital as rising sea levels and coastal flooding diminish the availability and accessibility of paved roads. (Photo: POCCA team, 2023).

6.4.1 Experiences and perception of climate in the Pacific

Early findings from POCCA field studies conducted in Fiji and Samoa indicate varied understanding and perceptions of climate change. In the case of Samoa- there is some understanding of climate crisis amongst the matai who are representatives of their villages to government. In their roles they are fortunate to attend and participate in government ministry workshops including those on climate change, where they are presented with the causes of climate change, its scientific impacts and suggested ways to contribute to saving the environment. It's important to note here that understanding and perception can be based on the information that is available.

For instance, in Samoa and Fiji some people perceive climate change only in terms of its physical aspects such as sea level rise, soil erosion, warmer weather, droughts, etc. There is little discussion on how weather changes and uncertain weather patterns affect land, vegetation, and marine life. Local people are well aware of the various changes albeit the connection between gas emissions, rapid development and their crops and marine resources are less known factors. In addition, the social and cultural impacts of the climate crisis are not readily discussed or thought of, although there is discussion on what people can and should do to reduce such impacts.

One of the challenges is that without sharing the necessary information relating to climate change with local people, there is a risk of low engagement, and this can be of concern. For example, the perception by some about poor harvest can be based on their Indigenous spiritual belief about cosmological and supernatural intervention as a result of something wrong they have done to create imbalance with nature. Other non-verifiable perceptions such as coral bleaching is a result of using kava to catch fish. Although this may be true in some cases, it does not provide the full picture about the role of carbon emission which leads to climate change.

Indigenous Pacific communities have had strong connections with nature prior to the arrival of Christianity. Those connections with the environment are perceived as sacred, and have transcended generations through names, stories, songs, metaphors and traditions. When Tui Atua talked about Samoan Indigenous religion, he identified four types of harmonies which provide a sense of balance within the Samoan cosmology. These are in harmony with the cosmos, harmony with the environment, harmony with one's fellow human and harmony with oneself (Efi, 2018). This statement highlights the profound spiritual connection many Pacific Indigenous cultures share with the land, sea, and natural resources.

This indicates that many local communities have a belief that climate change results from their activities, rather than other broader causes, including the scientific explanations. An important information people in the community must know is that although Pacific Island Countries and Territories (PICTs) contribute the least to gas emissions, they are also forced to feel they are responsible for the climate change and its impacts on society.

A significant reason why Pacific people perceive climate 'crisis' the way they do, different from the perception of those in the global North and their perception of 'climate change', is due to the fact they live and experience its harsh realities. For many, particularly on the coastal areas- they know no other way. The waves reaching their front or back yards are not new and they have adapted and know what to expect. The frequency of category 5 cyclones, droughts and flooding has reminded Pacific people of the importance of their collective efforts and responses, as well as the agency of culture in mitigation and building of resilience.

For example, in Samoa, there is a strong understanding of the culture of resilience and the responsibility to protect which starts from the family. Good leadership will provide for effective division of labour, decision making and inclusive support for everyone in the village, which sees the untitled men start working on rebuilding homes as soon as it is possible to safely start the clean-up. Thus, Pacific perceptions are based on the way of life and survival that is informed by Indigenous knowledge systems which provide practical ways of coping, adapting and mitigating impacts. The frequent cyclones have meant Pacific people have become innovative in their actions and developed relevant ways to strengthen their practices and responses to climate calamities.

6.4.2 Experiences and perceptions of climate change in the diaspora

The views and perspectives of Pacific peoples within climate change discussions and spaces are varying and oftentimes influenced by lived experiences as previously stated. These experiences capture complex and nuanced realities that provide insight into deeper understandings of Pacific people's perceptions and engagement with climate change. Research conducted by MahMah Timoteo (2023) explores these complex and nuanced experiences in the context of Aotearoa. Pacific climate activists such as Aolele shared her experience of being a parent and activist during a climate crisis: 'They're already mourning the futures of their children' (Timoteo, 2023, p. 172). For Aolele, the climate anxiety that people face is valid. However, they recognise that this anxiety can lead people to feel powerless and ultimately giving up on the future. 'We just got to keep it pushing. Because if we don't, then, you know, that's our livelihoods, it's our culture' (p.173). Facing some of the harshest consequences of climate change, many Pacific nations do not have the option to stop thinking about these consequences. 'I'm forced to be hopeful because I refuse to accept anything less than a world that my child deserves or that our people deserve' (p.173). The participation of activism by our Pacific people is not always a choice, rather an action necessary to survive and protect our future generations. As Aolele explains, this mahi comes with layers of challenges.

> I can't deal with white climate spaces because they probably won't understand the layers of me being a mum…I think it's just a lot of competing priorities. Even our own people,…just trying to put a roof over your head, food on your table, that's a huge priority for some people… (Timoteo, 2023, p.171).

Climate change poses huge financial challenges for Pacific people when it comes to taking action. Evidence is the many priorities that people in our community are forced to face. With cost-of-living skyrocketing in Aotearoa (Stats NZ, 2022), and Pacific people, specifically women, being the least paid demographic in the country (Rovoi, 2022).

Aolele explains that many of the climate spaces in Aotearoa she has been a part of are dominated by non-Pacific people, who have historically made her, and her community feel unsafe, undervalued, and lesser.

> There's that layer of, you're white, I'm brown. I'm trying to, what's the word? Code switch! And I'm still very aware of my brownness in those spaces. I'm watching out for something racist (Timoteo, 2023, p.161).

Like many other Pacific climate activists in Timoteo's research, they experience a constant state of uncomfortability in white dominated spaces, resulting in many of them not wanting to contribute to conversations due to shame and safety. In turn, highlighting the entrenched defence mechanisms that are put into place in order to navigate generational trauma. Identifying the intersecting realities people face can help provide tools to better cater to our Pacific communities' needs and safety within climate spaces and discussions.

The majority of the Pacific climate activists that were spoken with conveyed that they felt safer and more valued in Pacific led and operated groups, such as the Pacific Climate Warriors. Here, they felt that their lived experiences were better understood and considered. This demonstrates that it is important for our Pacific people to have spaces that are intersectional and highlights meaningful Pacific representation. Allocating time, money, and resources towards developing groups and spaces like this has the potential to uplift the skills, voices, and lived experiences of Pacific peoples in climate action, with emphasis on this being a collective effort (Timoteo, 2023).

Many of the same experiences can be felt in the realm of policy and governance by Pacific peoples. Bella (another interviewee) shared her experience as a proud Pacific woman in a field dominated by palagi men.

> He wasn't taking on board what I was saying in the meeting. He wasn't listening to me when he was listening to all the men, the 30 plus men in the room (Timoteo, 2023, p. 150).

It is common for Bella to feel inferior, constantly aware of the way her gender and race are positioned within these spaces.

> I just took it as I think he sees brown, female as you're underneath me, you shouldn't be – I shouldn't be listening to you because I have more brain power than you, more knowledge (Timoteo, 2023, p. 150 - 151).

This can be incredibly frustrating for Bella who is usually the only one in the room that has a Pacific Island lived experience of climate change. She explains that it is very normal for her to be left out of important email threads, even ones she has created. It is common for her and other Pacific colleagues to not be addressed directly, rather information is passed onto her non-Pacific team leaders who are trusted to relay the messages, an experience that her palagi colleagues do not seem to face.

When asked if more Pacific Island people working in climate policy would be beneficial, she expressed that she did not want them to be subjected to the harsh reality of working in such spaces, risking the well-being of other Pacific people in order to receive the collective support she desperately needs in her climate work.

Through interviews in Timoteo's research (2023), a number of Pacific people in New Zealand policy work have mentioned that there is a lack of importance and value placed on community perspective, with some admitting that community consultation with Pacific communities is commonly done at the last minute which leaves little time for community groups and individuals to come together and participate.

In order for Pacific perspectives and voices to be amplified in climate spaces and discussions, greater value needs to be placed on Pacific people as a whole, ultimately challenging the clear racial and gender bias that exists within these governmental institutions. As an interviewee outlined,

> Us Pacific people value working with others… we get support through partnership, collaboration and in a white man's world, it's very top-down. They lose what is really happening at the grassroots level. A lot of our cultural practices we do a lot of back and forth – we do bottom up. We listen, we observe at what is happening at the grassroots level and then we share our narrative, our programs at what is happening in the community… (Timoteo, 2023, p. 154).

Community is one of the most important aspects in the lives of Pacific Island people. Through community, we hold our language, cultural practices, traditions, ancestral stories, Indigenous knowledge, and so much more. With Pacific communities at the forefront of the climate crisis, their experience is paramount in understanding how communities across the world will learn to adapt and survive.

Unfortunately, many members in the Pacific community feel overlooked in the climate discussions and spaces.

6.5 The role of human agency, civic and citizenship education

This section of the chapter will shed light on the significance of the role of civil society and the challenges and opportunities that arise from the current global climate crisis. While civil society in the western world is well defined, Pacific societies and their civil and societal spaces are complex and are highly embedded within their social and ecological landscapes (Movono et al., 2017). The rise of the Pacific civil society movement within the climate change space, while profound, is not new. Rather, it is a manifestation of the legacy of Pacific peoples within their respective self-determination journeys. From the early days of colonial rule, struggle for independence, rise of labour movements and political evolution in the Pacific have been driven or directed in some way by the civil sector. While the broad definition of civil society is often directed and confined to non-governmental institutions that act on the will of the people, it is a foreign concept and one that is fraught with its own complexities.

Civil societies by definition must act on behalf of peoples and communities and not become an external structure, to 'represent' people - leaving little thought about the agency and power of people and communities to their own interpretation (Nesadurai, 2010). Some of the challenges faced by civil society in the Pacific includes donor pressure, staff turnover and more importantly, local recognition and legitimisation to NGOs operating in the Pacific.

Further, the communal, interrelated and dependant social setting prevalent within the Pacific have been seldom acknowledged within civil society debates, neither have there been deep discussions about how civil societies can be grown and developed from the grassroots (Pernia, 2016). To date, a genuine bottom-up approach to civil empowerment has avoided lending power to locals and must now be recognised as an opportunity and tool within the climate adaptation and mitigation arsenal.

Most communities in the Pacific where studies have been conducted in responses to shocks such as cyclones, tsunamis and the recent pandemic have shown signs of resilience, agency, and organisation (Nalau et al., 2017; Movono & Scheyvens, 2021). Tourism dependent communities across the Pacific, including Vanuatu, Samoa, Fiji, and the Cook Islands have shown resilience during the greatest calamity of our time (Movono et al., 2017). Most of these communities already have pre-existing committees, groups and collectives that mobilise to ensure community well-being, food security and compassion (Ratuva et al, 2020). The behaviours, structures and mandate of these internal groups qualify them as civil societies, but because they are loosely nestled within the traditional context are therefore perceived as 'requiring help from an NGO.' While help may indeed be needed, people in these communities want 'partners' who can work to empower and uplift these pre-existing groups into a stage of transformation, rather than just being used as conduits for the dissemination of aid, training programs or donations, especially in the climate change space.

6.5.1 Cyclone Pam, Winston, Harold and Yasa

Here, we suggest that there must be more thinking and conversations held on attributing power to people, whilst acknowledging socio-political and traditional capital inherent within specific communities and areas in the Pacific. In the face of shocks, the immediate first responders are the affected themselves, who in most cases do not see themselves as victims, but rather catalysts for adaptation and response to their situations. Hence, this is where the role of civil society can be localised while emphasising a genuine bottom-up approach to civic action and partnership. In fact, the Pandemic and the subsequent closure of international borders have forced civil society organisations and their international partners to pivot, essentially being coerced into a rapid localisation approach.

During the pandemic Pacific civil society organisations had to rely on local staff, expertise, community partners and consultants to conduct work that would sometimes require overseas consultants. Further revealing that the 'fly in and fly out' approach of Pacific development is not always necessary when it comes to response to sudden and often prolonged shocks such as the Covid19 pandemic.

As viewed from the region, local villages and in-built groups/committees are the first respondents to any natural disaster, these agencies build empowerment and resilience through learning from first hand experiences the devastating impacts of the climate crisis and experimenting with initiatives and innovative responses for the next cyclone. For the Pacific countries this is their system of social protection through the concept of human agency, and they do not see this changing anytime soon. While it is true that international aid provide assistance to the affected communities, it can take weeks and months for the humanitarian efforts to reach those on the ground and for the most part- by the time they arrive, the clean-up, the rehabilitation and the rebuild is already well on its way, led, coordinated, and conducted by village and community people- civil society.

Research findings from the POCCA field studies indicate that it is not just the communities themselves that perceive their own agents as first respondents, but also national governments, in fact there seems to be an expectation that it is and should be the civic duty of communities themselves to initiate any response activity post disaster. This is particularly important for countries that do not have civil defence organisations to provide the initial steps to help those impacted.

Whilst this has been the norm in the Pacific region which goes hand in hand with the local traditional leadership and organisation of communities, there is little to no recognition of this by international aid providers. For instance, whereas the Red Cross would be equipped, recognised, and have readily available funding for further work they identify- the local civil societies lack any of the above. This may be due to the nature of being embedded into societies, however it is important that they are seen as official respondents, agents of change regardless of whether or not they have an official registered status as a civil society organisation. Essentially, this chapter argues that people want self-determined development futures that protect local values and what Pacific people hold dear.

As such, crucial development work, especially within the climate crisis context, requires a locally focused approach that leans on localising civil society whilst recognising the power and agency of traditional, customary and community collectives that also act for the benefit of their own communities. More importantly, as first responders to any crisis, local communities and actors are not mere vulnerable victims, but are active agents of change and response to future perturbations. More investments and conversations are needed to better understand how a bottom-up approach that builds civil systems from the ground can yield benefits for localisation and long-term resilience in the Pacific. Perhaps, education and enlightenment of the future generation maybe a first step in this direction.

6.5.2 Amplifying Pacific voices: The role of civic and citizenship education

Civic and Citizenship Education (CCE) plays a key part in informing and framing people's perceptions of climate change. Although Indigenous education on climate change is not new to the Pacific, the more recent dominant framing and terminology used in climate change education has prioritised Western knowledge systems and institutions which are disconnected from or has 'othered' Indigenous practices and framings. While some Indigenous peoples have strong knowledge and relationships with the environment, others have had to (re)establish these connections which have been lost over generations due to societal changes through colonisation and capitalism (Nesterova, 2020, p. 1051). There is a need to amplify Pacific Indigenous knowledge in CCE to foster more nuanced perceptions on climate change in the Pacific and abroad. As a result, there are opportunities for Pacific Indigenous Knowledge to be embedded in climate change narratives of CCE to provide more meaningful connections and relevance to Pacific peoples and to elevate support of the climate change agenda.

Some of the work being actioned in the Pacific to support climate change CCE and the opportunities that exist, begins by setting the scope of 'Civic and Citizenship Education' used in this chapter. It then explores a number of relevant levers of change or sub-themes used to educate, frame, and reinforce perceptions of climate change in the Pacific. These subthemes include climate change as part of the school curricula, the role of media and communication platforms in amplifying voices; and the power within family and community narratives/stories.

Civic and Citizenship Education is described as addressing 'the formal institutions and processes of civic life, such as voting in elections, while citizenship education addresses how people participate in society and how citizens interact with communities and societies' (Krieble & Tavich, 2017, p. 60). Literature on the role of CCE has often been associated with school curricula with a focus on democratic education, and at times, authoritarian regimes which use CCE to reinforce legitimacy (Kennedy, 2019). There have been increased calls for climate change CCE to become a necessary component in the school system and the necessity for a more national-driven, coordinated approach to the school curriculum (Akoorie, 2021).

In the Pacific, it can be argued that climate change education is not a new phenomenon. Climate change knowledge has been part of the school curricula, implemented by awareness programmes with an array of groups such as media, women growers, governments, regional agencies, development partners and civil society for some time (Vize, 2012, p. 221). Extending beyond these institutions, narratives of climate change in an Indigenous sense, have long been a part of Pacific traditions and practice as a way of life.

The framing of CCE in literature has predominantly focussed on knowledge transfer and active citizenship of young people rather than the role of older generations. Kennedy (2019) states,

> Whether in ancient Greece, Rome, China or India, older generations have always sought to inculcate in young generations their expected duties, obligations and responsibilities in order to ensure the maintenance of the existing order, its values and its priorities (Kennedy, 2019, p. 1).

In the Pacific, older generations play an important role in raising a child or young people. There is also a gap in the need for all members in the community to engage in CCE, which include older people and those that are disengaged in civic education.

6.5.3 Climate change as a component of school curricula

This chapter recognises that climate change is real and does not discriminate. It affects every region worldwide but its effects on PICTs are more intense and increasingly powerful. In the 2014 World Risk Report, which assessed world regions with high exposure to frequent and damaging climate-related risks, Vanuatu, Tonga, the Solomon Islands and Papua New Guinea were identified among the top 15 countries most at risk (UNU & Alliance Development Works, 2014, cited by Aipira et al., 2019). As most Pacific communities live close to coastal areas, the severity, frequency, and pace of all weathers have impacted sea level rise with increased coastal erosion, inundation, flooding, and salinisation of coastal aquifers (Ferris et al., 2011, cited by Charan et al., 2019). Those occurrences affect the lives and livelihoods of the coastal inhabitants who are totally dependent on marine, and ecosystem endows (Chandra et al., 2019). To combat the climate change issue, UNESCO (2012 & 2019) has identified education as the main tool to educate, inform and train people about climate change awareness and actions.

Education plays a significant role in addressing issues of climate change and is a critical agent in undertaking educational and public awareness campaigns. UNESCO (2010, cited in Filho & Hemstock, 2019) suggests that education provides opportunities to keep society informed, provides training for an effective workforce, and enables government officials to make sound decisions to protect communities against climate risks.

Education is considered an untapped agency to combat climate change catastrophes according to Mochizuki & Bryan (2015). They contend that education is ethical and cost-effective in addressing climate change, enables learners to understand and act responsibly to complex issues, and empowers learners' readiness to take action to address the issue. Although education has been highly recommended as the means to respond to climate change issues, Cordero et al., (2020) noted that education is rarely mentioned especially in climate change solution discussions.

Climate change education has been part of the curriculum delivered in secondary and higher education in some parts of the world. According to Filho & Hemstock (2019), the nature of climate change education at university level included relevant content knowledge on climate systems, climate science and climate change impacts. Other components are also considered such as the 'issue of analysis, community and personal decision-making, political processes, social justice, inter-cultural sensitivity and inter-cultural competence, behaviour change, stewardship, and connections between climate change and economics' (Filho & Hemstock, 2019, p. 2).

Therefore, according to Anderson (2012, cited in Filho & Hemstock, 2019), climate change education tends to teach content relevant to the institution.

On the other hand, some studies (Filho & Hemstock, 2019; United Nations, 2014; Prasad & Mkumbachi, 2021; Aipira et al., 2019) identify the delivery of the climate change content, as an issue of great concern, because climate change teachers tend to lack confidence in the subject area (Filho & Hemstock, 2019). For example, those who teach science feel unprepared to integrate action and content knowledge specific to climate change education because they are more factually based (Oversby, 2015, cited in Filho & Hemstock, 2019).

Another issue that has been identified that creates barriers to climate change actions and resilience, is social and economic inequality. According to Filho & Hemstock (2019) most of the least developed countries including the PICTs are vulnerable to the climate change crisis. This is because there is little formal provision of climate change education at university level' (Filho & Hemstock, 2019, p. 2) within the Pacific. For example, studies from 15 PICTs identified barriers to improving climate resilience (Filho & Hemstock, 2019). These barriers include the lack of human capacity as well as the lack of expert knowledge on the issue. Lack of education adds to the inequality which affects people's coping and adapting capacity to deal with challenging situations systematically and appropriately. Climate change education is necessary to provide vulnerable communities with informed choices to make good decision-making.

One issue that has been raised is the role of education in promoting climate change awareness through the curriculum. Although many OECD countries include environmental science in their school curriculum, students' knowledge and understanding of the topics weren't reflected in their test results.

According to the OECD (2012) report, a climate change programme for international students within the OECD countries showed that only one in five students can consistently identify, explain, and apply scientific concepts to environmental topics. Another 16% of students did not have enough knowledge to answer questions related to basic environmental issues, whereas 20% of the students were on a baseline level of scientific proficiency (OECD, 2012 & 2019). Such a low level of scientific knowledge was revealed regardless of the schools indicating that they teach environmental science as part of their school science curriculum. These results are very concerning in regard to how climate change is taught and delivered within schools and how climate change policies are implemented in government levels (UNESCO, 2012 & 2019).

Regardless of how significant the curriculum is in promoting and enhancing climate change awareness in society, climate change isn't yet included in the curriculum for all levels of schooling except for higher education and secondary school. UNESCO (2019) indicates as one of its goals to include climate change in the curriculum worldwide for all school levels. An early introduction of climate change education in schools has been raised in many climate change discourses. For example, an explanatory design study conducted in Fiji investigated primary school teachers' perceptions and at which level climate change education was to be addressed, whether at decision-making level only or to include primary school children (Havea et al., 2019).

In their response, the majority of teachers believed climate change should be taught to children from a much younger age. By doing so, children should learn from their young age how to adapt and respond to climate change challenges. Furthermore, teachers also noted that not only is it the children's right to know and to contribute to the climate change conversations, it is also their duty as teachers to provide students with relevant information about the issue.

Another issue concerning the curriculum is the exclusion of climate change topics in all school disciplines but to STEM disciplines (Filho & Hemstock, 2019). Although the United Nations has emphasised the significance of everyone's contributions to mitigate climate destruction, many students are excluded from learning important information about climate change if they are uninterested in STEM subjects or disciplines.

Climate change discourses have dominated the global space in recent years. However, over the years, the curriculum in regard to climate change awareness and actions have faced various challenges (United Nations, 2014; Prasad & Mkumbachi, 2021; Aipiria et al., 2017; Charan et al., 2017). There have also been challenges with finding solutions (Ozdem et al., 2014; Chopra et al., 2019; Havea et al., 2019). A significant gap is that the delivery of climate change topics and issues through the STEM disciplines exclude the majority of students who choose non-STEM subjects in schools.

Table 6.1 shows the type of climate change content is available in their school curricula as well as the availability of civic education workshops on this topic.

Countries	Climate change discourse inclusive in curricula	Civic Education Workshops
Cook Islands	Not yet	No
Fiji	Environmental Science only	On a Needs only basis
Federated States of Micronesia	No Yet	No
Kiribati	Environmental Science only	No
Nauru	Not directly stated	No
Niue	In development	Yes- to share information with community
Palau	Not Yet	No
PNG	Not directly stated	Not Yet
Republic of the Marshall Islands	Not Yet	On a needs basis only
Samoa	Environmental Science component	Yes, only at National level
Solomon Islands	Not Yet	No
Timor Leste	Not Yet	No
Tokelau	Not Yet	For risk management and preparation
Tonga	In development	No
Tuvalu	In development	Yes, only at National level
Vanuatu	In development	Work in Progress

***Table 6.1**: Climate change currirula in Pacific schools (POCCA Case Studies, 2024).*

6.5.4 The role of media

Media is a powerful agent used to educate and inform the public which facilitates peoples' opinions and knowledge on key issues, such as climate change. Information and communication technology (ICT) platforms not only disseminates information and informs knowledge, but it also provides spaces for active citizenship and engagement (Krieble & Tavich, 2017, p. 65; Zhang et al., 2022, p. 290). It can be seen as a space that allows people to explore their relationship with issues of the world (Zhang et al., 2022, p. 290). Despite the evolution of ICTs and the fast-paced momentum of social media, radio is seen as the most effective means of communication within the region with many people increasingly accessing these channels on their mobile phones, including television viewership and news media (Titifanu'e et al., 2017, p. 136).

However, with the impact of COVID-19 on many communities, further research should be conducted to explore whether this is still the case.

How the climate change narrative is then portrayed in the media, plays a significant part in how the public form and frame their opinions on the issue. Dominant climate change narratives in the media have been problematic to say the least. Often these narratives have focused on Small Island Developing States as 'proof' of climate change, 'victims' of climate change, climate 'refugees' or as travel destinations which are not reflective of the framings Pacific peoples have wanted to amplify (Dreher & Voyer, 2015). If this is the only exposure that people receive about climate change in the Pacific, it does not provide a representative or nuanced understanding on the issue which continues to undermine Pacific agency in climate justice. The diversity and richness of views on climate change spanning across the Pacific have not always been included in the dominant framing of climate change. Some of these perceptions and voices have been amplified by groups such as the Pacific Calling Partnership (PCP) (Dreher & Voyer, 2015), Pacific Climate Warriors and Pacific political leaders. To have more nuanced and informed understandings of climate change, there is an urgent need for the media to shift existing climate change narratives to a frame that includes Pacific agency.

In addition to traditional media forms, social media has fast become a useful platform for governments, civil society groups, think tanks, and individuals to drive messages that align with their own agendas and to build support communities. Social media has increasingly been used as a means to raise awareness and activism of climate change (Titifanu'e et al., 2017, p. 134). In exploring how Pacific governments engage with civil society using ICTs, through policy dialogue or service provision, Hassall argues that government activity on social media has had extensive growth compared to the establishment of websites or portals that the public can use to access information to government departments or agencies (Hassall, 2017, p. 365). This highlights that government agencies in the Pacific have tended to use social media platforms rather than traditional website channels to disseminate information and engage with its followers. With shifts in methods of Governments' conveying information to the public, it has also meant that the public have the ability to readily engage with this information.

At a grassroots level, social media platforms also play a powerful role in mobilising communities on shared interests - such as human rights, identity, sport, and climate change - with a wider geographical reach connecting networks within an instance. Titifanu'e et al. (2017), assert that information and communication technologies have potential to act as a catalyst for the rebirth of grassroots regionalism' (p. 134).

They cited the West Papua campaign as an example where ICT tools such as social media were used by activists to bring to light human rights abuses in West Papua, spread information and mobilise protest movements across the region. In this sense, these platforms give power to citizens 'to become active content creators and allow their narratives to be heard' (p. 145).

With Pacific voices and narratives often marginalised in mainstream media, social media platforms provide an accessible avenue for activists and individuals to publicise the urgency of these matters and to build collectivism (Burch, 2020, p. 250). In analysing 9000 tweets relating to 2018 rugby league test match between Tonga & Australia, Ross (2022) found that aside from the game, for Pacific users' patterns emerged in the meaningfulness of their relationships with each other, being visible and a shared pride in being part of a Pacific collective (p. 14). Social media spaces are an avenue for individuals to counter hegemony by shifting the dominant narrative in the media, assert activism and to band together on commonalities to showcase pride in being from the Pacific.

As a digital space, its accessibility, participatory and somewhat permanent nature has provided an avenue for Pacific Indigenous knowledge and practices to remain alive. Inamara & Thomas (2017) explore climate change adaptation using Indigenous knowledge on Andra Island in Papua New Guinea at a community level. In this case, by using community media as a platform, oral storytelling and photography visually showcased and recorded Indigenous practice and enabled a cross-generational discussion. They found that while this method articulated adaptation strategies on Andra Island, it also 'records community traditions, structure and processes' that have occurred over generations and were not 'disregarded due to modern influences' (p. 128). In addition, community members were also engaged in creating content, resources, reflections, and reconstructing discussions with traditional and more emergent narratives (p. 127).

With ongoing technological advancements, a number of challenges have surfaced in the digital realm. For example, 'Though social media seems conducive to cultivating skills for participatory citizenship, the presence of mixed messages on the internet conveyed confusing, rather than always informative, civic knowledge' (Zhang et al., 2022, p. 300). The increase in misinformation and disinformation has raised questions about the ethical responsibilities of the big tech, giant media corporations and the role of governments. In this regard, there are opportunities for schools and communities to explore how to co-create media literacy programmes relating to social media consumption and creation (Zhang et al., 2022). Other concerns, link to issues around access to technology and connectivity. There have also been concerns surrounding the funding of media in New Zealand and the Pacific have centred on a lack of resourcing, concern of journalism standards and independent reporting (Burch, 2020; Robie & Chand, 2017). There is a need to strengthen public interest media in relation to climate change.

Radio New Zealand (RNZ) has attempted to portray Pacific voices in a nuanced manner, particularly in relation to the climate crisis, through their RNZ Pacific coverage which includes Pacific stories, podcasts, and audio feeds. A recent news article at the beginning of the 52nd Pacific Islands Forum (PIF) in November 2023 emphasised the remark by the Forum Chair, Hon Mark Brown (Prime Minister of Cook Islands) that Pacific leaders will lead the Forum agenda and would assert the need for discussions to focus on climate and economic security, rather than being overshadowed by other powers and

interests in the region (Lewis, 2023). Furthermore, as COP28 commenced at the end of November 2023, RNZ Pacific published an article which reinforced the critical need for Pacific voices across the region to be amplified in COP28 negotiations (Altangerel, 2023).

At the end of the PIF leaders meeting in Cook Islands in 2023, the Falepili agreement, a pact between Tuvalu and Australia was announced with a focus on climate migration and security. Following this controversial announcement, a flurry of reports and commentaries surfaced - with many reports focusing on Australia's positioning and voices on the agreement rather than providing more nuanced accounts which include Tuvaluan perspectives (Needham, 2023; Reuters 2023). The significance of nuanced reporting and the inclusion of diverse Pacific perspectives and voices in the media - including platforms such as PIF and COP28 - is beneficial to media organisations, under-represented communities, and society as a whole. Inclusive reporting strengthens trust in mainstream media organisations, it helps redress harm created to impacted communities that have been made invisible, misrepresented and/or under-represented and it also fosters a greater understanding of the world around us including solutions that benefit more people.

Figure 6.1 below shows the monthly coverage of the climate crisis in selected Pacific countries, either through normal media including newspapers and televised news and social media through platforms such as Facebook, Instagram and TikTok.

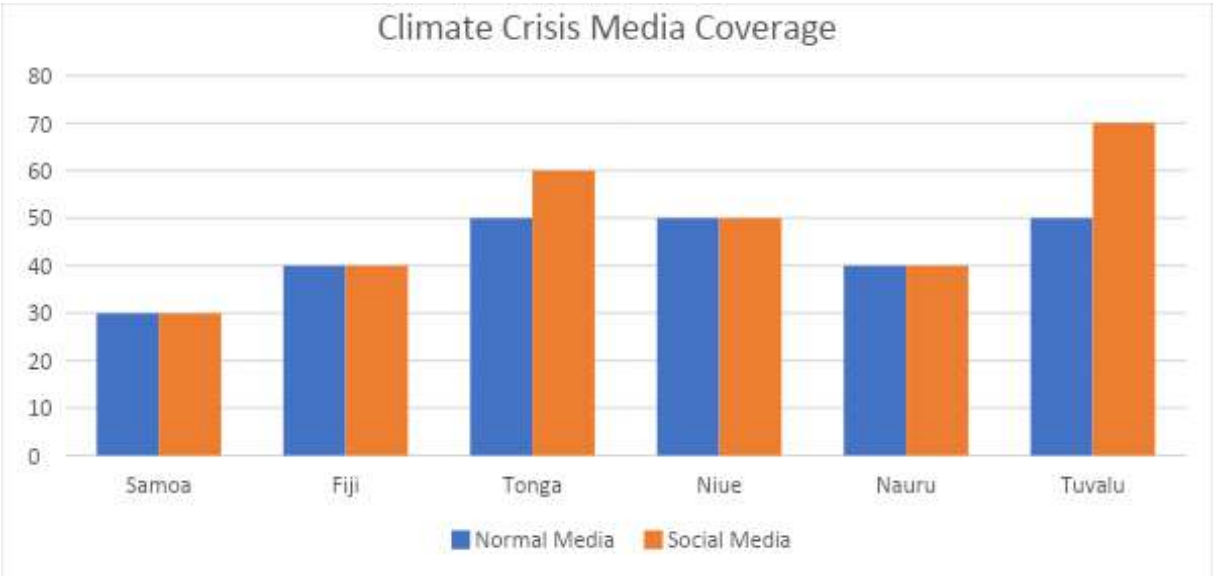


***Figure 6.1**: Climate crisis media coverage in the Pacific. (POCCA Case Studies, 2023)*

6.5.5 The power within family and community stories/ narratives

Although the media and the school system are important actors or agents in formulating peoples' perceptions of climate change, family members, friends and community stories and narratives are also influential in understanding climate crises and solutions within the climate change space. Our fore parents' narratives of how they coped and survived the climate crisis prior to modern technology are really powerful. However, as technological knowledge increases, our young people's understanding of climate change is informed by the Internet, TV, and the media without their parents or family's input.

This disconnection is concerning as our young people tend to consider traditional sources of information to become less relevant in their own lives (Klock & Fink, 2019).

However, if our Indigenous stories and experiences of survival and resilience through the climate crisis over the years are not shared, our young people are going to miss out on learning Indigenous coping mechanisms and resilience ethos of our forefathers' survival when they experienced extreme weather conditions and challenges.

One of the dilemmas with regard to climate change discourses is that the dominant voices tend to dictate and undermine the Pacific people's knowledge and experiences when they use statements and language that project the effects of the climate change crisis onto the future of Pacific nations (Herman & Kempf, 2018). Such discourses are seen to be power orientated and do not provide comfort or empower Pacific peoples within the climate change space. In response to such statements and projections unto the future of the islanders, Kiribati for example have constructed discourses of their own to respond to those challenges. These discourses are accompanied by emotions; some of these discourses find expression in the lyrics of newly composed songs or in contemporary interpretations of the poetry of old songs' (Herman & Kempf, 2018, p. 21).

Herman and Kempf (2018) argue that those types of discourses from a Kiribati perspective present a strong message that Indigenous communities are not powerless but are active participants in climate change solutions.

In regard to the connection between land, sea, and humans, Efi (2018) and Dickie (2005) insist that they all have a spiritual bond. These entities are strongly connected and are bound by a feagaiga (sacred covenant) (Efi, 2018). Dickie (2005) refers to this relationship as a perfect representation of an interdependence existence' (Dickie, 2005, p. 1).

Within this relationship, humans become the custodians of the land and sea. They are to protect and respect these entities (Efi, 2018) as all humans belong to the land (Dickie, 2005 & Efi, 2018).

The extended family is seen as a source of personal and cultural identity, spiritual wellbeing, and security (Paton & Fairbairn-Dunlop, 2010). Talking about the Samoan context, Latai-Niusulu says: 'Fa'amatai in contemporary Samoan society is now characterised by the multi-layered arrangement of extended families,

villages and churches, as well as government and external agencies, which has helped facilitate responses to climate events and climate change and strengthened local awareness and the capacity to anticipate and plan for future change' (Latai-Niusulu et al., 2020). Christianity offered many Pacific Island communities a different hope and different ways of doing and knowing. This has been demonstrated through a large number of Pacific populations currently identifying themselves with the Christian faith (Cass, 2020; Havea et al., 2019; Fache & Fair, 2020). However, the stance of the church in relation to climate change as a crisis has not been fully explored or understood as was raised by Cass (2020), who interviewed some mainstream church leaders in Fiji, Tonga and PNG asking them about the role of the church in mitigating the climate change crisis in the Pacific, as well as the role of the church in facilitating climate induced migration. In their response, all church leaders believe that the church plays a crucial role in the climate change/crisis space. For example, the church leaders believe that it is easy for the church members in their congregation to listen to them because when the church speaks, the people do pay attention' (Cass, 2020, p. 89).

This is seen as an advantage to the church because the church speaks in a way that people understand, whereas other organisations, including the government, articulate themselves in more technical and political language. The church is closer to the community and has also helped local people relocated due to climate crisis (Cass, 2020).

6.6 Policy implications

- There is an urgent need for practitioners, policy makers, researchers, and academics to ensure the decolonization and Indigenization of the climate change space and discourse to create a space for Pacific voices and narratives, to be led and told by Pacific peoples.

- There is an urgent need for academia and the media to shift existing climate change narratives to a frame that is inclusive and privileges the Pacific agency. This will contribute to a more nuanced and informed understanding of climate change in the Pacific. It is also urgent for academia and media to have critical dialogues about the environmental, social, cultural, political and economic impacts of climate change on Pacific communities, not just the physical impacts.

- Media and journalism education in tertiary institutions must explore a more targeted or specialised focus on advanced programmes including climate change reporting to tackle the evolving challenges such as misinformation, disinformation, climate catastrophe and health pandemics resulting from climate crisis. This should also prioritise reporting on the ethical responsibilities of governments and multinational companies, their contributions to green gas emissions as well as their financial contributions to PICTs to help them address and mitigate climate crisis impacts.

- During times of natural disasters, human agencies in the form of villages and community groups in the Pacific are first respondents – this can be for weeks, before external help arrives. Financial aid and necessary equipment should be provided for such agencies to enable them to conduct their rebuild and rehabilitative work, whilst help is on the way. This shows that the 'fly in and fly out' approach for development and responding to climatic events is no longer applicable to the Pacific. Recognition should be given to village and community people who provide the most support post disasters and should therefore be compensated just as 'outside helpers' are, when they conduct work in the Pacific.

- More investments and conversations are needed to better understand how a bottom-up approach that builds civil systems from the ground can yield benefits for localisation and long-term resilience in the Pacific. This enables the local people to determine their immediate needs as well as identify a development model that aligns and protects local values and what is important to them, both tangibles and intangibles.

- In the diaspora, effective and meaningful attention and value should be placed on community consultation and perspectives, which would result in community guided polices that in turn actively work for the community, rather than a 'top-down- approach that is often misinformed and ineffective. Pacific individuals and the wider community should have accessible means in which they partake in the decision-making process relating to climate change which will highlight the importance of intersectional experiences and Indigenous Pacific knowledge sharing.

- Timely resourcing, attention and funding should be provided for Pacific grassroots community groups in the diaspora to start the discussions around climate change and support them to provide Pacific led initiatives that are meaningful and sustainable. These should be well tailored to the different regions of Aotearoa, for instance, as an initiative that works in Auckland may not necessarily work in Christchurch.

- There is an urgent need for climate change civic and citizenship education to become a compulsory component in the school systems in the Pacific and the necessity for a more regional and national-driven, coordinated approach to school curriculums.

- Specific priority should be focused on including climate change content for early childhood education through storytelling and play, this will ensure a smooth transition to higher levels of the education system.

- Climate financing should not be limited to infrastructure or short-term initiatives, priority should be given to long-term sustainable development including capacity building, educational opportunities and Pacific led approaches and avenues for sharing climate change information and stories of empowerment and resilience.

6.7 Conclusion

Narratives play a significant role in how topics such as climate change are understood and engaged with. Indigenous communities, particularly in the Pacific have been portrayed as victims, communities whose fate is not in their hands (Farbotko & Lazrus, 2012). It is imperative to critique the portrayal of Pacific peoples within these climate narratives as it sheds light on the often-harmful power dynamics that exist within dominant discourse.

Dominant, global narratives about climate change, such as climate refugee discourses, can entrench vulnerable communities in inequitable power relations, redirecting their fate from their hands. The abstractions of time, space and belonging which dominant climate change narratives often assume are not universally shared. Rather, cultural values and practices of particular groups of people in particular places are important for understanding the meanings and consequences of climate change (Farbotko & Lazarus, 2012, p. 382).

This chapter has discussed the urgent need for the climate change space and narrative to be decolonised with a transition to being Indigenised. An attempt at this at all levels of society particularly the decision makers, practitioners, researchers, and academics is integral to creating a safe space for Pacific people to amplify their voices and tell their stories of adaptation and resilience. Recognising the importance of the role of the media in how Pacific communities are portrayed is important to note and has been discussed in this chapter. In addition, it has identified ways in which civic and citizenship education can help to make the climate change discourse informative, open, safe and inclusive of Pacific perceptions, rich experiences and values. Moreover, this chapter has provided an invaluable insight into Pacific communities and their crucial role as agents of change, as first respondents after a natural disaster hits. They not only provide the manpower needed for the clean-up and rebuild but also provide physical and psychological support for communities affected. These actions should be formally recognised and compensated along with donors giving priority to local communities to determine their needs and priorities with funding and approaches that are locally led and values based. This chapter concludes with policy implications that are integral to recognising the invaluable beliefs and perceptions of Pacific people relating to climate change, as well as ways to decolonise and indigenise the climate change space and discourse.



> "According to our traditional values, this really affects our lives in regards to our natural resources and as it affects our resources, it can also impact our health. It can also affect our houses, as the sea continues to rise it will affect our traditional livelihoods"
>
> Roney Joel
> Reverend at Edjit Island
> Marshall Islands
> POCCA team interview
> (POCCA research team interview, 2023)

Once, students from the distant island (pictured) could walk across the reef to reach the mainland (where the photo was taken). Now, due to rising sea levels, the path is submerged, and the journey is no longer possible. (Photo: POCCA team, 2023).

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Chapter 7

Solwara, Moana, Ocean and Local Communities – The Social, Cultural and Economic Connections

Authors

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Fishermen wade out to begin beach seining in North Tarawa, Kiribati. Shifting tidal flats, driven by changing lagoon circulation due to climate change, now force them to walk further distances to reach fishing ground (Photo: POCCA team, 2023).

Abstract

Pacific Islanders are people of the sea: it is their pathway to each other, to the rest of the world, their endless saga and their most powerful metaphor, because 'the sea is in them.' Pacific peoples, whose lands are in the world's largest ocean, have developed unique cultures and knowledge, which include an in-depth understanding of their oceanic environment. The people's customs and cosmologies, livelihood, food security, identity and connections are derived from their small islands and the extensive sea that surrounds them. Over centuries, Pacific people's ability to adapt has equipped them with the knowledge and skills needed to protect their environment, secure their livelihoods, devise resource use practices and technologies to harness resources of the sea, air and land, trade with their neighbours, and adapt to the environmental hazards of tropical island environments. This is why we should learn from and engage Pacific Island communities and empower them to adapt and build resilience to live in their island communities and assist them in making appropriate choices in response to climate change and its worsening and wide-ranging impacts. This chapter highlights the diverse and rich narratives through the lenses of researchers. It tells of the sophisticated and organised societies that existed in the Pacific Islands in the past and how the people lived in their island homes today. These rich community experiences and challenges across the Pacific Ocean, arguably the largest carbon sink in the world, and how people have adapted to the climate crisis using culture-based responses passed down over generations present useful lessons for Pacific Island communities today and in the years to come.

Glossary of key terms

ʻAmaʻama	Mullet in Hawaiʻian
Awa	Milkfish in Hawaiʻian
Bi	Traps constructed of stick or stone boulders on intertidal flats in Fijian villages where sea turtles are kept alive. In Kia Island, Fiji the bi made of stones forming tidal pools where trapped fish are kept alive until they are needed
Drua	Plank-built double hulled canoe in Fiji, which were up to eighty feet (24 metres) in length and had a mast almost as high as the vessel was long
Fanua	Placenta in Samoan
Fatupaepae	Honourable title given to an elderly woman or women who work for a common good for the community
Gonedau	Traditional fishing clans in Fiji
Ika ha	Marlin was traditionally regarded one of the sacred fish by the Atafu people in Tokelau
Inati	Social system in Tokelau within which marlin meats are equally distributed to each household
loko iʻa	Traditional fishponds built to trap the brackish water ponds formed where the freshwater and the sea met and sustained vibrant fisheries that provided centuries-old sources of protein for Hawaiians
Kaiga	Kinship groups in Tokelau
Kakadu	thick white disks from a rigid cockle *(Anadara granosa)* in the Solomon Islands
Kalia	Tongan traditional canoe built to cut through large waves
Kee	White shell *(Beguina semiorbiculata)* in the Solomon Islands
Kula	Exchange system practised in the Trobriand Islands in PNG
Kurila	Black horse mussel shells *(Atrina vexillum)* in the Solomon Islands
Kuʻula	Hawaiian wise and skilful fisherman who built the first fishpond
Mākāhā	Sluice gates that allowed juvenile fish to naturally enter the pond and fatten up on the abundant seaweed and algae supply while preventing the exit of the larger, grown fish
Lakatoi	Double hulled outrigger canoes in Santa Cruz (Vanuatu)
Laumaile	Small flowering plant in the dogbane family which is used to make garlands during palolo harvest in Samoa *(Alyxia stellata)* (Samoa)
Limu	Seaweed in Tongan

Lomani	Treasure or care for in Fijian
Moana	Ocean (Polynesia)
Moka	Fish trap made of stones set up on the intertidal flat in Fiji. Fish are enticed to swim into the trap at high tide and are tricked to stay in the trap when the tide recedes, which would be faster outside the trap
Moso'oi	Sweet smelling flower which is harvested and used for making garlands and scenting oils in the Pacific. Local name moso'oi is used in Samoa *(Cananga odorata)* (Samoa)
Mwali	White armband traded in the southern end of the Trobriand Islands in an anticlockwise direction
Namele	Cycas seemannii plant, the national tree of Vanuatu
Nuqa	Generic name for rabbitfish. A fish which appears annually in December and January in Fiji *(Siganus sp.)* (Fiji)
Palolo (Samoa) Balolo (Fiji)	Edible Polychaeta species of worms *(Palola viridis)* harvested in the Pacific. Delicacy is collected early in the morning during their short annual appearance on the last quarter of the moon in October to November
Pute	Umbilical cord in Samoan
Pulotu	Ancestral spiritual world in Tongan
Qoliqoli	Traditional fishing grounds in Fiji
Ralik	Sunset in Marshall Islands
Ratak	Sunrise in Marshall Islands
Romu	Red lipped rock oyster *(Chama pacifica)* in the Solomon Islands
Seasea	Plant with scented flowers used to make garlands in Samoa for palolo harvest *(Syzygium corynocarpum)* (Samoa)
'Sevusevu	Introductory protocol in Fiji involving the presentation of kava *(Piper methysticum)* on arrival at a place
Takiulu	Noosing wahoo *(Acanthocybium solandri)* is a highly regarded fishing method in Tokelau. The catch is lured by baitfish, such as a flying fish towed behind a canoe to pass through a prepared noose, which is then jerked to catch the wahoo by the tail. Marlin *(Xyphias gladius)*, yellow fin tuna (*Thunnus albacares)*, and sharks were also occasionally caught using this method

Tafuliae	Standard unit of shell money strands measuring about 1.5 m in length
Talagogo	Seabird species *(Sterna fuscata)* caught on the outer reefs at daytime in Tokelau using scoop-nets.
Taoga	Cultural objects (Samoa)
Tapu	Prohibited, restricted, set apart, forbidden under the directive of the chief/leader for the purpose of community conservation (Cook Islands)
Tautai	Master fisherman who directs the fishing activities in Samoa and Tokelau
Taupulega	Village Council of Elders who govern their village activities in Tokelau
Ta Nuqa	Harvesting/catching rabbitfish (nuqa in Fiji)
Te Laa	Crab claw shaped sail used by navigators in Santa Cruz (Vanuatu)
Te Tautai	Master fisherman (Tuvalu)
Tomako	Beautifully built and fast canoes of Nusa Roviana, New Georgia in Western Province of the Solomon Islands
Tunidau	Master fisherman (Fiji)
Vaka	Boat or canoe (Polynesia)
Vaka Moana	Modern ocean voyaging canoe
Vanua	Land, people and spiritual realities (Fiji)
Vegan or Soulava	Red shelled necklace traded in north end of Trobiand Islands (travelling in a clockwise direction)
Wane i Asi	'Salt-water people' in Langa Langa Lagoon in Solomon Islands
Wane i Tolo '	Bush people' who live in the interior of the island



> “Climate change adaptation is already providing positive reward for the villagers of Malawai, Gau in Fiji. Where the mangrove forests that their women had planted about two decades ago are now protecting their village by enhancing the accumulation on land building sand and sheltering the village from strong winds and bigger waves. The village is more beautiful with the green vegetative cover. Fishing around the mangroves are now much more productive than before. This type of nature based solution is cheap, doable and rewarding and must be mainstreamed”
>
> Joeli Veitayaki
> Malawai village
> Gau
> Fiji
> (POCCA research team interview, 2023)

Malawai Village, Fiji, showing the rebuilt seawall and the bridge as part of the community adaptation strategy (Photo: POCCA team, 2022).

7.1 Introduction

This chapter focuses on how Pacific Islanders lived in the past and their relations with each other and with their small islands in the world's largest ocean. The chapter also explores how Pacific people are now trying to cope with the rapidly changing environment caused by climate change and other associated factors that affect the lives in Pacific communities today. People's customs and traditions, livelihood, security, identity, and connections are related to their small islands and the extensive sea that surrounds them. Pacific Islanders have always lived in their small islands in the Pacific Ocean where they have formulated social and cultural systems to organise social and political units to sustain themselves. They observed sophisticated social and economic relations and forged nearby and long-distance arrangements to support and defend their communities. They developed sophisticated exchange and trading arrangements to sustain themselves in their small island homes.

In trying to adapt to their rapidly changing environment and climatic conditions, Pacific people must take advantage of all the time-tested knowledge, traditions and practices that have enabled their ancestors to live in their Pacific Island homes. These knowledge, traditions and practices had provided for Pacific Islanders in the past and can be used as the basis of the easiest and cheapest way to adapt to the environment and climate changes faced today.

This chapter also examines the social, cultural, and economic connections Pacific communities have with the solwara, moana or the ocean and how these interrelations, which had served the people well in the past, are used by Pacific people today to adapt to and live with the changing conditions they are faced with. Pacific Islanders need to protect their environmental resources, secure their sources of livelihoods, devise appropriate resource use and management practices and technologies to sustainably harness the resources of the sea and land, trade with their neighbours, and adapt to the environmental hazards in tropical island environments. They need to engage Pacific Island communities, empower and support them to adapt to the changes and build resilience to live in their island communities. The people must be assisted to make appropriate choices in responding to climate change and its worsening and wide-ranging impacts. These damaging impacts of climate change are now devastating Pacific Island communities that are now continually recovering from environmental catastrophes.

Pacific Islanders cosmologies, legends, genealogies, and relations reaffirm the close connections people have with the ocean. These relationships are articulated through the Pacific people's culture and practices that enabled them to live comfortably in their islands.

The people's fishing, sailing, and trading activities were tied to their shared understanding of their ocean. Pacific Islanders need to successfully respond to changing ocean conditions, which is a challenge given all the changes that are taking place. However, the people have useful lessons they can learn from their ancestors who built artificial islands to avoid malaria carrying mosquitoes, have agriculture systems and fishing methods that provide secure food supply and are undertaking community based as well as national and regional marine resources management.

The importance of the ocean to Pacific Islanders is illustrated by the way they relate to and use it. The ocean is respected and, in some spots, revered. It is an important source of food, wealth and the means through which people connect with their relations. The sea is part of the people with whom they share close ties. The people have ownership rights over the ocean because they are important to them.

Pacific Islanders are engaged in all kinds of partnerships to protect their island homes and ensure they are better prepared for climate change. Pacific people and their institutions are working together to ensure that they look after their ocean and are prepared for expected climate change impacts.

7.2 Indigenous cosmologies, culture and connections to the ocean

Pacific peoples' relationships with the ocean are inscribed in cosmologies, narratives of origins, genealogies and worldviews steeped in connections with ocean ancestors, deities and humans that transform into turtles, sharks, snakes, eels, or birds and later become totems. Marine creatures such as the stingray and eel (Maude & Maude, 1994) separated heaven and earth. Cosmological stories illustrating the interconnectedness of people, and the ocean environment of the islands are found across the Pacific Island Countries and Territories (PICTs).

In the Marshall Islands, a story of settlement of their southeastern islands from Kiribati, beginning with Mili Lijebake, the wife of the deity Wūllep, swam north from Kiribati in the form of a turtle, with her granddaughter, Limaninbit, on her back under the guidance of Wūllep, who could fly overhead as a frigate bird (Genz, 2018, p. 36).

The narratives of shape shifting and the movement between human, animal, and deity, indicate the close binding relationships between people, marine animals, and the spiritual world of the ocean.

In his 2024 David O McKay lecture entitled 'Fonua: Intersecting Cosmogony and Ecology,' Tevita Ka'ili, discussed a 'cosmogony of Tongan genealogy,' based on written accounts and oral traditions, in which the beginning of the Tongan world is formed by the ocean and Pulotu (the ancestral spiritual world) in which the two original ancestors, seaweed (limu) and ocean bottom mud mix to form a rock from which the first pairs of twins emerge. Out of these pairs of twins, emerge the principal ocean and land deities (shared by other Polynesian communities such as Hawai'i), which link Tongans to the ocean world and land, and provide for the principles of stewardship of the ocean, land, and sky. (See https://speeches.byuh.edu/devotional-tevita-kaili-2024-02-13).

Within Fijian cosmology, there is no disconnect between the realm of spirits and people, as people and spirits are/were believed to share a common world. This meant that the geographical component of Fijian cosmology consisted of places where the people and spirits were closely associated (Parke, 2014).

In Vanuatu, the tradition of complex sand drawings contains symbolic meanings and a wealth of knowledge on kinship systems, social cycles, history, cosmology, and intricate relationship between people and the environment (Park, 2013).

The shared tradition of Paikea between the island of Mauke and Aotearoa, as retold by Ma'ara Maeva in 2023 (https://www.earthlaws.org.au/event/orka-kinship-with-whales/) connects the name Paikea to whales, land crabs and the ancestor who voyaged from Mauke to Mangaia, Rarotonga and finally Aotearoa 800 years ago, following the whales. This story passed on through generations, demonstrates the close and enduring linkages between the human and non-human ocean world.

According to the former Head of State of Samoa, Tui Atua Tupua Tamasese Taisi Efi, harmony with the cosmos in Samoa involves the acknowledgement by humans of the sacred relations between humankind and the heavens (Efi, 2007). This knowledge has long been respected by Samoans, whose livelihoods depend on the cosmically based navigational knowledge. Fishing, planting, and sailing were all determined by the timely appearances of the moon and stars, which influenced the choices, months and years (Efi, 2007). He added that in the search for harmony between man and the cosmos, to tamper with the cosmic balance was to tamper with the balance of life.

The legend of Sina and Tuna is core to Samoan culture and tells of the sacrifice of an unrequited love (Efi, 2018, p. xi). Tuna, an eel, pines for Sina, a girl (Sina is also the goddess of the ocean across Polynesia). Unable to charm Sina, Tuna eventually willed himself to death with the parting request that Sina sever his head after his death and bury it in the earth. A tree would sprout from where Tuna's head is buried; the leaves would be woven into mats, baskets, and shutters; the milk would sustain Sina's thirst; and the flesh would give her food. Every time Sina dehusks the nuts, she and her descendants will see Tuna's face and be reminded of his undying love whenever they drink the juice from the nuts. This Samoan mythology illustrates the importance of human connections to nature and the values of love and sacrifice that remain essential features of Samoan agriculture and spirituality (Efi, 2007).

In the relationship between humans and the environment, according to the High Chief, the relation was one of equivalence (Efi, 2007). The harmony between humans and the environment was based on the relationship between humans, plants and animals. The burying of the umbilical cord (pute) and placenta (fanua) reminds people of the connections to the land and the importance of maintaining harmony and respect for the environment, which lives, feels pain, grows and dies as do humans (Efi, 2007).

Pacific Islanders' connections to the marine environment are illustrated in their understanding of the factors that influence their daily lives, beliefs and culture. Before a fishing trip or navigation, the weather and the stars, patterns of flowering plants and other associated phenomena (Hills et al., 2022) were carefully observed and checked. Observed signs from plants and animals also would warn people of impending storms (Kitolelei et al., 2021). Climate change is now creating more vulnerable populations by placing pressure on the fragile ecosystems and organisms that Pacific Islanders have long respected as integrally connected to their worldview, understanding of the cosmos and daily existence.

7.3 Material culture and the ocean

7.3.1 Shell money in the Solomon Islands

Shell money, according to myths, was introduced to the Langa Langa lagoon by a woman from Buin in Bougainville. She was banished and floated in a coconut shell from Buin to Guadalcanal and finally to Malaita where she landed at Tafilo, a village in Lalana near Laulasi. The shell money trade between the people of Langa Langa and Buin continued until the Bougainville crisis between 1988 and 1998. Shell-money from the Langa langa Lagoon is the traditional currency used in Malaita and the Solomon Islands (van der Ploeg et al., 2020). Different shell types are used in making shell money include a red lipped rock oyster called Romu *(Chama pacifica)*, white shell known as Kee *(Beguina semiorbiculata),* black horse mussel shells Kurila *(Atrina vexillum)* and thick white disks from a rigid cockle known as Kakadu (Anadara granosa) (Goto, 1996).

Shell money consists of small, polished shell disks, drilled, and placed on strings that are used to pay for bride price, funeral feasts and compensation because it has a cash equivalent value. It is also worn as an adornment and status symbol. The standard unit, the tafuliae, is several strands 1.5 m in length (Goto, 1996). The Langa Langa Lagoon people produce shell money, but much is inherited from parents. Shell money trade is used by the private ship owners to generate capital that is used to build their ships. In Buin, shell money is traded for cash that is used to build wooden boats. The increased shell money production has caused the depletion of shell resources in Langa Langa Lagoon (Cooper, 1971). Old traditional strings are now rare while some of the shells are now difficult to find, the result of the biannual collection by the Langa Langa people from the lagoon areas of the Lau tribe. The Lau chief now authorises shell collection in return for half of the strings produced.

Shell money is still used in Solomon Islands ceremonies, settling disputes, and as bridal and land payments. It is also beautifully crafted and carefully stitched together into ornamental costumes and headdresses that demonstrate the importance of shell money to ocean-culture-people relationships.

7.3.2 Kula exchange

Kula exchange or Kula ring is an exchange system the people of Trobiand in Papua New Guinea practice, where a permanent contractual partnership in the trade of traditional valuables is established and involves a ceremonial pattern and trade route. The system is a classic demonstration of the cultural connection of Pacific Islanders that strengthens peoples' relations to each other, the sea, their marine resources, navigation and ancestral spirits. The two traditional valuables are traded in opposite directions and are made up of two gifts, the red shelled necklace (vegan or soulava) which is traded in the north end Trobiand (travelling in a clockwise direction) and a white armband (mwali), traded in the southern end in an anticlockwise direction. Kula objects sometimes had names and histories attached and every detail of transactions is regulated by traditional rules and convention. The soulava necklace was made from the spiny oyster shells (Spondylus sp.) which had different colours, depending on where it was collected in PNG. The value of the soulava was based on the colour richness, the cut and polishing of the shell. The shell was exchanged using the left hand between people in different villages and later in other islands.

The white armband (mwali) was carved from a giant cone snail and embroidered with coloured trade beads, egg cowries and nuts. The armband is small, therefore was attached to a string to be worn and handed over, using the right hand.

Kula objects had nine grades which showed the importance of those who owned them, and the higher the grade, the more powerful the person had to be in order to sustain the spiritual elements comparable to the value of the objects. The anticipated Kula ring trade began with the yam harvest and a meticulous yam display, and the associated feasts were done to illustrate village hospitality to their visitors and partners (Leach & Leach, 1983).

Decorated ceremonial canoes, which held up to 15 men, travelled between islands to participate in the exchange. The exchange of Kula valuables reinforced status and authority since hereditary chiefs owned the most important valuables and organised ocean voyages. A limited number of men participated, and each man kept the valuables for a relatively short period before passing it to one of his partners from whom he received the opposite item in exchange. The partnerships involved mutual duties and obligations that created links between tribes and allies. The communication of material and non-material cultural elements connects distant areas and people over the ocean (Malinowski, 1920).

7.4 Pacific Islanders connections with the sea and climate change

The ocean (Solwara in Melanesia and Moana in Polynesia) dominates the world of most Pacific peoples and provide critical ecosystem services that support them. Pacific people are observant, adaptive, and resilient - traits shaped by millennia of close association and intimacy with their ocean and island homes. These traits have allowed the people to survive in their ever-changing and challenging small island environments. In the Pacific Islands, the ocean and people are closely connected as the people are owners and guardians of their ocean to which they are connected and dependent.

The sea influences the culture and lives of people in maritime communities where their ingenious and in-depth understanding of the marine environment and its resources (Amesbury, 2013) enabled them to use sophisticated knowledge, skills and practices to live comfortably in their small islands. Pacific peoples designed and travelled on ocean-voyaging canoes, created artificial islands and tools, and engaged in practices such as navigation, trade, fishing, farming, healing, and established governance systems, social relations and safety networks that illustrate their connections to the ocean. These connections that allowed Pacific peoples to live comfortably in their uncompromising island homes are discussed in the different sections of the paper.

Pacific communities have well established trading networks that illustrate their understanding of the weather, seasons, stars, ocean currents, navigation, vessel design and construction, trading needs, building, farming, fishing and connections. Pacific peoples were interacting regularly across the ocean prior to the arrival of Europeans into the Pacific.

'As Hau'ofa (2008, p.158) affirmed, the sea is our pathway to each other and to everyone else, the sea is our endless saga, the sea is our most powerful metaphor, the ocean is in us'.

Sea passages were not feared barriers but communication highways that formed the basis of connectivity and the maintenance of kinship and exchange networks across the islands. With their knowledge of seafaring, navigation, ship design, and construction, Pacific people made the ocean an integral part of their small island home (Hau'ofa, 1993).

Ocean navigation was an integral part of the Pacific Islanders life and culture. The most sophisticated techniques and knowledge of traditional navigation belonged to an exclusive circle of traditional experts. In Pacific communities such as Tahiti, Tonga, Caroline Islands, Tikopia, Kiribati, Samoa and Niue, navigation was guided by the stars. Navigators of Micronesia and Polynesia also used the wind to assist them in navigation while Tahitians, Tokelauans and Cook Islands navigators used the sun, which directed the wind (Lewis, 1972).

Navigation skills of Pacific Islanders were associated with adventure, raid and conquest, deep sea fishing, deliberate return home after drifting, and voyaging by one-way exiles.

In addition to the wind, sun and celestial bodies (e.g., the Etak system used in the Carolinian Islands; Hills et al., 2022), swell patterns and geographic features were also used. In the Vitiaz Strait between New Guinea and New Britain, Siassi navigators of PNG used a compass based on the local geographic features such as mountains and river mouths (Lewis, 1972). Place names, including on sea routes and reefs, were memorised and ritualised through chants and dances to ensure accurate voyaging (Hills et al., 2022). Local people's navigation skills were acknowledged by Western explorers when Captain James Cook in 1769 included a Tahitian navigator, Tupaia, on board the HMS Endeavour to help him explore the so-called Terra Australis Incognita.

Well-built and excellently designed Indigenous Fijian canoes were considered by some to be superior to those of other Pacific Islanders (Williams, 1982). Routledge (1985, pp.17-18) considered Fijian 'great war canoes of historical times were the constructive triumph of the age'.

The largest drua, plank-built and with an outrigger hull, were up to eighty feet in length and had a mast as high as the length of the vessel. In addition, to their crew, the canoes were capable of cramming over two hundred warriors on the deck between the hulls.

Traditional master navigators helped ensure that Pacific peoples today still use the time-tested technology and skills of their ancestors. For instance, in 1976, Mau Piailug from Satawal in the Federated States of Micronesia guided the reconstructed Polynesian voyaging canoe Hokule'a on her maiden voyage from Hawaii to Tahiti. He also trained Nainoa Thompson, the Hawaiian navigator who then trained other navigators who have been sailing since (Evans, 2021). In 2007, the Hokule'a accompanied the Alingano Maisu, a canoe gifted to Mau Piailug for his contributions in maintaining the Pacific voyaging traditions. This is now with his son, Captain Sesario Sewralur, in Palau, where it is used for teaching navigation (Speidel & Inn, 1994; UNESCO 2013, Island Times, May 2, 2023).

Pacific peoples are still sailing into the farthest reaches of the Pacific Ocean, stretching from Rapanui (Easter Island) in the east to Aotearoa (New Zealand) in the southwest and Hawaii in the north. They are now sailing in Vaka moana, (ocean going canoes) that are powered by the wind and sun. Seven of these eco-friendly Vaka moana were funded by a philanthropist through the Okeanos Foundation for the Sea that contracted the Salthouse Boatbuilders in Auckland. One of the seven canoes, the Fijian Uto ni yalo (Heart of the spirit) along with the ongoing construction of a 100-foot waqa Drua, continues to reconnect Pacific Islanders with their cultural heritage while raising awareness on new opportunities and current ocean issues. This integration of past and present technologies allows the people to address the world's energy and climate change crisis (Saumakidonuoroitoka, 2014).

The canoes of the Marshall Islands, the Waan Aelõñ in Majol initiative to build specially designed canoes, proas for fishing and double-hulled vessels for transport, across the whole archipelago of the Republic of the Marshall Islands (discussed in Chapter 16), is another example of ongoing navigational tradition addressing decarbonisation.

Indigenous knowledge and skills have over time prepared Pacific Islanders for all kinds of eventualities at sea, where many were and remain fearless (Lauer, 2023). In the Mariana Islands in prehistoric times, oceanic fishing was possible because of their Flying Proa, the large ocean-going sailing canoe that had been admired by Western navigators since the 1500s (Haddon & Hornell, 1975).

Chamorro anglers of the Mariana Islands caught open-ocean species such as mahimahi *(Coryphaena hippnurus)* and marlin while navigating the Mariana Archipelago where they had settled 3,500 years ago (Amesbury, 2013), long before distant water fishers from Asia and Europe arrived in the region. In Tokelau, ancient atoll inhabitants carefully harvested sharks, sea turtles, seabirds, and nearshore pelagic species such as parrotfish, groupers, emperors, trevally and scads to sustain their communities (Amesbury, 2013). Today, fishers in Simbo regularly fish pelagic species, paddling kilometres beyond shore in small dugout canoes using both long standing and newer techniques. Lauer (2023) relates how fishing in those waters is treacherous and 'requires a keen sensitivity and familiarity with currents, winds and swells, all of which can suddenly shift direction or strength'(p. 62).

Pacific peoples have used a range of techniques developed over time and across space. In Tokelau, fishers used noose to catch fish with rigid dorsal fins and or tails such as wahoo (Elders from Atafu Atoll. 2012). In Bwaiyowa Village in Milne Bay Province in PNG, the fishers flew kites made of reinforced dried breadfruit leaves to catch pelagic fishes such as longtom *(Tylosurus sp.)* and barracuda *(Sphyraena sp.)* that are attracted to hooks that hang from the kite and splash along as they hit the wave tops (Yamelu, 2004) Stories, such as the one of Suñama illustrate the depth of knowledge, skills and bravery. Suñama, a Chamorro fisher, was toying with the fish he had caught when a big shark took off with the billfish, dragging Suñama's canoe and sinking it. Suñama tied his line to the capsized canoe and dived after the shark, using the line. He fought off the shark, retrieved his catch and brought it to his canoe, which he righted, and then sailed home, flying a woven mat from the masthead signalling his success (Amesbury, 2013).

Fishing activities in Tokelau were aligned to moon phases as well as seasonal cycles (Ono & Addison 2009). Tokelau was occasionally struck by cyclones between November and March, while mild southeast trade winds between May and November, is when fishing activities were conducted (Gillett 1985; Hooper 1985; Matagi Tokelau, 1991). In-depth understanding of lunar and tidal cycles was critical for fishing activities (Ono & Addison, 2009) and the knowledge developed by men and women through their personal experiences influenced their roles, responsibilities and fishing locations.

Pacific people can predict tidal conditions that determine the accessibility of fishing spots and the appropriate fishing activity. Fishing at high tide was conducted in deeper water with stronger currents (Ruddle, 1996).

Reef gleaning is done by women and children on the reef margins and flats at low tide while diving and baited hook-and-line fishing were used at low and incoming tides.

Changing tides and the switching of fishing methods from gleaning to baited hooks and outrigger canoes were made in deeper water while mid-tide conditions were for gillnets, traps and cast nets used in shallow waters. Collective fishing is still conducted today with the catch shared across the whole community.

Fishers moved seaward as the water level receded and retreated landward with incoming tide. High tide fishing activities were conducted along the shore and in 'the mid-reef, reef channels, front and inner reef zones' (Ruddle, 1996, p. 142). Fishers also noted other environmental factors that influenced the fishing decisions, gear, the methods and the techniques used (See Table 7.1).

Environmental signs such as the flowering of plants, the presence of toxins in fish, weather changes and coral spawning (Craig, 2009) are used in Samoa to predict the rising of the palolo *(Palola viridis)*. Fishers dress up and wear garlands made of moso'oi *(Cananga odorata)*, laumaile *(Alyxia stellata)*, and seasea *(Syzygium corynocarpum)* before they go to look for palolo (Levine & Sauafea-Le'au, 2013). This period is associated with fertility manifested in different ways such as the sharing of palolo with family members and friends and the taking of the balolo baskets to the gardens in Cicia and Vanua Balavu in Fiji.

Malaita men of Fanalei in the Solomon Islands have traditionally hunted dolphins and continue to do so today, using the teeth to obtain bride price, for personal adornment and increasingly for cash. Master dolphin hunters can describe the size, age, life stage and sex of dolphins and classify them into the 15 types based on dolphin teeth observation (Takekawa, 2000). Similarly, in Marovo Lagoon, women who gut the fish caught by their men developed extensive knowledge of lunar and seasonal cycles through the eggs and milt on the fish species they gutted (Akimichi, 1978).

The tautai title in Tokelau was attained by master fishers that had considerable expertise in fish-catching methods, leadership skills and experience in directing and managing fishing expeditions (Gillett, 1985; Matagi Tokelau, 1991; Ono & Addison 2009). In Tuvalu, the master fisher, the te tautai (Thaman et al., 2016) directed the fishing from the start of the fishing expedition to the sharing of the catch after the fishing. In Fiji, the gonedau, the customary fishing clans, were led by the tunidau (Kitolelei et al., 2022). During highly specialised fishing trips such as turtle fishing, strict taboos and rules were adhered to by all who participated because of the belief that any rules broken could result in unsuccessful fishing or even death (Veitayaki, 1995).

Coastal fisheries encompass a range of fishing methods and gear that reflect the variety of species people used. These fisheries depend on the continued productivity of the coastal areas, which are dynamic and complex environments that contain important habitats, such as estuaries, sand and mudflats, seagrass beds, mangrove forests and coral reefs that need to be managed effectively to support the local people's ecological, economic, cultural, and social interests and wellbeing.

Country	Environmental factors	Reference
Samoa,	Lunar cycle, tidal movement, wind	Mokoroa (1981); Kramer (1994);
Cook Islands	movement (speed and direction)	Herdrich and Armstrong (2008); Solomona and Vuki (2012); Levine and Saua-fea-Le'au (2013).
Fiji	Wind, tidal movement, daily weather conditions, yam season, local environment conditions	Kunatuba (1983); Veitayaki (2002)
Tuvalu	Celestial movements, lunar cycle, tidal movement	Kennedy (1929); Turbott (1950)
New Caledonia	Current movement, flowering or fruit bearing of selected trees, lunar cycle	Teulières (1988)
Solomon Islands	Lunar cycle; wind patterns; flowering, shedding and the re-growth of leaves of certain plants, wind and tidal movement, wet and dry seasons (1992);	Akimichi (1978); Gina-Whewell Takekawa (2000); Sabetian (2002); Atu (2005)
Vanuatu	Solar cycle, lunar cycle, wind, tidal patterns, cold and warm seasons, yam planting season	Mondragón (2004); Hickey (2006)
Papua New Guinea	Eddies, currents, driftwood, lunar cycles, seasonal periods	Groves (1936); Carrier (1982); Hamilton et al. (2005)
Tonga	Tidal movement	Vaea and Straatmans (1954); Kronen (2002)
Tokelau	Lunar cycle, seasonal cycle	Ono and Addison (2009); Elders from Atafu Atoll. (2012)
Kiribati	Lunar cycle, wind, tidal movement	Tebano and Tabe (1993); Lieber (1994); Takeda and Mad (1996)

***Table 7.1**: Environmental factors that influence Indigenous fishing decisions regarding gear, fishing methods and techniques (Kitolelei et al., 2021)*

7.4.1 Climate change and the ocean: Impacts on Pacific people

Pacific peoples are faced with the destructive impacts of climate change in the form of devastating Category 5 cyclones, droughts, floods, heightened sea level, coastal erosion and ocean acidification (Salem, 2020). For instance, Vanuatu was devastated by eight category 4-5 tropical cyclones between 2015 – 2023, affecting infrastructure and security in coastal areas (CSIRO et al., 2023).

Villages in Oneisomw island (Chuuk State, FSM) are susceptible to coastal flooding during cyclones and high tide events while drought and saltwater intrusion threaten the scarce water sources including streams, water tanks, wells and aquifers that the community relies on. Anthropogenic activities such as improper waste disposal practices, animal and human waste runoff and sediment runoff from deforestation exacerbate the problem. Local communities in Oneisomw have revitalised the use of traditional wells and planted trees around the wells and along streams to stabilise the degraded banks and reduce sedimentation. While the Indigenous community leaders supported this local initiative, coordination, planning, and funding were required to ensure better management of the watersheds and protection of the ecosystem services (McLeod et al., 2019).

Exposure to extreme weather events and the low adaptive capacity in Pacific Island communities (Barnett & Campbell, 2010) make them vulnerable to the impacts of climate change. They are also among the most susceptible to natural hazards (Mimura & Nurse, 2007). In the Solomon Islands, five islands are now underwater and the other six are now experiencing severe shoreline recession (Albert et al., 2016).

Sea surface temperature increase threatens low-lying areas and atolls and communities with ocean-based economies such as maritime transport, fisheries, and tourism (Coelho, 2019). In addition, food production is susceptible to the destruction of crops during extreme events, soil erosion, salinity from flooding, poor crop yields during droughts, and the contamination of groundwater due to sea-level rise (Confalonieri et al., 2007; Barnett & Campbell, 2010).

According to researchers in Fiji, the risk of contracting diarrhoea increases (Singh et al., 2001), as the changing patterns of rainfall influence the contamination of drinking water (McMichael et al., 2006). In addition, breakdowns of water and sewage during extreme weather events further enhances the increase of diarrhoea outbreaks (Confalonieri et al., 2007; Patz et al., 2000).

Healthy and productive terrestrial and marine habitats are critical for food security in island communities as higher sea surface temperatures are causing coral bleaching and acidification, which directly and indirectly affect the fisheries and the marine ecosystem.



> "I'm Melanesian, its DNA, by blood, so everyone we feel for each other whenever there's other provinces experiencing a natural disaster or something, unfortunate things happen, we donate and share to the unfortunate families and communities"

Jonathan Neande
Community Participant
Tanatana
East Boroko
Papua New Guinea
(POCCA research team interview, 2023)

Kepara Village, where regular flooding from tides and rainfall is a constant challenge, the community unites to support one another in times of need, (Photo: POCCA team, 2023).

7.5 Pacific people's adaptation, resilience and responses to changing ocean environment

Pacific peoples have lived and thrived in their oceanic habitat for generations and have formulated adaptive arrangements to survive in their challenging island environments. At the time of European contact, Indigenous Pacific Island communities were already socially developed and highly structured to live and adapt to their island homes in the world's biggest ocean. They were trading across the Pacific Ocean and had sophisticated governance arrangements, social ties and connections, sources of livelihood, navigational and resource use skills and practices that allowed them to access marine resources over wide expanses of land and sea (Kabutaulaka, 1993).

Customary marine tenure or the usage rights and ownership of sea space by a social unit (Calamia, 2003) is a common and effective resource management arrangement across the Pacific. The practice showed the close association between society and marine resources and placed the responsibility for resource health and integrity on the primary owners and beneficiaries (Veitayaki et al., 2015). In Vanuatu, the use of the *Cycas seemannii* plant, known locally as namele (featured on the Vanuatu national flag) signified taboo or areas within a village where entry was restricted unless permitted by the high chief. Namele leaves were also indicative of the geographical boundaries of a taboo area in which the harvest of resources was temporarily forbidden after the performance of certain customary protocols and ceremonies (Hickey, 2006).

The tomako canoes of Nusa Roviana in New Georgia, in the Western Province, Solomon Islands were beautifully made and very light. Shaped like a crescent, the largest could hold about thirty people. According to Alvaro de Medeña, the Spanish navigator who visited the Solomon Islands in 1568, the rowing speed of the tomako was marvellous (Florek, 2022). Jean-François-Marie de Surville - French explorer 1769 added that the canoes were built of thin planks of timber 'tied strongly with rattan to ribs of wood, bent in the shape of the boat, and serving as its frame...the joints are stopped with a black mastic, which render these vessels impenetrable to the water' (Florek, 2002).

There were also accounts of a woman navigating between Tarawa and Abemama after a civil war in Kiribati in the 1780s. Sabetier (1939) also described a woman navigating a return trip between two islands in Kiribati in the 1930s (Huffer, 2008). Women were also food providers on long journeys, weavers of vaka sails and other valuable weavings for traditional voyages such as those conducted between the Caroline Islands and Yap (Federated States of Micronesia). In Satawal, Caroline Islands, girls trained as stand in way finders in cases where the navigators were confused (O'Connell, 2013).

In Papua New Guinea in the late 1800s, missionaries and government officials on the south coast wrote about the annual long-distance trading relations amongst the coastal communities between what is now Port Moresby and the Gulf of Papua 400 kilometers away (Skelly & David, 2017). The Hiri Trade involved large fleets of Indigenous Motu double-hulled outriggers known as lakatoi built by the men while the trade involved tens of thousands of clay pots prepared by the women of nearby villages.

7.5.1 Artificial islands of Malaita, Solomon Islands

According to Malaita legend, the first settlement on the island began around 3,000 BC at a place called Siale (van der Ploeg, 2020). The early coastal settlers, believed to be castaways from Mt. Kolovrat (Alasa'a), the highest peak on Malaita Island, had travelled to Siale to fish and then decided to stay.

The people of Langa langa Lagoon and Lau Lagoon, built over 120 artificial islands such as Sulufou, Funaafou, and Adaege (van der Ploeg, 2020; Stanley, 1998). These artificial islands were built from rocks family members gathered from the reef in their canoes and then brought to their chosen sites where they dropped the rocks into the water to create their island homes. Due to absence of freshwater ponds, mosquito infestations are not found on these islands on the reefs (van der Ploeg, 2020; Stanley, 1998).

Laulasi Island, in Langa langa Lagoon, South of Auki was settled as a result of the hostilities among the inlanders of Malaita that forced these people to the lagoon where they learned to build their islands on the sandbars using the coral they collected from the reef. People from different parts of Malaita and elsewhere followed and settled in the Langa langa Lagoon. With inter-marriages over time, the descendants moved on to settle the whole of the Langa langa Lagoon.

Many artificial island communities had returned to the mainland because they were encouraged by the missionaries who were anxious to promote a clean break with the pagan past, and inducement in the form of greater access to land for subsistence farming.

7.5.2 Lau lagoon

Lau Lagoon, on the northeast coast of Malaita Island, is more than 35 kilometers long and has about 60 artificial islands in the shallow parts of the reefs. Lau Lagoon is accessible only by sea and the people, wane i asi 'salt-water people' distinguish themselves from wane i tolo 'bush people' who live in the interior of the island.

The lagoon is home to a number of villages, the largest of which, Forau, has around 1,500 permanent residents that can increase to three times that number during important local feasts or religious holidays. Funa'afou island, located near the edge of the Makwanu Passage, has about 200 inhabitants. Living on the reef islands was healthy, as the mosquitoes were not found.

Women grow swamp taro *(Cyrtosperma merkusii)*, sweet potato, yam, and supplementary crops such as papaya, bananas, sugar cane, coconut, and green vegetables. The men fished in the lagoon and in the ocean using a number of fishing techniques that they had developed with particular reference to the habitats in the lagoon. The islanders observed a tenure system over areas of the lagoon and adjacent sea, which were designated into owned and free areas. The areas with higher resource potential were owned and inherited by patrilineal descent groups. Recognition of ownership rights allowed the Lau fisherman to manage the marine reserve and maintain an ecologically sustainable system of marine resources use.

It also allowed the Lau fisherman to fulfil the social and cultural goals of the community by ensuring a large catch to meet the needs of the Lau people and provide a surplus that allows for the economic and social exchange between the Lau fishing community and the agriculturalists of the central areas of Malaita. Dolphins, which are a food source and money, are hunted in Lau Lagoon. The practice stopped in 2010, after the villages of Fanalei, Walende, and Bitamae signed an MoU with the Earth Island Institute, a non-governmental organisation. The Agreement broke down in early 2013 and some men in Fanalei resumed hunting.

Sulufou Islanders are living with the ravages of climate change (Van der Ploeg et al., 2020) as the majority of the residents have abandoned their artificial island homes because of the threats of natural hazards (Tua, 2023).

7.6 Ocean governance and living with climate change

The plight of Pacific people living with the impacts of climate change is outlined in the book Pacific Climate Cultures: Living Climate Change in Oceania (Crook & Rudiak-Gould, eds., 2018). In the book, His Highness, Tui Atua Tupua Tamasese Tai'si Efi asserted that greed is the unhealthy preoccupation human beings have with profit, where the accumulation of material gain for individual profit is at the unreasonable expense of others. This, he argued, makes the climate change dialogue complicated because the people must understand the technicalities of atmospheric changes and rising sea levels as well as the soul-searching questions that people must address about themselves and their pursuit of wealth (Efi, 2018).

PICTs are vulnerable to the impacts of climate change and are among the most susceptible to natural disasters (Mimura & Nurse, 2007). It is projected that ocean temperature, ocean acidification and sea levels will continue to rise (IPCC, 2023), Australian Bureau of Meteorology and CSIRO, 2013), which will be catastrophic for Pacific Islanders as it is projected that up to 14% of coastal land will be lost due to a sea-level rise by 2050 (Feresi et al., 2000).

7.6.1 Community-based resources management – Lomani (Care for) Gau

Gau Island, the largest island in Lomaiviti Province in Fiji, is a biodiversity hotspot with lush mountainous landscapes, diverse seascape and coastal villages that are transitioning to modern living.

Lomani Gau is a network of people willing to be change agents in their communities. It provides regular meetings, capacity building and small-scale project funding to support community-driven initiatives that the different villagers want to work on. Proper resource use practices that allow for or support self-sufficient and resilient communities are trialled and promoted.

The Lomani Gau initiative and its forerunner, the Mositi Vanuaso project advocate for the protection and conservation of coral reefs, mangrove forests and native forests and the enhancement of the adaptive capacity of villagers and the natural ecosystems on Gau.

Training is offered and appropriate community actions are encouraged to address risks such as climate change, biodiversity loss, destructive development, waste management and altering watersheds. The 16 villages on Gau use their resource management plans to address the challenges which they determine. Sustainable farming and fishing, the rehabilitation of terrestrial and coastal ecosystems, waste management and alternative sources of income are pursued by the villagers. All the villages declared no-take zones within their customary fishing areas, which sadly were gradually abandoned after a year or longer as the villagers succumbed to the systemic poaching and illegal fishing by commercial fishers from outside their villages. The villagers also banned wildfires, planted trees to compensate for the deforestation and were advised not to farm right up to the edge of waterways to minimise soil loss, erosion and pollution (Veitayaki & Holland, 2018).

Lomani Gau is also pursuing a long-term goal to declare a forest reserve over Gau's mountainous areas that were declared reserved in 2000 by the Gau Island Council (See Figure 7.1 for map of Gau Island). The planned reserve will encompass the cloud montane forest area in the mountainous areas, the island's forests, and biodiversity (Watling & Gillison, 1995) and the habitat of the iconic Fiji Petrel *(Pseudobulweria macgillivrayi)*, which has been critically endangered (Shirihai et al., 2009; Priddel et al., 2008).

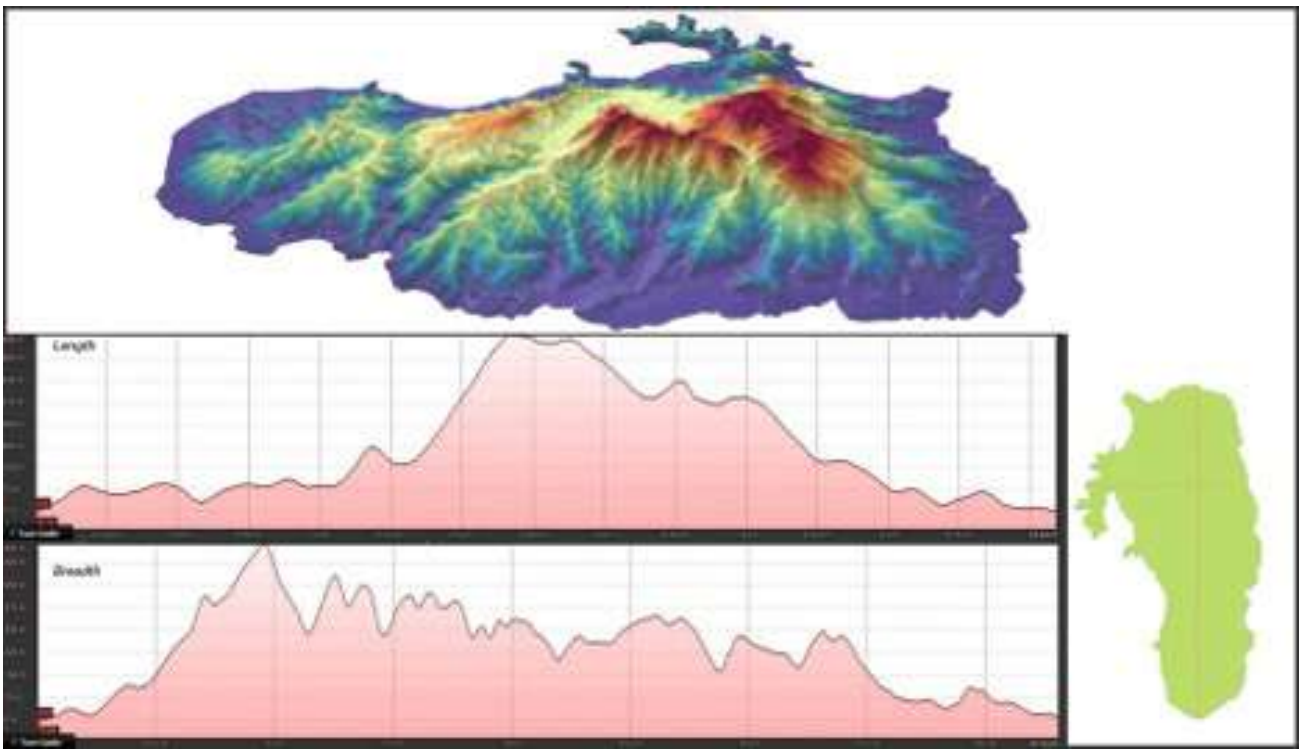


***Figure 7.1**: Cross Section of Gau Island showing the landscape that has to be used and carefully managed. Source: Presented to Joeli Veitayaki by Sione (John) Kaitu.*

7.7 Ocean resources, uses, challenges and impacts of climate change

Coastal fisheries in Pacific Islands are utilised by local communities that have ownership rights to the resources they require for subsistence and livelihoods (Ruddle, 1996). Commercial fishers and marine resource users must have valid licences or customary access rights to marine resources in specified areas. Coastal fisheries are under severe pressure from urban and commercial users who are better equipped, more efficient and consistent, which results in intense fishing that weakens community based marine resources management.

In 2014, coastal fisheries contributed an estimated US$300 million annually to the GDP of Pacific Island Countries and Territories (PICTs) (Gillett, 2016) and employed approximately 100,000s of people, with subsistence fisheries engaging 10–20 times more people than commercial fisheries (Hanich et al., 2018). Women constituted approximately 25% of small-scale fishers and accounted for 56% of the landings (Harper et al., 2013). Fisheries were the main source of protein for Pacific peoples, of whom 89% consumed fish weekly, with a range between 59% and 100% (Household Income & Expenditure Survey, HIES data from 10 PICTs, 2012–2016).

The per capita fish consumption rate for PICTs was 37 kg per person per annum, ranging between 20 kg and 110 kg (HIES data 15 PICTs, mainly 2001–06). Over-exploitation of coastal fisheries resources (Hanich et al., 2018) will result in 16 of the 22 PICTs (SPC, 2008; Bell et al., 2009) unlikely to meet their fish requirements by 2030. This is a major concern given the people's heavy reliance on fisheries for food security and livelihood, rapidly increasing populations and demands, inefficient and destructive fishing practices, and degraded fisheries resources.

At the Regional Fisheries Ministers Meeting in 2020, the PICTs Regional Fisheries Ministers agreed to the following conclusions:

a. Coastal fisheries are important for food and nutritional security, community resilience, economic growth, employment, poverty alleviation and empowerment of women.

b. Coastal fisheries are critical for the recovery from COVID-19 pandemic impacts.

c. There is a need for diversification in the economic opportunities of the fisheries sector.

d. Impacts on future generations need to be at the forefront when making long-term decisions.

e. Regional cooperation is needed to address the challenges related to COVID-19 and ongoing threats from Illegal, Unrecorded and Unregulated (IUU) fishing.

f. Data collection, analysis and validation of evidence based on economic and social impact assessments is important for informing fisheries management responses.

g. The Council of Regional Organizations of the Pacific (CROP) must be supported to implement longer-term strategies for sustainable resource management and economic recovery.

h. Aquatic biosecurity in aquaculture in the Pacific Island region must be endorsed by the Regional Framework on Aquatic Biosecurity developed by the Secretariat of the Pacific Community (SPC) and officials through the Regional Technical Meeting on Coastal Fisheries and Heads of Fisheries (HoF).

i. The decline in the status of key invertebrates and finfish species and reef ecosystems must be rectified.

j. The proposal to hold a two-day community-based fisheries session incorporated within the annual RTMCF to engage non-state actors in coastal fisheries was endorsed.

The Pacific Ocean, one of nature's greatest carbon sinks (UNESCAP, 2010) influences the climate, ocean currents and complex ecosystems that serve the globe. Changing climate and environmental conditions are expected to reduce ocean productivity, resulting in biodiversity loss. It is critical that this engine room of the earth's climate and the mainstay of Pacific Island economies be cared for, so that it continues to provide the ecological and economic services for Pacific Islanders and humanity as a whole.

The Small Islands Developing States (PICTs) Accelerated Modalities of Action (SAMOA) Pathway provided holistic views on adaptation measures that add to the long list of UN and regional agreements and strategies for sustainable development. The SAMOA Pathway encouraged national governments to work with their local partners to achieve their sustainability goals. The lack of action in the implementation of the Pathway and the attainment of the objectives is a concern because of the current state of the environment, the resources and the economy all are expected to negatively impact future generations.

Customary owners of the resources throughout the Pacific Islands should use their rights to declare resource management areas and actions. They have made the hard decisions to restrict, reduce and manage the use of their coastal resources for contemporary and future generations. Community-based initiatives such as some of the building practices and sources of agriculture and farming must be promoted by the Governments and development partners to ensure the effective conservation of the resources to benefit the communities, the resources and the environment.

The intimate relationship between the people and their natural resources illustrates the care that Pacific peoples have for each other, future generations and the environment (Govan, 2009, p. 22). Community-based resource management developed practices to restrict collecting, gleaning and fishing when it was justified. People's knowledge, education, belief, community dynamics and perceptions support the resource-management activities people take.

In ancient Tokelau, only the men fished on the outer reefs. Women and children fished in the lagoon and gleaned on the reef. People on Atafu Atoll knew more than 160 fish names and 12 mollusc names, which illustrated the knowledge people have of their fisheries (Ono & Addison, 2009).

The fish names and fishing methods showed the importance of larger pelagic fish species such as Carangidae and Scombridae, and the people's reliance on the outer-reef and offshore resources that were economically and culturally important. People have an assortment of fishing techniques including seines, hand nets, stone weirs, lines, spears, ropes, and lures used throughout the lagoon, inner reef, and outer-reef-to-offshore zones of Atafu to catch different types of coral-reef fish, sharks, sea turtles, pelagic fish (Gillett 1985; Mafutaga a Toeaina o Atafu i Matauala Porirua, 2008; Ono & Addison, 2013).

The use of different fishing areas and methods also depended on the tide. Fishing activities shifted seaward as water levels receded and changed as the tide rises. Women and children fishing activities were mostly along the shoreline, 'and to a lesser extent the mid-reef, reef channels and front and inner reef zones' at high tide (Ruddle, 1996, p. 142).

Fish behaviour in response to changing tide also influenced the use of different fishing gear in the different zones. At high tide, many pelagic species moved towards the shore from deeper water to the reef platform where they were fished for using hook and line, casting nets and diving. At ebbing tide, gillnets were set in or close to reef passages to catch the pelagic fish returning to deeper waters. At low tide, fishers followed their targeted species into deeper waters, where they fished for them using 'lines from the exposed reef margins, by diving along the reef front and channels, and by cast netting and gathering over much of the reef' (Ruddle, 1996, p. 142).

Traditional fishing lore and knowledge in Tokelau was associated with the tautai title system, which only men could attain. These 'master fishermen" had considerable expertise in fish-catching methods, leadership skills and experience in directing and managing fishing expeditions (Gillett, 1985; Hooper, 1985, p. 2010; Matagi Tokelau, 1991; Ono & Addison, 2009). Offshore fishing was more important than reef or lagoon fishing because of the restricted size of the lagoons. The people used 47 offshore fishing methods compared to 29 lagoon fishing methods and 45 reef fishing methods on Atafu (Mafutaga a Toeaina o Atafu i Matauala Porirua, 2008). Casting a hook or lure for skipjack *(Katsuwonus pelamis)* and yellowfin tuna *(Thunnus albacares)* offshore was the most important single type of traditional fishing method used on Atafu (Gillett, 1985; Hooper, 1985; Matagi Tokelau, 1991). Skipjack and yellowfin tuna fishing is a communal, family, or fishing group activity involving several boats (Hooper, 2008; 2010). Depending on the kind of fishing authorised by the Taupulega, the catch from the canoe was taken to the fatupaepae to be shared to the family and with members of the crew who were not of the kaiga (Ono & Addison, 2009).

Flying fish *(Cypselurus sp.)* were usually caught at night in waters close to the shore using scoop-nets and torch light, which replaced the coconut leaf torches that were used on Atafu (Mafutaga a Toeaina o Atafu i Matauala Porirua, 2008; Ono & Addison, 2009). Catches of up to three hundred fish per night were common (Passfield, 1998) and available throughout the year. Catches were most abundant between July and October when they were consumed in greater numbers than tuna (Passfield, 1998). Talagogo, a seabird species, (Sterna fuscata) were caught on the outer reefs during the daytime using scoop-nets (Ono & Addison, 2009).

Noosing wahoo or *(Acanthocybium solandri)* is a highly regarded traditional fishing method in Tokelau (Matagi Tokelau, 1991) and is known as takiulu (Ono & Addison, 2009). The catch is lured by baitfish, such as a flying fish towed behind a canoe to pass through a prepared noose, which is then jerked to catch the wahoo by the tail. Marlin or *(Xyphias gladius)*, yellow tuna or *(Thunnus albacares),* and sharks were also occasionally caught using this method.

Marlin was traditionally regarded as one of the sacred fish (ika ha) by the Atafu people and its meats are equally distributed to each household with the inati system (Ono & Addison, 2009).

Sea turtle (fonu) was also an important catch among all the atolls of Tokelau (Matagi Tokelau, 1991, p. 188). Although there were different methods to catch sea turtles, the most popular method was to catch a pair of mating turtles, usually as two men swim to the turtles, each seizing a turtle (Macgregor, 1937, pp. 99-100). Traditional restrictions (lafu) were observed for turtle fishing. A man with a pregnant wife was not allowed to join a fishing party since his presence with the team would keep the turtles away (Matagi Tokelau, 1991, p. 189). Turtle was sacred to the Atafu people, and its meat was equally distributed to each household by the inati system; the way sacred species such as skipjack tuna and marlin were handled (Ono & Addison, 2009). Turtle fishing was aligned to the turtle's mating period, which was between September and November on Atafu. Turtle fishing was currently officially prohibited throughout Tokelau because of its depleted and threatened state (Ono & Addison, 2009).

The lunar calendar provides valuable nutritional and practical farming information on root crops, fruits, vegetables, and medicinal plants that can be grown and the spawning aggregations times for some fishes. Indigenous Fijian (iTaukei) traditional Lunar Calendar (Table 7.2 below) as in other Pacific Island communities, is still widely used because it provides empirical time-tested wisdom and knowledge that informs and guides the peoples' agricultural and marine resource use practices. However, there is consensus now for some adaptation of timing for these traditional practices given the changing climatic conditions now faced.

iTaukei Month	Notes on Yams	In the sea	On land	Birds, shellfish, crustaceans
Vulai Sevu (February)	• Month of offering first fruits to chiefs, landowners and the church • Yams offered as firstfruits	• Rabbitfish *(Siganus sp.)* and goatfish freplaced by voro (a small fish that looks like goatfish)	• Yams harvested	
Vulai Kelikeli (March)	• Yam harvest continues	• Sea resources diminished, fish are fatty and spoils easily	• Ideal time to plant sweet potatoes • ivi *(Inocarpus fagifer)*, vutu *(Barringtonia edulis)* and uto *(Artocarpus altilis)* matures	• Dilio *(Pluvialis fulva)* congregates to migrate to Alaska and Siberia • Mangrove crabs *(Scylla serrata)*, mud lobsters *(Thalassina anomala)* and red mangrove crabs *(Parasesarma erythrodactyla)* matures and breeds

iTaukei Month	Notes on Yams	In the sea	On land	Birds, shellfish, crustaceans
Vulai Gasau (April)	• Lots of rain, heavy rain for Fiji asparagus *(Saccharum edule)* to flower • Yam harvest continues • New gardens cleared	• Bigeye scad *(Selar crumenophthalmus)* abundant • The sea resources impoverished	• Flowering of the Fiji asparagus *(Saccharum edule)* • uto *(Artocarpus altilis)* ripens • Oranges *(Citrus reticulata)* ripens and spoils	• Golden plover *(Pluvialis fulva)* begins migration • Freshwater mussels not nice to eat • Mangrove crabs, mud lobster and red mangrove crabs matures and breeds
Vulai Doi (May)	• Rainy season easing • Less mosquitoes and flies	• Sea unproductive • Baitfish including the Chub mackerel *(Rastrellinger kanagurta)*, daniva *(Herkiotsichthys quadrimaculatus)* and Fijian silverside *(Hypoartherina ovalaua)* abundant	• Heavy rain spoils Fiji asparagus before it flowers • Yam harvest continues	
Vulai Werewere (June)	• Clearing of new yam gardens begin after harvest of yams	• Silver biddy *(Gerres oyena)* and the spotted herring bountiful and caught using nets	• Early maturing yams are planted • kawai *(Dioscorea bulbifera)* matures and harvested • Fiji asparagus and thatch grass *(Erianthus maximus)* flowers	• Coconut crabs *(Birgus latro)* fatty and burrows in the sand
Vulai Cukicuki (July)	• Early maturing yams planted • Clearing, digging and work continues in new yam gardens	• Octopus *(Octopus sp.)* abundant • Rock cod *(Epinephelus microdon)* and little priest *(Thryssa encrasicholoides)* abundant • Whale sightings	• Drala *(Erythrina variegata)* and vasili *(Cordyline fruticosa)* flowers • Harvest of sweet potatoes *(Ipomoea batatas)* • Drala *(Erythrina variegata)* and vasili *(Cordyline fruticosa)* flowers • Harvest of sweet potatoes *(Ipomoea batatas)*	
Vulai se ni drala (August)	• Unpredictable weather • Continuation of work on yam gardens	• Abundance of octopus *(Octopus sp.)* • Rock cod and kawakawa *(Epinephelus sp.)* spawns • Little priest *(Thryssa encrasicholoides)* and silver biddy plentiful • Turtle mating season begins	• Yabakilevu *(Diocorea sp.)* and sweet potatoes planted for Christmas • Harvest of wild yams • Mangrove *(Rhizophora sp.)* bears fruit • Tarawau *(Dracontomelon vitiense)* and ivi bear fruit	• Freshwater mussels *(Batissa violacea)* mature

iTaukei Month	Notes on Yams	In the sea	On land	Birds, shellfish, crustaceans
Vulai se ni drala (August)	• Unpredictable weather • Continuation of work on yam gardens	• Abundance of octopus *(Octopus sp.)* • Rock cod and kawakawa *(Epinephelus sp.)* spawns • Little priest *(Thryssa encrasicholoides)* and silver biddy plentiful • Turtle mating season begins	• Yabakilevu *(Diocorea sp.)* and sweet potatoes planted for Christmas • Harvest of wild yams • Mangrove *(Rhizophora sp.)* bears fruit • Tarawau *(Dracontomelon vitiense)* and ivi bear fruit	• Freshwater mussels *(Batissa violacea)* mature
Vulai Vavakada (September)	• Yams sprout and the supporting sticks are put in place to support plants off the ground	• Rock cod *(Epinephelus sp.)* spawns	• Taro *(Colocassia esculenta)* planted around yam garden perimeter • Lesser yams *(Dioscorea bulbifera)* planted • Moli *(Citrus sp.)*, mangoes *(Mangnifera indica)* bear fruit	• Golden plover *(Pluvialis fulva)* and batikaciwa *(Limosa lapponica)* return to Fiji
Vulai Balolo Lailai (October)	• Yam gardens planted • Fish fences erected and fishing nets *(uwea)* woven		• Taro, kawai and via now planted • Breadfruit matures • Borosousou *(Physalis angulata)* and cagolaya *(Zingiber zerumbet)* sprout • Houses prepared/ reinforced for hurricane season	• Small harvest of seaworm *(Palolo viridis)* delicacy
Vulai Balolo Levu (November)	• Rain signals sunny months • Yams growing and supporting structures in place	• Spanish mackerel *(Scomberomorus commerson)* abundant	• Flowering of sinusalusalu *(Phaleria disperma)* and misimisi blossom • Breadfruit, mangoes, kavika *(Syzygium malaccense)*, dawa *(Pometia pinnata)*, vutu and pineapple *(Ananas comous)* matures and ripens	• Land crabs *(Cardisoma carnifex)* mature

iTaukei Month	Notes on Yams	In the sea	On land	Birds, shellfish, crustaceans
Vulai Nuqa Lailai	• Yam gardens thrive • Fast maturing yams such as vurai ready for harvest	• Spawning of rabbitfish *(Siganus sp.)* • Sharks give birth • Giant trevally *(Caranx ignobilis)* spawns	• Vurai *(Dioscorea sp.)* planted • Breadfruit, mangoes, kavika, dawa and pineapples mature	• Lairo vula *(Cardisoma carnifex)* spawning • Gogo *(Anous minutus)* lays eggs, which are consumed by people • Cockles abundant *(Anadara antiquata)* and trochus *(Rochia nilotica)* plentiful
Vulai Nuqa Levu	• Yams are dying and supporting structures collapse • People avoid walking in yam gardens during rain because yams can be spoilt	• Rabbitfish *(Siganus sp.)* abundant • Shark pups grow bigger and eyes no longer blind • Fish poisoning common	• uto and vudi *(Musa sapientum)* mature • Dawa and wi *(Spondias dulcis)* ripen • Ivi *(Inocarpus fagifer)* mature	• Land crabs *(lairo)* migrate to the ocean to spawn • Shellfish such as kuku *(Modiolus sp.)*, kolakola *(Spondylus sp.)* and kaikoso *(Anadara antiquata)* mature

***Table 7.2**: Features of the iTaukei Lunar Calendar that is used in Fiji to guide agriculture, fishing to regulate resources harvest. Adapted from Williams (1858, Tabacakacaka i Taukei Na Vula Vaka Viti (2018)*

The sustainable use of marine resources in the future is a concern because most of the science-based management methods undertaken so far have been unsuccessful. Contemporary scientific methods have not fared better, as shown by the collapse of important fisheries such as the turtles, rock cod and beche-de-mer. The empirical knowledge that took centuries to accumulate is being discarded as people adopt destructive contemporary methods.

Traditional marine management practices in rural communities are still used as alternatives to contemporary methods, which are centrally controlled by designated government agencies. These practices allow the effective control of people, which is what fisheries management is about (Hviding, 1994). Change, however, is rapidly occurring. While a sizable part of the population is residing in rural areas in most of the countries of the region, the advent of new technology and equipment is altering the state of equilibrium that had allowed the Indigenous communities to survive on these islands (Hviding, 1994; UN, 2009; IPCC, 2023).

Customary marine tenure system is incompatible with commercialization of threatened marine life. Extractive commercial activities threaten the sustainability of local marine resources and the wellbeing of coastal communities. In the same way, illegal, unrecorded and unregulated activities threaten the sustainability of natural resources such as coral reefs, sand, gravel and key biodiversity areas such as mangroves and seagrass beds.

Alternative resource use options by local communities should be focused on sustainable use of their resources through local participation and decision-making.

7.8 Adaptation for ocean, strategies for climate change

Some PICTs have formulated their sustainable development pathway to allow their people to adapt to the challenges they are faced with. Current and future development activities are addressing the security of Pacific Island communities. Pacific Island leaders endorsed the Pacific Islands Regional Ocean Policy (PIROP) and presented it to the World Summit on Sustainable Development in 2002. PIROP encouraged the development of national ocean policies that outlined the regional, national and local community's commitments to safeguarding a 'healthy ocean that sustains the livelihood and aspirations of Pacific Island communities' (Mandel & Barnes, 2018), while providing a principled approach to responsible ocean governance in the region. This was within the ambit of the 2014 SAMOA Pathway, the PICTs development blueprint for local, national and regional sustainable development.

Vanuatu was one of the first PICTs to formulate a national ocean policy through its National Ocean Policy: Our Ocean, Our Culture, Our People, which identifies the cultural values of the ocean as one of its three pillars. In its principles it also states that the policy is to respect the culture and traditional ownership of land and sea, and support and reinforce traditional marine resource management systems, cultural values and traditional knowledge (Ocean Committee, 2016, pp.16).

Fiji's National Ocean Policy (NOP) highlights the importance of people and knowledge. For instance, Goal 4 emphasises the promotion of a people-centred approach to ocean management by sharing benefits in an equitable and inclusive manner that respects the rights, traditions and culture of communities while Goal 6 stresses the integration of traditional knowledge, heritage, and cultural practices with scientific knowledge, to provide a holistic platform that can meet the contemporary challenges of the ocean (Fiji Ministry of Economy, 2021).

In addition, Fiji's Green Growth Framework outlines the nation's sustainable economic development aspirations on land and in the sea, with emphasis on social and environmental wellbeing (Ministry of Strategic Planning, National Development and Statistics, 2014). The instrument outlined a process to ensure that development is sustainable, that the environment is maintained, and that space is provided for all stakeholders who are engaged in sustainable development activities to collaborate (Ministry of Strategic Planning, National Development and Statistics, 2014). Fiji is also committed to sustainably manage 100% of its EEZ and designate 30% of its EEZ area as Marine Protected Areas by 2030.

As shown in the case studies, in PICTs, coastal fisheries offer food and nutritional security, community resilience, economic growth, employment, poverty alleviation and empowerment of local communities. Coastal fisheries consist of subsistence, artisanal and small-scale commercial fisheries, aquaculture and mariculture. These important aspects of fisheries are not well understood and often invisible despite their economic importance, contribution to local livelihoods, and the dire need for their effective management.

Coastal fisheries are the home of unique marine biodiversity and the basis for varied commercial activities but are vulnerable to intensive resource use that inflict negative impacts on the land, coast and the open sea. The multiple species and stakeholders in coastal fisheries make sustainable resource management complicated.

Sustaining coral reefs, seagrass beds, mangrove forests, wetlands and freshwater bodies that support the fisheries resources must be mainstreamed. The health and productivity of these habitats depend on how well the multidimensional threats of natural hazards, environmental degradation, overfishing, climate change, economic globalisation, international organised crime, demographic changes, deficiencies in state capacity, poor governance, breakdown in social cohesion, law and order problems and the global pandemic are addressed (Lawson, 2003; Barnett & Campbell, 2010; Barnett & Waters, 2016).

The implementation of strategic objectives for sustainable fisheries included in the PICTs sustainable development plans and poverty reduction strategies are critical to the maintenance of healthy and productive fisheries resources. In many cases, short-lived fisheries development initiatives illustrated the problems Pacific Island nations faced and highlighted the need to implement appropriate, localised, and science-based development plans and strategies. The declaration of Locally Managed Marine Areas and community based marine resources management throughout the Pacific Islands was popular amongst communities given the customary responsibilities people have for maintaining their coastal fisheries.

Local communities in the PICTs must l ook for local solutions to having more effective community-based marine-resources management. While the customary arrangements had worked well in the past, people's knowledge, education, belief, perceptions and community dynamics have changed. Community-based resource management should be revamped to address the changing social, cultural and economic situations. Pacific peoples know the importance of having healthy and productive fisheries resources and have shown their commitments to manage their resources. Their governments and development partners must allow them to effectively implement their resource-management activities.

Pacific peoples live on small islands and have access to land and marine resources. The knowledge and independence of these communities, which enabled their sustainability for generations, should be acknowledged and used by governments to be better prepared for climate adaptation. This approach is more effective, relevant and reliable than dependence on costly systems imposed by external donors from Global North countries. Traditional knowledge of settlements, food sources, agricultural systems, medicine, social relations and resource management that have provided relief in times of need in the past and allowed people to overcome the effects of climate change and sea level rise (Veitayaki, 2002) must be adapted and used rather than discarded for some new but unproven modern alternatives.

The high dependence on diesel-powered generators in PICTs has consequences such as the astronomical costs and worsened carbon emission. These undermine the drive to use renewable energy sources and sustainable transport to reduce the costs of government service while supporting the needs of households in rural villages.

The use of sustainable transport and renewable energy promises much needed economic opportunities to rural communities in the future and this is where a lot of focus should be.

Global concern over emissions has provided the financial impetus for investment in renewable energy alternatives for electricity generation. Similar mechanisms and processes should be used to offer financing packages to upgrade Pacific shipping with more efficient and appropriate vessels. The continued use of fossil fuel powered vessels introduced newer assets that are more efficient and can lead to overall fuel dependency reduction. Such mechanisms can promote the introduction of renewable energy and the reduction of fuel dependency and emissions. Investment in research and development to prove the commercial viability of regionally appropriate renewable energy vessels is an essential and easily justifiable action.

7.9 Partnerships to respond to the changing ocean environment

7.9.1 Partnerships for sustainable ocean-based tourism in Fiji

Fiji is using her international leadership position to foster her pursuit of sustainable blue and green growth. The country Chaired COP23, led the 2017 Ocean Conference and endorsed the 2017 International Year of Sustainable Tourism for Development. Fiji is one of the 17 member nations of the High-Level Panel on the Sustainable Ocean Economy that is advocating for sustainable ocean economy through scientifically grounded voluntary commitments Fiji has an Environment Management Act (EMA) of 2005, the Green Growth Framework (2015), the Agriculture Sector Policy Agenda, a National Climate Change Policy and a National Ocean Policy (Republic of Fiji, 2021). Some hotels have taken the initiative to implement some of their sustainability policies in line with the national and regional blue growth philosophy. Below are some examples of these.

7.9.2 Marine Conservation Agreements (MCA) areas

Exciting and innovative tourism based marine resources management initiatives are undertaken in the Narera Marine Reserve, the Vatu-i-Ra Conservation Park, Lavaki Beach House on Beqa Island, the Boteira Resort on Naviti Island in the Yasawa Group, the Barefoot Manta Island Resort, the Waivunia Marine Park and the Sema Shark Reef Marine Reserve (Mangubhai et al., 2020). The initiatives in these resorts were established under a variety of Marine Conservation Agreements (MCAs). The partners agreed to maintain the ecosystem services by protecting chosen sites from incompatible activities or ensuring that the natural resources in these areas are sustainably managed (Mangubhai et al., 2020). MCAs exist under contractual Agreements consisting of a voluntary transaction and the exchange of a well-defined ecosystem service to attain conservation target(s).



> “Our families understand our land and ocean, and our land and ocean understand us, and it is like we have a common language. Our common language was ‘care’; we care for one another”

Community Participant
Cook Islands
(POCCA research team interview, 2023)

A destroyed seawall due to constant occurrences of storm surges in Raratonga, Cook Islands (Photo: POCCA team, 2023).

They require the participation of the parties, of which one holds rights over the natural resource in question; an arrangement where the service user compensates the service provider through agreed upon incentives. The Agreement is maintained as long as the provider continues to supply the ecosystem service (Mangubhai et al., 2020).

The Shangri La Yanuca Island has been operating a socially, ecologically and financially rewarding waste management, marine education and ocean resource management campaign. The hotel is using the Resilient Based Management (RBM) approach where people's knowledge and understanding of current and future drivers of ecosystem functions are applied to choose, implement and adapt 'management action that sustains ecosystems and human well-being' (Reef Resilience Network, 2022).

The Shangri La Yanuca Island, Fiji also operates Fiji's only Marine Education Centre that promotes understanding of ecosystems and corals, the reasons why they should be better managed and what people can do to help. Children and their parents, moved by what they have learned, invest in the future by planting mangroves in the designated areas or building a fish house made from rubble and broken coral pieces collected from the beach that they implant in the designated parts of the reef areas around the hotel. Hundreds of fish houses on the reef each have GPS coordinates that guests can use to check on their fish house using Google Earth until they return.

7.10 Sustaining the ocean amidst the climate crisis

People and governments in the PICTs must acknowledge and take advantage of the Indigenous systems that can be used to adapt to climate change and contribute to sustainable development. These knowledge, practices and systems illustrate the relevance and effectiveness of the Indigenous knowledge systems, technology and conservation that were part of these systems. Practices such as resource ownership systems, social connections, networks and periodic prohibitions are currently used and adapted because they have allowed Pacific peoples to live in their island environments using the knowledge they learned from their elders, culture, traditions and their daily experiences (Kitolelei et al., 2021). Examples of these are discussed below.

Ku'ula, the Hawaiian wise and skillful fisherman who built the first fishpond or loko i'a to trap the brackish water ponds formed where the freshwater and the sea met and sustained vibrant fisheries that provided centuries-old sources of protein that are being revived today. The sluice gates or mākāhā allowed the juvenile fish to naturally enter the pond and fatten up on the abundant seaweed and algae supply while preventing the exit of the larger, grown fish. Annual fish production of around 486,000 pounds of mullet ('ama'ama) and 194,000 pounds of milkfish (awa) remains a significant contribution to food security in Hawai'i (McDaniel, 2022).

The kiaʻi loko or caretaker of the fishpond, lived at the pond, was responsible for monitoring and protecting the stocks from poachers, and harvested the fish at the konohiki's request. The person had to be a skillful stonemason, master fisher, expert on tidal flows and oceanography, knowledgeable about the watersheds and be well informed about the nutrients in the streams and how these feed the growth of macro- and micro-algae in the fishponds. The person also had to demonstrate a deep connection to the ʻāina (land), to moana (ocean), and to their community.

The Kuaʻāina Ulu ʻAuamo (KUA) organisation collaborates with grassroots networks of community groups and supports the Hui Mālama Loko iʻa (Hui) - a network of Hawaiian fishpond practitioners and organisations. It assists Hui members with communication and education projects, hosts training and workshops on different issues related to fishponds and organises an annual meeting that brings practitioners together to share ideas and knowledge (McDaniel, 2022).

Loko iʻa restoration varied from very active to informal. Some fishponds had developed formal partnerships with landowners and were physically rebuilding the fishpond. Others were engaging the surrounding communities to generate an interest in the cultural resource they had not known was in their neighbourhood. Alegado argued that 'Fishponds represent the perpetuity of our culture, a way to connect with the traditions of our ancestors, but also a way to feed people—it's a key piece of Hawaiian food sovereignty' (McDaniel, 2022).

Under the Micronesian Challenge project, the Micronesian countries are kept to protect their marine resources and solicit much needed funds and technological assistance from international partners. To make it sustainable, assistance is needed to support local initiatives and promote the implementation of appropriate action at all levels of governance such as Palau's commitment in 2020 to protect 30% of her coral reefs and 20% of her forest resources to contribute to the global coral reef conservation targets.

The Blue Prosperity Fiji (BPF) project in Fiji is a partnership between the Fiji Government and the Waitt Institute to support the implementation of the Fiji National Ocean Policy's vision to provide 'a healthy ocean that sustains the livelihoods and aspirations of current and future generations of Fiji' and the mission 'to secure and sustainably manage all of Fiji's ocean and marine resources.' BPF promotes the maintenance of a healthy ocean that sustains thriving communities, and a prosperous economy in Fiji. It emphasises community consultations, scientific research, and use of traditional knowledge and practices to sustainably manage 100% of Fiji's marine space and designate 30% of that area as fully protected areas that supports ocean industries and fisheries management.

The U.S.-based non-profit organisation supports sustainable ocean management by providing technical expertise, capacity building, tools, and funding to help Fiji meet its SDG commitments. Under its Blue Prosperity Coalition in the Pacific, it supports similar partnerships in Samoa, Vanuatu, Tonga, and the Federated States of Micronesia in the Pacific and the Azores, Barbuda, Bermuda, Curacao and the Maldives in the Atlantic and Indian Oceans. BPF creates and implements sustainable ocean plans that benefit communities, the economy, and the environment. It facilitates policymaking and capacity building to support the effective implementation and long-term success of Fiji's sustainable ocean plans.

BPF learns from existing ocean management initiatives, is science-based, consultative and collaborative in gathering inputs from government agencies, civil society, NGOs, community groups, ocean experts and the the Blue Prosperity Coalition members that promote private sector involvement.

The Blue Prosperity Coalition espouses that people simultaneously protect their environment and their economy and that sustainable ocean management must be in harmony with economic growth and innovation, fisheries management, and ocean protection so that people, nature, and the economy can all co-exist and thrive.

BPF Team members consist of a Country Manager, a Strategic Adviser, a Communication Officer and four Coordinators. Most of the Team members are placed in the Government Ministries where they are working with their government counterparts. The Country Manager is based at the Office of the Prime Minister while the Communications Officer is based at the Ministry of Information. The Environment Coordinator is in the Ministry of Environment and Climate Change, the Fisheries Coordinator is with the Ministry of Fisheries and Forests, the Blue Economy Coordinator is with the Ministry of Finance and the Ocean Use Survey Coordinator is based at the University of the South Pacific. This arrangement enhances the integration of BPF into the Government where BPF facilitates, supports and assists in all the areas relating to its work. The integration of science and Indigenous knowledge is part of the approach BPF uses in conducting its activities.

Furthermore, Pacific Island nations have created shark sanctuaries in the Cook Islands, Federated States of Micronesia (FSM), French Polynesia, Kiribati, Marshall Islands, New Caledonia, Palau, and Samoa. These sanctuaries cover more than 17.1 million square kilometres (6.6 million square miles) that add to the world's first regional shark sanctuary that was declared by the Micronesian countries in 2016.

7.11 Policies for climate resilient communities

Indigenous peoples in the PICTs own and manage a sizable proportion of the region's biodiversity. Although much of the Pacific's biodiversity is located on Indigenous people's ancestral lands and in their Moana/Solwara, Indigenous people's contribution to conservation, sustainability and resilience have yet to be fully recognised and supported. This situation should be corrected because fundamental changes are taking place in the islands and ocean that demand attention from all custodians. Indigenous people's sources of livelihood should be developed and sustainably managed. This responsibility is becoming more challenging to undertake given the complexity of contemporary ocean uses. Indigenous peoples of the Pacific should be empowered and supported to use their holistic perspectives and time-tested sustainable practices to carry out resource management activities to conserve their coastal environments, ocean and their offshore territories and natural resources that constitute the people's distinct cultural identity and spiritual practices (Dutra et al., 2021).

Conservation and Indigenous organisations should collaborate and sustainably use their biodiversity to protect nature from unsustainable resource exploitation and the damage caused by the climate crisis. Full recognition of Indigenous land and resource rights, leadership and effective participation are key to involving Pacific peoples in the conservation of their natural resources.

PICTs should support the CBD's Post-2020 Global Biodiversity Framework, the UNFCCC Paris Agreement and the IUCN's Nature 2030 Agenda (2018). They should promote the adoption and implementation of rights-based approaches and safeguards that ensure the recognition, respect and enforcement of Indigenous rights related to land, territories, waters and collective resources, while strengthening equitable and collaborative governance systems that ensure respect for Indigenous people's rights, cultures, knowledge and livelihoods. Recognition and respect for rights to the sustainable management and use of the numerous species on which Pacific Islanders rely should be a regional priority. The way forward for the Pacific region is to create Pacific-centric policies, which are focused on people's adaptation and resilience.

People need to fully acknowledge and recognise the value of the time-tested holistic knowledge systems that Indigenous people have used to survive in the Pacific for millennia. Climate change and environmental disasters remind us that we are all part of the same sinking ship. Our leaders and communities must adapt and refine past strategies and integrate Indigenous knowledge with science to guide the formulation of policies and approaches that address the climate change challenge in the Pacific Islands in ways that engage and involve the people (Hamilton et al., 2005; Hamilton & Walter, 1999). Social sectors must effectively participate in policy planning and implementation for a Blue Economy. Policies that engage minorities and the disadvantaged groups tend to gain wider support and are more effective in the long term. Many coastal fisheries are being used to their maximum capacity or are overexploited, so necessary improvements to their management must address historical and current inequities to avoid impacting vulnerable communities.

Having adequate resources and scientific knowledge will not automatically lead to sustainable development, and improved well-being for the people. It is critical to provide the enabling conditions to support their application. Ocean development and management must directly follow from the needs and goals of the people who are connected to the ocean.

7.12 Conclusion

Pacific peoples have lived in the Pacific Ocean the longest. They have forged their connections to their ocean dominated environment and the other people with whom they live. The people have adapted to the environmental conditions that have changed over time.

Understanding the cosmology, the customs and traditions and the changes that are taking place are important, and so are people's customary and historical relationships with the sea, the influence of the sea on Pacific communities, and the impacts of climate change on the sea and on Pacific Islanders. The way the Pacific peoples adapt to the changes to the ocean as well as the governance arrangements and systems used to facilitate these responses are critical to note.

Some of the strategies Pacific peoples have used for generations to adapt to the climate change crisis in the islands and safeguard the ocean and its resources have been highlighted in a number of case studies in the chapter. Some of the proposals suggested as way forward emanate from both case studies and research over the years.

Pacific peoples are well aware of the challenges they face today. They have time-tested social and cultural system to help them adapt and cope with their responsibilities in living with climate change. The people have adapted to some of the contemporary challenges and need the support to better organise themselves to address the crisis they face. We have to engage them, build their capacity and support them with technical and financial resources to live secure and prosperous lives in the world's largest ocean.



> ‘We used to have cultural boundaries, but these boundaries have since been broken down due to various influences inside the society. Cultural values were misused in a variety of ways. Young people should return to older people to obtain as much traditional knowledge on how their forefathers used to adjust to changes in climate change as possible, as this is the greatest way for dealing with the effects of climate change’
>
> Adron Grace
> Fanafo Community
> Santo
> Vanuatu
> 2023
> (POCCA research team interview, 2023)

Villagers in Santo, Vanuatu, peeling cassava, considered by many in the Pacific to be a resilient crop which can withstand the impacts climate change (Photo: POCCA team, 2023).

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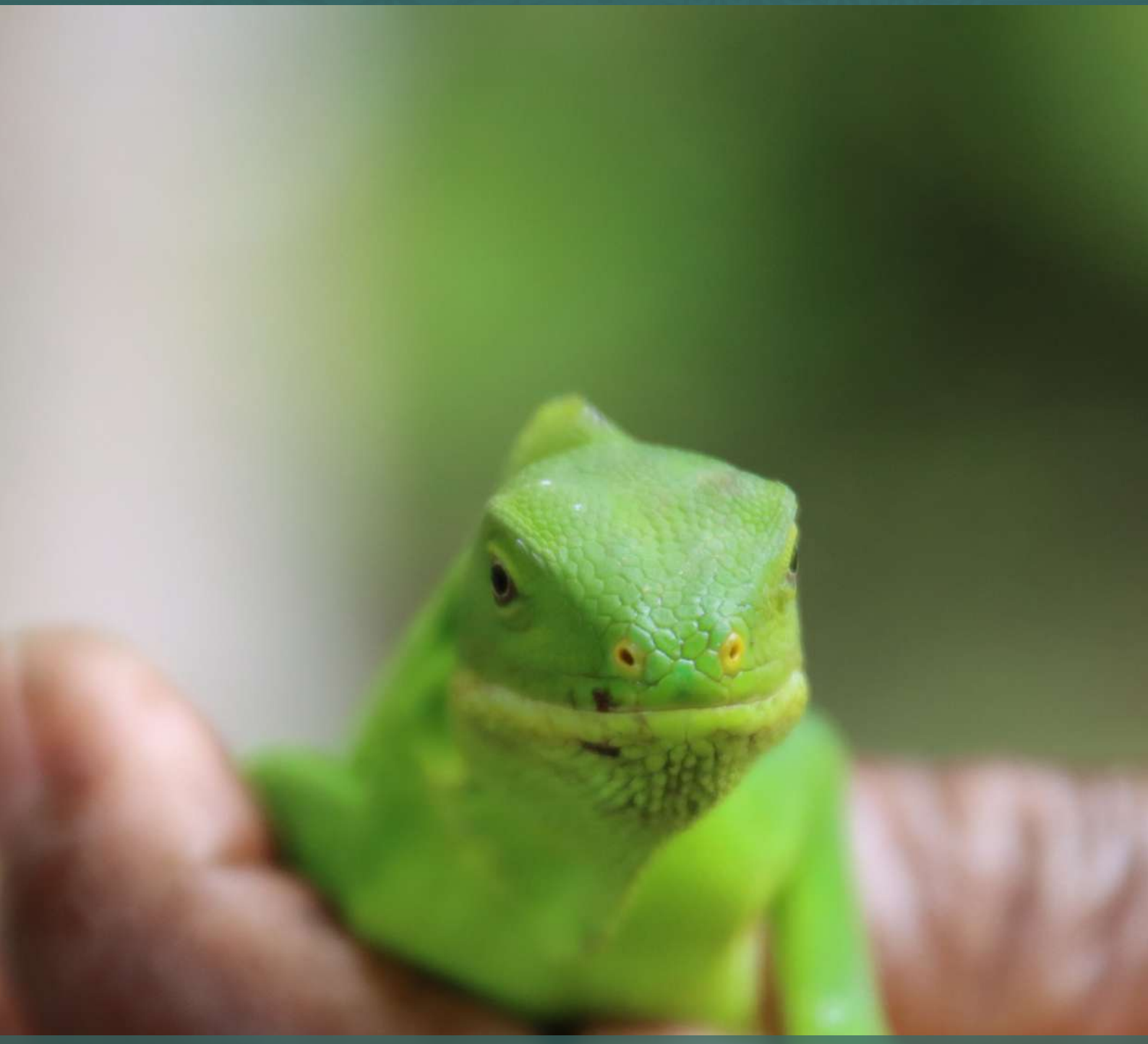
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Chapter 8

Safeguarding Biodiversity through Indigenous and Local Knowledge for Climate Change Resilience

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Tthe Gau iguana *(Brachylophus gau),* whose habitat is being threatened by climate change. The Gau community in Fiji has initiated a programme to protect this rare species (Photo: POCCA team, 2022).

Abstract

This chapter highlights the fundamental importance of biodiversity to the health and spiritual well-being of the Pacific region and people, and to the health of our planet, especially in the context of climate change. The Pacific is internationally recognised for its vast ocean and exceptional biodiversity which for centuries has sustained life, provided food, medicine, and resources for highly diverse cultural and traditional practices. Addressing and mitigating the impacts of climate change on biodiversity in the Pacific region requires a holistic perspective from terrestrial to freshwater and marine environments, including impacts on areas of both high (hotspot) and low (cool spot) biodiversity in unison with the unique human communities they sustain. The importance of local cultures, practices and Indigenous knowledge in maintaining and building responses to climate impacts, such as the role of 'nature-based' approaches, are discussed. We explore how the interconnected processes of climate change and biodiversity loss threaten balanced social-ecological outcomes on our islands in the Pacific and showcase how climate change responses that are embedded in nature and culture can be led by local communities in partnership with local and national governments. Key policy recommendations and research gaps are also identified, including the need for strengthened connection to the private sector, ecosystem services valuations that clearly reflect the economic value of habitat and biodiversity and a just transition to sustainable economic development via engagement with local communities, business, and industry. Only by working together, fully utilising existing information and understanding each other's perspectives can we reduce ecosystem disruption, achieve integrated biodiversity conservation and foster sustainable climate change resilience.

Glossary of key terms

Biodiversity	A foundational concept for cultural survival and sustainable living, clearly articulated in the Pacific via the concepts of ethnobiodiversity, biospirituality and agrobiodiversity
Conservation	Protection and preservation of biodiversity
Cool spots	Locations with less biodiversity, but where biodiversity is critically important to the livelihoods, culture and social well-being of local people.
Ecological services	Benefits, such as food, shelter, trade and resilience to climate change impacts that are derived from nature
Ethnobiodiversity	'(K)nowledge, uses, beliefs, resource-use systems, conservation practices, taxonomies and language that a given society or community, including the modern scientific community, has for its islands, ecosystems, species, taxa and genetic diversity' (Thaman, 2007a)
Hotspots	Locations with exceptional concentrations of endemic species
Indigenous and Local Knowledge (ILK)	Knowledge, innovations and practices of Indigenous and local communities around the world. Developed from experience gained through time and adapted to the local culture and environment, encompassing knowledge, experience and values possessed by Indigenous societies and passed on from generation to generation through cultural practice and evolution
Nature-based Solutions (NbS)	Climate change responses that work with and enhance nature to help address societal challenges, including climate change. These solutions are grounded in the understanding that healthy ecosystems are crucial for human well-being and resilience. (See IUCN, 2020; SPREP, 2020)

8.1 Introduction

Rapid and dramatic changes in biodiversity and climate globally are having fundamental impacts on social and ecological system function, and threatening livelihoods, wellbeing and resilience around the world (Pörtner et al., 2021). The Pacific Islands region includes internationally recognised biodiversity hotspots (i.e. regions of the world with exceptional concentrations of endemic species). However, these unique areas face a range of anthropogenic pressures ranging from climate change to habitat loss, owing to their small land to sea ratio, high levels of species endemism and vulnerability to invasive predators (Jupiter et al., 2014). Biodiversity in the PICTs is '(a) foundation for cultural survival and sustainable living' (Thaman, 2007a) and this is clearly articulated via the concepts of ethnobiodiversity, biospirituality and agrobiodiversity (Thaman, 2007b; 2008a). Several types of coastal marine and wetland ecosystems (e.g., mangroves, seagrass beds, coral reefs) provide frontline protection from the impacts of climate change such as storm surges, cyclones and sea-level rise (Spalding et al., 2014; Muna et al., 2023). These ecosystems therefore support mitigation of, and adaptation to, climate change impacts for coastal communities (Malhi et al., 2020). Biodiversity loss and climate change resilience are closely interlinked, with a wide range of interrelated drivers spanning local to planetary scales (Maxwell et al., 2016). Increasingly, there is recognition that climate change and biodiversity loss must be addressed in an integrated way with the participation of Indigenous peoples, local communities, and diverse stakeholders (Janif et al., 2016; Mcleod et al., 2019; Popovici et al., 2021). The philosophy of stewardship with a holistic approach that has long been part of the Pacific way of life is underpinning developments in the legal recognition of the rights of nature (Harden-Davies et al., 2020) and thereby reuniting humanity with science and policy.

The impacts of climate change on Pacific biodiversity and ecosystems in general are of significant concern, especially with increasingly severe tropical cyclones in recent years (Wang & Wang, 2023), with their massive destructive impact on Pacific Islands. The resulting loss of biodiversity and damage to ecosystems (terrestrial, freshwater, and marine) have caused considerable stress on Pacific communities. This chapter draws on scientific and community-based research carried out in the area of climate change and biodiversity in the Pacific Islands and examines short-term and long-term consequences for biodiversity and communities in the Pacific region. It keeps the importance of a Pacific context in the foreground, where climate change and biodiversity are framed in Indigenous terms, reflecting the interconnectedness between people and nature (see Efi, 2018) that has existed for centuries.

It is clear that resilience to current and future climate change impacts across all ecosystems in the Pacific needs to focus strongly on significantly reducing anthropogenic environmental degradation and biodiversity loss. Responses that are grounded in local and Indigenous knowledge and practice, and led by Pacific peoples, are essential.

8.2 Biodiversity is culturally and socially embedded in the Pacific

The specific dynamics of climate change and biodiversity loss are geographically varied and responses need to be tailored to local ecological and social-cultural contexts within the exceptionally diverse Pacific. The Pacific Islands region, in many respects, bears the brunt of global climate change due to particular biophysical vulnerabilities and geographic characteristics. However, Pacific cultures and communities are also holders of a wealth of knowledge and practices that are, and will be, essential in addressing climate change impacts in the region and beyond, and impacts on biodiversity in particular.

Pacific communities have co-existed with the natural environment for centuries (McMillen et al., 2014), but these relationships are now threatened by the impacts of climate change and in some cases unsustainable resource use. Climate change impacts in the region include a complex mix of slow- and fast-onset changes, while a wide range of other non-climatic and anthropogenic processes also threaten biodiversity, such as changes in land use, habitat destruction, modification of river flows, freshwater pollution, overexploitation and unsustainable use of resources and invasive species (Hills et al., 2011). Although these threats are non-climatic, they are all potentially exacerbated by climate change impacts, which highlights the interconnectedness of the climate and biodiversity crises.

Pacific peoples, their livelihoods and natural resources are highly interdependent. For example, natural resources are important 'food' and income-generating assets and essential in the treatment of certain health ailments. Women tend to gather seashells near shore for making handicrafts, and lagoon shellfish for food, while men fish more often offshore or harvest specific hardwoods and forest products from within the forests for important cultural uses such as kava bowls or canoes, or for housing materials.

The traditional treatment of certain skin infections and internal health conditions relies on many local plant resources (Weiner, 1970; Whistler, 1992). Environments, communities and resources are highly interconnected across marine, freshwater and terrestrial systems. Approaching biodiversity in the Pacific in the context of climate change therefore demands an integrated ridge-to-reef perspective with Pacific people at its heart (See Fig. 8.1).

The Pacific is as rich in cultural diversity as it is in biodiversity. This is well articulated by the term ethnobiodiversity, which is defined as 'knowledge, uses, beliefs, resource-use systems, conservation practices, taxonomies and language that a given society or community, including the modern scientific community, has for its islands, ecosystems, species, taxa and genetic diversity' (Thaman, 2016, p.6). Thaman (2004b, p. 46) stresses that:



***Figure 8.1**: Ridge-to-reef interrelated protection services delivered by ecosystems on small islands. Source: Mycoo et al., (2022: Fig.15.4)*

this final category or cultural 'level' of atoll biodiversity must be seen as central to the definition of atoll biodiversity itself because, on the atolls, people and their knowledge, traditions and spirituality are seen as inseparable from their marine, terrestrial and freshwater ecosystems (e.g., as embodied in the Melanesia pidgin concepts of kastom/custom or ples/place; the all-encompassing pan-Polynesian concept of land/fonua, fanua, fenua, henua or 'enua, depending on where you are; or the concepts of te aba, in Kiribati and bwirej in the Marshall Islands, all of which encompass land, sea and people), rather than seeing them as separate external entities.

Long before the arrival of modern science and application of formally learnt western knowledge, Indigenous Pacific communities applied their rich Indigenous and local knowledge systems to guide the sustainable use of biodiversity. The cultural value of local biodiversity is an important reason for conservation for future generations, as the ability to apply Indigenous knowledge in-place is essential to maintain cultural practices and identities. The maintenance of vital Indigenous biodiversity knowledge and practices, including the use of totems, may require new ways of passing knowledge from generation to generation (Naikatini, 2024).

For example, tattoos are a significant element of cultural identity in certain Pacific countries such as Samoa (Figure 8.2a), the Marshall Islands, Aotearoa New Zealand and the Cook Islands (Gell, 1996; Hage et al., 1996). The tattoo ink in Samoa is derived from the lama - candle nut tree, *Aleurites moluccanus* (Figure 8.2b) which is burnt to produce soot that serves as the basic ingredient of the ink. Kava drink is associated with a range of societies throughout the Pacific region and is prepared in a special hardwood bowl (tanoa) made from the Pacific teak tree *(Intsia bijuga)* or the Pacific kauri *(Agathis macrophylla)*. For ceremonial purposes in Fiji, the kava bowl cord, of woven coconut fibre, is decorated with large white marine shells (buli leka) of the species *Ovula ovum* (Figure 8.2d), which is laid out along the ground towards the guest of honour. Tapa cloth, originally made for clothing, now plays an important role in traditional ceremonies in Fiji, Samoa, Tonga and Papua New Guinea.

It (tapa) is made from the inner bark of the paper mulberry tree, *Broussonetia papyrifera,* using traditional methods passed along generations orally and through practice (Figure 8.2c). A similar traditional clothing material is the ietoga, or fine mat, woven from the dried leaves of three species of the pandanus plant/tree. In Samoa, fine mats are highly valued in cultural events such as funerals, weddings, bestowals of chiefly title and the cultural practice of ifoga. In the Solomon Islands the Ngali nut tree *Canarium indicum,* endemic to East Melanesia, is a culturally significant plant that carries many dances, stories, recipes and seasonal practices (Figure 8.2e).

Indigenous and local knowledge is therefore an essential component of understanding and maintaining biodiversity in the Pacific. However, unsustainable exploitation of natural resources and biodiversity in the region is related to a gradual loss of traditional knowledge on the significance of particular species (Brodie et al., 2013). There is much value in integrating traditional and modern or scientific knowledge to better understand current impacts of climate change and to foster and develop nature/culture-based approaches to mitigate or adapt to these impacts and nurture biological diversity.



Figure 8.2: *(a) Traditional tattoo, a significant element of cultural identity in certain Pacific countries. Image: Gese Gese; (b) The lama (candle nut tree, Aleurites moluccanus) which is burnt to produce soot as the basic ingredient of traditional tattoo ink. Image: Malotau Lafolafoga; (c)Preparing tapa cloth and transferring knowledge across generation. Image: Malotau Lafolafoga; (d) Marine shells (buli leka) of the species Ovula ovum used in Fiji for traditional and ceremonial purposes. Image credit: G. Brodie; (e) A traditional Ngali Nut harvesting gathering, where the community comes together to crack the nuts in preparation for feasting, accompanied by songs and storytelling. Image credit: Jones Otafalu.*

8.3 Climate change impacts on biodiversity, ecosystems and communities in the region

PICTs are facing multiple impacts of global climate change, including rising sea levels and connected impacts from king tides and storm surges, land loss from inundation and erosion, saltwater intrusion, rising land and sea temperatures, tropical cyclones and floods, ocean acidification, spread of invasive species and sustained droughts and water scarcity (Nurse et al., 2014). These processes produce compounding impacts on environments and communities and threaten biodiversity and ecosystems across a range of land and seascapes on the ridge-to-reef continuum (Delevaux et al., 2018). Impacts vary across island types and by environment, including between rural and urban settings. Interconnected terrestrial, freshwater, and marine ecosystems are impacted in complex ways.

Ecosystems face stress from both slow-onset pressures (e.g., warming) and increasingly frequent and severe shocks (e.g., tropical cyclones and storms). Particularly vulnerable to a range of pressures, for example, are coral reefs, mangroves, seagrass beds and coastal wetlands and montane forests. The region is even starting to witness the loss of entire low-lying islands to sea level rise (e.g., in the Solomons). With respect to ecosystem impacts, in its Sixth Assessment Report, the IPCC (2022, p. 35) noted evidence for changing ecosystem structure, species range shifts, and changes in timing (phenology) across terrestrial, freshwater and ocean ecosystems in small island environments.

The interconnected impacts of climate change on biodiversity can be understood from an integrative 'ridge-to-reef' perspective, which explicitly recognises interaction across terrestrial, aquatic and marine systems, and interwoven bio-cultural diversity. An appreciation of these connections and interdependencies is essential to understanding the pathways and mechanisms via which climate change impacts biodiversity, including complex cascading effects (Goulding et al., 2016), as well as the potential means by which biodiversity conservation and nature- and culture-based approaches can underpin adaptation to and mitigation of climate change. While this chapter examines climate change impacts on terrestrial, freshwater, and marine biodiversity, it does so in the context of a ridge-to-reef perspective, and through specific examples, with a view to maintaining a holistic and integrated understanding of emerging problems and solutions. In addition, we consider temporal dimensions to the challenge of biodiversity conservation in the face of climate change and examine current and short-term impacts as well as anticipated long-term ramifications for Pacific ecologies and peoples.

Biological diversity (or biodiversity), technically defined, encompasses the variability found among all living things, and includes species, ecosystems and genetic material (United Nations, 1992).

In the Pacific region, however, biodiversity encompasses peoples and cultures, as well as the local, traditional and Indigenous knowledge systems that they hold (Thaman, 2004b). Across the Pacific, island states are particularly prone to the impacts of climate change due to their disproportionately large ocean to land ratio within their economic zones. Impacts vary according to the nature of the islands (high volcanic or low atoll; inhabited and developed versus uninhabited and/or isolated). Some effects can be short-term (e.g., extreme weather events such as cyclones, storm surges and king tides) while others have long-term impacts (e.g., ocean acidification and increasing surface seawater temperatures (SSTs)).

Below we describe impacts across different ecosystem types, acknowledging the interconnection between terrestrial systems (including different types of forests, grasslands, farms and gardens), freshwater systems (including creeks, rivers, lakes, streams, swamps and inland wetlands) and marine systems (including intertidal flats, estuaries, bays, lagoons, mangroves, seagrass beds and coral reefs). While we distinguish these ecosystems for the purposes of presenting different impacts, we see them as embedded in highly interconnected social-ecological systems stretching from sky, land or ridge to reef and beyond.

8.3.1 Terrestrial ecosystems

Pacific Islands have a rich and unique biota produced by island biogeographic processes and modified by more recent anthropogenic influences (Jupiter et al., 2014). Terrestrial biodiversity and species endemism per unit area in Oceania are among the highest in the world, with more than half the diversity in independent, developing island nations (Keppel et al., 2012). Island ecosystems are vulnerable to habitat loss, overexploitation, invasive species and pollution.

Studies have documented the exposure of terrestrial ecosystems to climate change impacts such as changes in temperature and precipitation patterns, which weaken the natural adaptive capacity of ecosystems (e.g., Hills et al., 2011; Kumar & Tehrany, 2017; Howes et al., 2018). Any disturbances or disasters such as cyclones, flooding or erosion/landslides render forests more susceptible to invasive species or fires and also lead to loss of habitat (micro-habitats) and ecosystem services (Taylor, 2017). Climate disaster impacts can be worsened by the presence of invasive tree species, which are more vulnerable to high winds and rain and get washed down catchments, blocking rivers or damaging infrastructure (Vissichelli, 2018; Hao et al., 2022). Many of these impacts are exacerbated in places where there are rapidly expanding urban areas or intensifying development and natural resource extraction (Bambrick, 2018).

Terrestrial biodiversity on some islands is more adapted to cyclonic impacts (Burslem et al., 2000). However, with changing climate patterns and more severe and regular cyclones extending out of their traditional zones, many Pacific Islands will struggle with natural recovery.

Increase in mean surface temperatures, along with changes in precipitation patterns can affect ecosystems in several ways including by influencing rates of survival and spread of invasive species (Finch et al., 2021). Additionally, climate change can also lead to an increase in the frequency and intensity of extreme weather events such as cyclones, floods, and droughts which in turn can transport invasive alien species to new areas and decrease the resistance of habitats to invasions (IUCN, 2021).

At the regional level, high-elevation ecosystems such as montane cloud forests are projected to disappear entirely by the year 2100, with corresponding global losses of their endemic biodiversity and connected sub-ecosystems (Taylor & Kumar, 2016). Minter et al., (2018) explain the long-term and far-reaching environmental and social impacts of land clearing and unsustainable logging in high island catchments of the Pacific, and highlight how impacts and effects connect in complex ways across ecosystems and societies. Solutions via well-supported local community practices are highlighted in our KIWA-funded WISH catchment management case study in section four below. Also, given the high degree of connectivity and interaction between terrestrial, freshwater and marine systems in small islands, adverse impacts on ecosystems may result in cascading biodiversity loss across these systems (Hills et al., 2011).



Figure 8.3: Frog *Cornufer guentheri* used by communities for food, medicine and magic in parts of the Solomon Islands (Pollard et al., 2015). This species may be threatened by live export for the pet trade, collection for food and logging (IUCN Redlist of Threatened Species, 2012). Image credit: E. Pollard.



Figure 8.4: *Nakauvadra forest and freshwater ecosystems. Image credit: G. Brodie.*

Since biodiversity is intrinsically linked to traditional knowledge (Pollard et al., 2015), any loss of biodiversity also risks loss of cultural knowledge and breakdown in cultural practices. There are many examples of this hidden loss of cultural practices playing out across the Pacific. In the terrestrial forests of Malaita in the Solomon Islands, for instance, climate change impacts and other anthropogenic pressures threaten to disrupt multiple traditional uses of the biodiverse frog (see Figure 8.3) and lizard fauna, where seven distinct cultural uses were identified across the themes of human food; trade - barter and exchange; totemic species, considered taboo or sacred to a particular tribe; medicine, curing of ailments; good luck charms, for magic, or sorcery (black magic); folklore, mentioned in cultural stories or myths; and fishing, mainly as bait (Pollard et al., 2015).

Traditional approaches to conservation provide opportunities for ecosystem restoration and protection. In the Pacific, examples of effective protected area management have involved government and non-government organisations working closely with local communities and resource users on integrated approaches to biodiversity protection (Salm & Mcleod, 2008). For instance, the Nakauvadra Community-Based Reforestation Project, led by Conservation International (CI) Fiji, has been working in Ra Province since 2009. The land in Nakauvadra (see Figure 8.4) is owned by communities residing in the adjacent Yaqara Valley. CI has engaged 28 communities to replant trees on 1,135 hectares of important habitat, establishing six community-run tree nurseries, and developing 16 community model farms to improve food security and boost household income for forest resource owners and communities. Another example, highlighted in Box 1, is the conservation efforts of Fiji's rare and endemic cicada, locally known as nanai. The nanai holds cultural significance as a totem to the landowners of Emalu. Through the Fiji REDD+ programme, a large area of the pristine Emalu Forests in the Navosa Province has been protected which is also habitat for the nanai (see Chapter 17 on Climate Finance for how protected areas are used for carbon trading).

Box 1: A Fijian Totem: Nanai - Fiji's rare and endemic cicada

Locally known as nanai, the cicada Raiateana knowlesi is endemic to Fiji. It has a periodic lifecycle (in which the adults are synchronised in their emergence) of eight years. The nanai has the longest periodic lifecycle of any cicada in the southern hemisphere and is found in the Navosa and Serua Provinces. The nanai also holds cultural significance as a totem and a delicacy to a clan in the Navosa Province. Due to its significance, both ecologically and culturally, this species is currently featured on Fiji's $100 bill.

During the nymph stage, the cicada spends most of its lifetime living underground before emerging into the adult stage (aerial life form) towards the end of the eight-year period. The adult survives for 3-4 weeks, during which time it reproduces and lays eggs. The nanai then returns to a sacred pond within the Emalu forest where it eventually dies. The last periodic emergence of the nanai was in 2017. To the people of Emalu, the year of its emergence is revered, and the emergence is a symbol of wealth and prosperity (Watling 1986).

Through the Fiji Reducing Emissions from Deforestation and Forest Degradation (REDD+) Programme, 7,400 ha of Emalu Forest (predominantly pristine forest) is currently leased by the Ministry of Forests and preserved under a 50-year agreement to protect the forest, its unique biodiversity, and in particular the nanai, a totem to the landowners of the Emalu Forest Reserve.



Figure 8.5: *Emerging nanai, a cicada of cultural and ecological significance in Fiji. Image: H. Waqa-Sakiti.*

8.3.2 Freshwater ecosystems

The islands of the Pacific support a diverse range of freshwater wetlands (riverine, lacustrine, springs, brooks, freshwater swamp forests and marshes) (Ellison, 2009). The diversity of freshwater ecosystem types and biotic community structures is at near global maxima in the Indo-Pacific region, towards Papua New Guinea and declines to the east towards Rapanui (Easter Island) with increasing isolation and decreasing island size and age. The biodiversity of aquatic communities is unique in each country, with very high species endemism (national, island and area endemics) due to the habitat isolation that epitomises Pacific Island Countries (Ellison, 2009; Jupiter et al., 2014; Keppel et al., 2014; Nunn et al., 2016). Inhabitants of volcanic high islands are heavily dependent on freshwater systems and surface waters (e.g., rivers, creeks, streams) that deliver a variety of ecosystem services (regulating, provisioning, cultural and supporting services) essential for livelihood sustenance (Rashni, 2021). The biodiversity of fauna found in rivers, creeks and streams reflects the condition of the freshwater system and therefore has potential for biomonitoring. Freshwater invertebrates such as snails, dragonflies and damselflies (Figure 8.6) are particularly useful in this regard because their lifespan is relatively short, and faunal diversity may change with changing environmental conditions. In Fiji, freshwater invertebrate identification and biomonitoring is taught to children via community education activities facilitated by the local conservation NGO NatureFiji - MarequetiViti (NFMV). Beyond their role as indicators of water quality and ecological health, freshwater invertebrates play diverse roles across food webs, and directly benefit human wellbeing. For example, insect predators like damselflies can be an effective biocontrol for mosquitos (Priyadarshana & Slade, 2023), and thereby help to mitigate malaria risk, which is high in parts of the Pacific region (Pollard et al., 2020)



Figure 8.6: *A predatory freshwater damselfly, a useful invertebrate for undertaking freshwater biomonitoring of water quality. Image: copyright Stephen Moore.*

Climate-induced changes to rainfall, temperature, and sea level (Jupiter et al., 2014; Taylor & Kumar, 2016) may all have significant impacts on freshwater ecosystems. Localised climatic drivers such as frequent floods, tropical cyclones and drought lead to degradation in micro-habitat and water quality and can exacerbate waterborne pollution and drive increased water demand (Rashni, 2021; Amosa, 2021). Sea level rise threatens restricted-range and amphidromous/migratory fish species such as eels *(Anguilla mamorata)* (see Figure 8.7). Shifts in distribution may be possible for tolerant, generalist species, but range shifts will be problematic for species with small distributions such as area endemics with patchy distributions (e.g., *Fijidoma maculata*, a monotypic genus with a single species), specialised habitat requirements (large water frogs, Cornufer guppyi), slow dispersal rates, or at high elevations (Jupiter et al., 2014; Taylor & Kumar, 2016).

Some local communities rely on coastal freshwater springs (which have a specialised biodiversity) as their sole drinking water source, or to replace the reticulated system when erosion contaminates the water supply (see Figure 8.8). Sea level rise and coastal inundation have also increased the salinity of spring water and altered associated biodiversity, while in atolls such as Tuvalu, salinisation from inundation has destroyed taro patches, impacting agrobiodiversity.

While these are commonly observed and projected climate threats to insular lotic systems, the actual impacts of climate change on aquatic ecosystems, biodiversity, food web stability and species composition structure remain poorly understood due to understudied taxonomy and nomenclature, scarce data on species ecology and distributions, and lack of fine resolution elevation data for very small remote islands. Additionally, there is a lack of comprehensive assessments on synergistic interactions of climatic and non-climatic threats like micro-habitat loss and invasive species. Investigation of such aspects holds crucial importance for sustainable use and management of freshwater ecosystems to safeguard biodiversity, food security and livelihoods for Pacific communities.

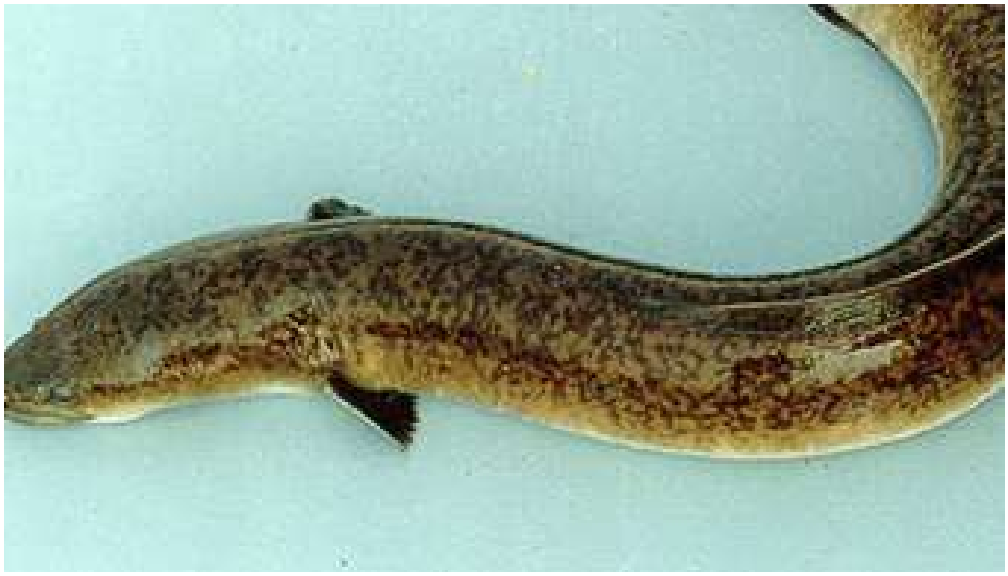


Figure 8.7: *Anguilla marmorata (Giant mottled eel). Image: copyright Kinikoto Mailautoka.*

Despite the lack of comprehensive national and regional assessments, Pacific researchers have examined links between climate change, anthropogenic activities and the physico-chemical and biological composition of insular lotic systems. A study of rivers in Samoa commonly used by local communities for recreational and domestic activities found high levels of microbial contamination attributed to storm water inflows and fecal waste from nearby livestock, including pigs and free-roaming fowl, coupled with erosion during intense rain events (Amosa et al., 2018). Deforestation and associated soil erosion led to increased sedimentation, reduced water quality and high accretion rates in the Rewa River in Fiji (Carpenter & Lawedrau, 2002). The contamination of freshwater ecosystems from such sources increases their ecological vulnerability and may subsequently reduce or alter biodiversity and ecosystem services provision.



Figure 8.8: *Coastal spring well at Yacata Island in northern Lau, Fiji. Image: copyright Vatuvara Foundation.*

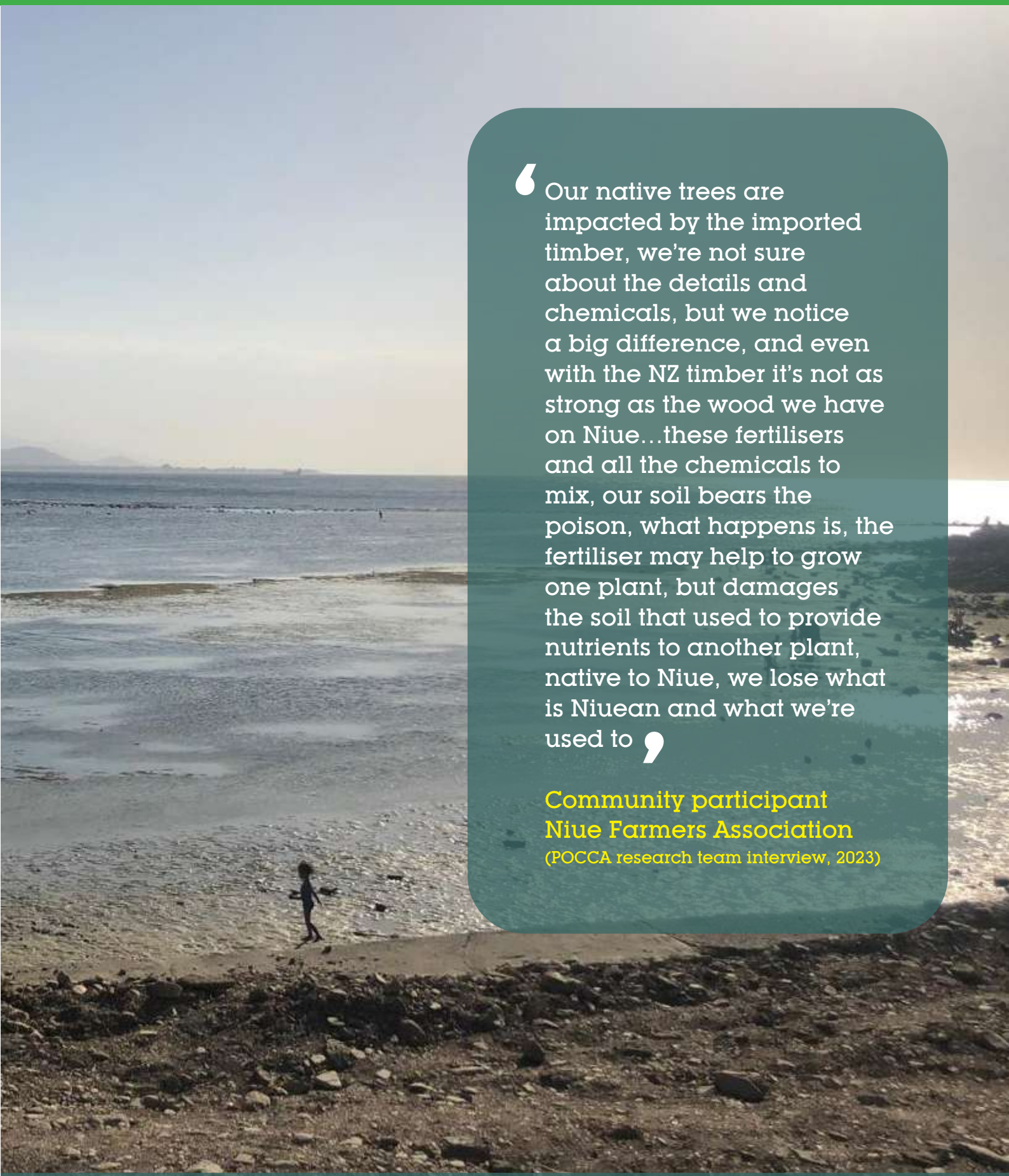
8.3.3 Coastal and marine ecosystems

Relationship between Indigenous Pacific populations and the Ocean

The nature of Pacific Islands, as low-lying reef and high volcanic islands (Nunn et al., 2016) confers specific habitats to each type, with respective attributes of marine biodiversity. The distribution of marine species is shaped by prevailing ocean currents, distance from Indo-Pacific biodiversity hotspots, and the transport of species via island 'stepping stones' (Veron, 1993; N'Yeurt & South, 1997). This means that islands in the broadly-defined eastern Pacific (e.g. French Polynesia, Rapa Nui, the Cook Islands) have a less diverse and more vulnerable fauna and flora compared to their counterparts in the western Pacific (e.g. Vanuatu, the Solomon Islands, Fiji). While this marine biodiversity gradient mostly applies to benthic species such as corals, algae, seagrass and coastal mangroves, it also applies to fishes (Drew & Amatangelo, 2017) and algae (N'Yeurt & South, 1997). Relatively high number of taxa can still occur in easterly localities where there is a wide diversity of habitats, and a pronounced latitudinal distribution of islands (N'Yeurt and Payri, 2010). Human migration patterns across the Pacific also reached westernmost islands first, with remote eastern Polynesia, Hawaii and Aotearoa/New Zealand colonised last by Indigenous populations (Friedlaender & Tucci, 2020). The increasing distance from epicentres of biodiversity from the western to the eastern Pacific islands implies that Indigenous populations in more remote Oceania were faced with fewer subsistence species and the need to conserve more carefully what was available to them. While many early Pacific seafarers took essential crops and domesticated animals – such as taro, bananas, breadfruit, pigs, and chickens – with them on long sea voyages, marine species were not usually part of this strategy (Anderson, 2003).

Dependence on marine and coastal ecosystems for subsistence

Archaeological evidence from Pacific islands , mostly from shell middens, shows that early colonising populations led a hunter-gatherer coastal lifestyle, making extensive use of the available marine biodiversity. Increase in human population may have led to local extinction of species, such as the giant clam *Hippopus hippopus* in the Fiji Islands (Seeto et al., 2011), forcing communities to move inland and take up hunting land-fauna and starting agricultural practices. For people remaining in coastal settlements, marine ecosystems continued to provide the majority of food, although more effort was needed to procure it. Communities developed specialised fishing skills, venturing further out-to-sea, and exploring alternative edible marine species such as intertidal invertebrates and seaweeds (Thomas et al., 2021). Today, in several Pacific islands there remains a strong tradition of consuming seaweed (marine algae), while on other islands the practice appears forgotten (Abbott, 1991; South, 1993; Conte & Payri, 2006; Ostraff, 2006). Indigenous Fishing Knowledge (IFK) has sustained Pacific Islanders for millennia but is now in danger of being lost due to commercialisation of fishing, urbanisation, coastal development, and climate change (Thaman et al., 2017; Kitolelei et al., 2021). Mangrove ecosystems, known for consolidating and filtering coastal sediments as well as providing a nursery area for food species, have been used for subsistence by Pacific Islanders for thousands of years (Baines, 1984). Economic and ecosystem services provided by marine habitats include tourism income, coastal protection, food security and biodiversity reserves (Allemand & Osborn, 2019; Brodie et al., 2020a; Brodie et al., 2020b).



> “Our native trees are impacted by the imported timber, we’re not sure about the details and chemicals, but we notice a big difference, and even with the NZ timber it’s not as strong as the wood we have on Niue…these fertilisers and all the chemicals to mix, our soil bears the poison, what happens is, the fertiliser may help to grow one plant, but damages the soil that used to provide nutrients to another plant, native to Niue, we lose what is Niuean and what we’re used to ”
>
> **Community participant**
> **Niue Farmers Association**
> (POCCA research team interview, 2023)

Receding shoreline in Niue (Photo: POCCA team, 2022).

The threat of Climate Change and demographic change to marine ecosystems

Sea-level rise is considered a threat to coral reefs in the Western and South-Western Pacific Ocean (Morrison & Aalbersberg, 2022). The most likely outcome is more fragile and less diverse coral reef ecosystems (De'Ath et al., 2012). Ongoing impacts of anthropogenic climate change and human population increase will pose significant challenges to Pacific Island peoples who rely heavily on marine ecosystems for their livelihoods (Fache et al., 2019). The UN Decade of Ocean Science for Sustainable Development and State of the Ocean Report (IOC-UNESCO, 2021 & 2022) called for more quantitative data and identified a key challenge as 'Changing humanity's relationship with the ocean' by 'ensuring that the multiple values and services of the ocean for human wellbeing, culture, and sustainable development are widely understood…'. Main anthropogenic threats to Pacific marine ecosystems are seawater temperature increase (von Schuckmann et al., 2023), ocean acidification (Gattuso et al., 2015), overfishing, stronger cyclones, and increasing levels of nitrate inputs to coastal areas from land runoff and wastewater from coastal settlements, industries and resorts. While some evidence points to a capacity for resilience among certain species of corals in heavily polluted urban environments (Lal et al., 2018), repeated stress on ecosystems would exceed their adaptive capacity when facing the combined impact of multiple stressors (Ellis et al., 2019; Benkwitt et al., 2020).

Rising Seawater Surface Temperatures

Rising seawater surface temperatures (SST) in the Pacific region and associated marine heatwaves, habitat disturbance and coral reef bleaching are becoming increasingly common, with records from Samoa, Fiji and Palau (Holbrook et al., 2022). While coral biodiversity associated with extensive reefs can recover from adverse events, repeated bleaching can have disastrous impacts for recovery on isolated reefs, with estimates that 70-80% of global reefs would perish by the end of this century (IPCC, 2018). For larger island countries such as Fiji, with comparatively high reef biodiversity, coral recovery from major bleaching events can be relatively swift – i.e., within 5 years (Sykes & Lovell, 2008). However, for more geographically isolated reef systems, recovery by recruitment could be past a critical level of bleaching stress, especially in light of recent catastrophic heat waves that have impacted coral reefs in the Pacific Islands (Elmer et al., 2016; Bowden-Kerby, 2023). This has major significance for the health of people of such isolated localities, who rely on their reef resources as a protein source.

Ocean acidification

Higher concentrations of atmospheric carbon dioxide due to anthropogenic activities and higher levels of dissolved CO2 lead to more acidic oceans with a lower pH (Kleypas et al., 2006; Feely et al., 2009). This causes the fragilisation of biodiverse coral reef structures, and decreased resilience of corals, coralline algae and other diverse reef organisms to disturbances (Gattuso et al., 2015; Fabricius et al., 2017). For Pacific Island communities, the most severe impacts would be on coral reefs and coastal invertebrate fisheries, such as molluscs and crabs, with fragilisation of shells, and higher mortality rates at larval stages (Johnson et al., 2016).

Acidification of fish body tissues would lead to lower blood pH and lower metabolic rates (Bell et al., 2011). A decrease in calcified phytoplankton can have effects on the trophic food web of tuna, while lower pH propagates sounds further in the ocean, and a noisier environment could make it harder for schools of tuna to locate prey (Lehodey et al., 2011). The impacts of ocean acidification on biodiversity such as seaweed, are not yet well understood, however negative overall impacts on metabolism, growth and reproduction have been reported for commercially farmed algae in the Pacific, such as Kappaphycus spp. (Largo et al., 2017). Seaweed farms could provide refugia from ocean acidification, due to their buffering effects (Xiao et al., 2021), also reported for mangroves (Camp et al., 2016) and seagrass beds (Ricart et al., 2021), which can reduce local acidity by up to 30%. This may encourage seaweed farming as an alternative income source for Pacific communities and protect seagrass ecosystems, as the combined benefits are substantial to the impacts of climate change on island biodiversity.

Impact of marine pests and invasive species on marine biodiversity

Coral reef biodiversity in the Pacific has been affected by Crown-of-Thorns starfish (COTs) pest outbreaks, with increasing seawater temperatures reported to promote larval settlement (Uthicke et al., 2015; Hue et al., 2020; 2022). Management efforts in the Pacific at the national level are impeded by a lack of quantitative distributional data. A novel approach involving local Pacific communities in citizen science is proposed by Dumas et al., (2020), where outbreaks are reported in real-time via a mobile phone and tablet to a centralised database; reports are then followed by removal campaigns organised under various in-country responses. Removal campaigns as a management strategy are seen as successful in other locations (Matthews et al., 2024). Prominent in recent years have been algal (seaweed) blooms across the Pacific and also the Caribbean Sea (Smetacek & Zingone, 2013; Fidai et al., 2020). In Fiji and Tuvalu, blooms predominantly involve the brown seaweed Sargassum polycystum (see Figure 8.9), and the red seaweed Gracilaria edulis (N'Yeurt & Iese, 2015a, 2015b; Andréfouët et al., 2017). The main drivers of these algal blooms appear to be linked to human population growth and associated coastal activities that generate large nitrate inputs into waterways through, for example raw sewage and industrial and agricultural effluents (Fujita et al., 2013; Iese & N'Yeurt, 2018; Nakamura et al., 2020). Ocean algal afforestation has been identified as a nature-based solution using excess coastal seaweeds to both mitigate rising carbon dioxide levels in the atmosphere as well as excess nitrate in seawater and generating renewable energy for small-island state communities (N'Yeurt et al., 2012; Capron et al., 2020). Over-abundant seaweeds and COTs have also been identified as a good source of organic fertiliser for Pacific subsistence crops (N'Yeurt & Iese, 2015a).



Figure 8.9: *Algal bloom of the invasive brown seaweed* Sargassum polycystum *in Funafuti Lagoon, Tuvalu displacing native biodiversity and causing environmental issues. Image credit: A.D.R. N'Yeurt*

Accumulative effect and promoting resilient marine ecosystems

Although ocean warming is seen as the main cause of coral bleaching, ocean acidification, pollution and other stressors create accumulative effect. Coral diseases for example have the potential to degrade coral reefs which are made more susceptible to diseases by their weakened state resulting from numerous cumulative threats. Resilience to current and future climate change impacts in Pacific marine ecosystems should focus strongly on reducing other anthropogenic environmental degradation (Brodie et al., 2020a).

Biodiversity reduction as an indicator of marine system health reflects not only environmental health, but in turn the health of the people who depend on it for physical and mental wellbeing. Many Pacific coastal habitats remain relatively healthy, and efforts at community and national levels seek to build resilience and address direct anthropogenic threats (Morrison & Aalbersberg, 2022).

8.4 Local responses to biodiversity and climate change – working with nature and culture

Climate change continues to threaten the survival of organisms and is expected to dramatically reduce species diversity especially if habitat conditions and the carrying capacity of ecosystems are altered by extreme climate conditions. Research into strategies for the effective conservation of biodiversity has been conducted primarily from a formal scientific perspective separate from the knowledges and practices of local communities. This top-down, less-inclusive approach risks alienating local communities from initiatives for climate resilience and the protection of biodiversity.

Studies (Adom 2016; Ancrenaz et al., 2007) have shown that an inclusive approach to the management and monitoring of ecosystems can lead to the successful preservation of beneficial species and to the sustainability of conservation efforts. Inclusiveness requires leadership by and participation of local and Indigenous communities as the key knowledge-holders in relation to their environment and biodiversity. Hence, Indigenous and Local Knowledge (ILK) is an essential resource to address increasing impacts of climate change on ecosystems in the region and can be integrated with modern science to develop and guide solutions and management decisions on biodiversity conservation and drive climate change responses (Beckford, 2018).

Indigenous people worldwide are custodians or guardians of land, sea and the natural ecosystems that in turn protect and sustain them (McMillen et al., 2014; Liggins et al., 2021). Indigenous (sometimes termed Traditional) knowledge encompasses knowledge, experience and values possessed by Indigenous societies (Ellis, 2005) and is passed on from generation to generation through cultural practice and evolution. This body of largely orally transmitted knowledge underpins traditional environmental management practices (Chunhabunyatip et al., 2022) that work in harmony with natural ecosystems in-place, in a manner akin to Ecosystem-Based Management. The Secretariat of the Convention of Biological Diversity refers to traditional knowledge as:

> knowledge, innovations, and practices of Indigenous and local communities around the world. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds (Secretariat of the Convention on Biological Diversity, 2019).

ILK typically recognises interdependence and reciprocity between humans and natural resources. Based on long-term lived experience and intergenerational observation of local conditions, ILK informs wise use and management of the environment and supports adaptation to environmental change (Mazzocchi, 2006).

More specific to biodiversity is the concept of Traditional Ecological Knowledge (TEK), which encompasses knowledge, skills and customary practices developed over hundreds of years through Indigenous people's direct interaction with the environment (Gupta, 2020). As highlighted by Kitoleilei et al., (2021) for Indigenous fishing communities in Fiji, it is critical to include ILK (or in this case IFK, Indigenous Fishing Knowledge) to preserve the status of ecologically and culturally important keystone species for the site-specific management of marine and other fisheries. Article 8 (j) of the Convention on Biological Diversity (CBD) (1992) acknowledges a link between Indigenous and local community traditions and knowledge that are relevant for the conservation and sustainable use of biological diversity. This is further strengthened by the 2022 Global Biodiversity Framework, which acknowledges the important roles and contributions of Indigenous peoples and local communities as custodians of biodiversity and partners in its conservation, restoration, and sustainable use. GBF implementation must ensure recognition of Indigenous rights, knowledge (including traditional knowledge associated with biodiversity), innovations, worldviews, and values, and ensure practices of Indigenous peoples and local communities are respected, documented, and preserved. This must occur with the free, prior, and informed consent of Indigenous people, including through their full and effective participation in decision-making in accordance with relevant national legislation and international instruments, including the United Nations Declaration on the Rights of Indigenous Peoples, and human rights law. Enabling Indigenous-led and designed conservation initiatives should foster the capacity of local communities to take ownership of and maintain long-term sustainability of such efforts. Recent efforts in this area in the Pacific region have been encouraging, for instance the CARE Principles for Indigenous Data Governance (Collective benefit, Authority to control, Responsibility, Ethics; Carroll et al., 2020), and have included the traditional ownership of genetic biodiversity (Liggins et al., 2021).

Cultural practices, knowledge and views of local communities can be powerful conservation tools and must be reflected in biodiversity policies and strategies (Adom, 2016). Also, researchers must comply with local protocols to ensure mutual understanding and expectations with local communities (Malsale et al., 2018).

One possible mechanism for enabling Pacific approaches to biodiversity protection and ecosystem restoration is in the development of nature- and culture-based approaches, which draw on TLK to work with nature and communities to adapt to and mitigate climate change impacts. The International Union for Conservation of Nature (IUCN) has defined 'Nature-based solutions' (NbS) as 'actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits' (Cohen-Shacham et al., 2016). The IUCN Global Standard for Nature-based solutions, developed in 2020, provides best practice parameters for the development of NbS, and has been contextualised to reflect environmental and cultural diversity in the Pacific via priority actions explicitly detailed in the Pacific Islands Framework for Nature Conservation and Protected Areas 2021 – 2025 (SPREP, 2021) endorsed by Pacific leaders.

Furthermore, NbS harness the capacity for biodiversity and ecosystem services to reduce vulnerability and build resilience to climate change. The focus of nature-based approaches in a Pacific context is concerned with the 'intactness' of social-ecological systems, including people and targeting multiple co-benefits – mitigating and adapting to climate change, conserving biodiversity, sustaining cultural practice, and building community resilience. Thus, nature-based strategies have potential to contribute to effective responses to climate change and impacts of biodiversity and communities in the Pacific. There is considerable scope to strengthen Nature-based approaches in the region which is why it is an explicit thematic working group area in the Pacific Island Roundtable for Nature Conservation (PIRT).

8.5 Case studies

The case studies (1-5) highlight a range of nature-based interventions focused on climate change mitigation and adaptation, disaster risk reduction and resilience to natural hazards undertaken through projects or programmes focusing on: forest conservation and restoration, riparian zone rehabilitation, catchment management (ridge-to-reef approach) and sustainable forest or fisheries management. These will further assess the benefits, effectiveness and barriers of these interventions and the sustainability of the project at the community level.

8.5.1 Case study 1: Forest and Protected Area Management

Implemented in Fiji, Samoa, Vanuatu and Niue, a five-year GEF-PAS project led by the Food and Agricultural Organisation of the United Nations (2012-2017) aimed to strengthen biodiversity conservation by mitigating forest and land degradation. Its developmental objective was to enhance the sustainable livelihoods of local communities living in and around existing or potential protected areas. The project has worked at the interface of these two objectives in the four countries with a range of activities structured within six technical components: 1) policy and legal reform; 2) extension and consolidation of the protected area network; 3) strengthening capacity for protected area and community-based conservation management; 4) developing mechanisms for sustainable protected areas financing; 5) sustainable use of biodiversity; and 6) sustainable land management in forest margins. The project was designed with the objective to assist the countries to achieve the Aichi targets of the Convention of Biodiversity, and in particular to contribute to the target to protect at least 17% of each country's terrestrial area. These actions also contribute to the more recent Global Biodiversity Framework targets agreed in 2022 which acknowledge the imperative issue of limited resource availability and capacity.



> "In my day, there were so many different native birds, we knew each bird by its colours and the specific trees they would build their nests on…,but what happened we began to notice our native birds disappear, we hardly see them, it's either the mynah bird has preyed on the native birds, or the mynahs have taken over their habitats. So much of the richness of our language originates from our observations and nature of our native birds"

Community participant
Neiafu
Samoa
(POCCA research team interview, 2023)

The Masamasa-Falelima National Park in Samoa which is home to protected native birds. Extreme weather patterns are threatening their habitat (Photo: POCCA team, 2022).

8.5.2 Case study 2: Watershed management for healthy ecosystems and people

The multi-donor Kiwa Initiative, launched in 2020, aims to strengthen the resilience of Pacific ecosystems, economies, and communities at national and regional scales by establishing a central hub for projects that promote Nature-based Solutions (NbS). NbS are defined within the initiative as 'actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively.' A programme supported within the KIWA initiative is the Watershed Interventions for Systems Health (WISH) in Fiji, which is a collaborative effort between governments, academics, and non-government organisations to address the threat to coastal and freshwater ecosystems via targeted up-stream' interventions, with local communities, to prevent, detect and respond to water-related diseases such as typhoid, dengue and leptospirosis and mitigate degradation of natural resources (Wakwella et al., 2023). The specific objective of Kiwa Initiative is to target nature-based solutions for climate change adaptation in the Pacific while mainstreaming gender equality and a human-rights-based approach. Globally, women remain poorly represented in climate negotiations (Gonda, 2019) and in leading solutions to urgent conservation challenges in climate and biodiversity loss. This bias is evidenced by a large case-study for understanding inequity for women in the conservation sector, focused on The Nature Conservancy (TNC) and including staff at offices within the Pacific (James et al., 2023).

8.5.3 Case study 3: Organic marine fertiliser community projects

As populations and demand for food are increasing in the Pacific Islands, soils are increasingly depleted as well as impacted by climate change and sea-level rise. At the same time, rising temperatures exacerbate algal blooms and the spread of marine pests such as Crown-of-Thorns starfish *(Acanthaster spp.)* and seaweeds such as *Sargassum polycystum* and *Gracilaria edulis* (N'Yeurt & Iese, 2015a). This community project, involving two local farming communities on Beqa Island, Fiji, is led by the Pacific Blue Foundation (PBF) and the University of the South Pacific's Centre for Environment and Sustainable Development (PaCE-SD). It aims to develop simple and sustainable uses for these resources as fertilisers (soil conditioners) that can be produced and utilised by coastal Pacific Island communities to reduce dependency on imported chemical (NPK) fertilisers. This work is based on research examining the use of starfish (Griffin, 2018) and seaweeds (Soreh, 2022) as organic fertilisers on a selected range of Pacific food crops. The research suggests that organic fertilisers derived from these pest species can substitute for chemical NPK fertilisers and provide essential trace elements found in seawater. Use of these locally available species would reduce the environmental impact from excess nutrients currently entering coastal areas from the use of excessive chemical fertilisers.

8.5.4 Case study 4: Palolo worm, *Eunice viridus*, as a coral reef health indicator and cultural tradition

Palolo 'spawn' (epitoke) is a seasonally harvested traditional seafood delicacy in Samoa (see Figure 8.10), and several other Pacific Island countries, and its emergence is linked to environmental factors such as the lunar cycle. It is the terminal reproductive part (eggs or sperms) of the worms that are released twice a year, making palolo 'rising' season a culturally significant time in Samoa and other Indigenous Pacific Islanders (Lee, 2022). Coral reefs, the palolo worm's habitat, are considered under threat from climate change impacts such as ocean acidification and human activities. Large numbers of worm harvesters walking on corals is also thought to add disturbance pressure in addition to potential over-harvesting. The price of palolo has increased but there is limited documentation of current harvesting practices, loss of traditional practices and fisher attitudes. Lee (2022) found evidence that local people had shifted towards western paradigms over traditional knowledge and values, and developed a preference towards buying overfishing, leading to higher demand with no increasing supply.

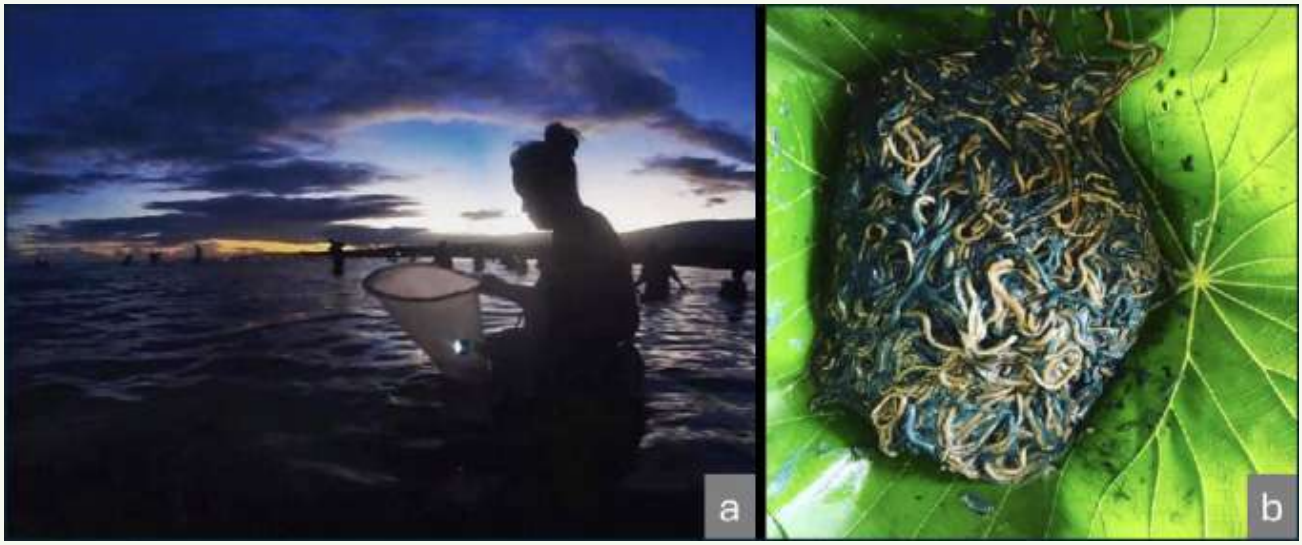


Figure 8.10: *(a) Palolo harvest, Samoa. (b) Collected palolo worms (epitoke). Image credit: F.P. So'oalo*

8.5.5 Case study 5: Atoll biodiversity cool spots: the role of women, communities & diverse marine resources in sustaining nearshore fisheries

As per Thaman (2004a & 2008b), this atoll case study reflects the concept of biodiversity 'cool spots' i.e., remote atolls may have less diversity than high islands close to large mainland 'hotspots' - particularly on land - but their biodiversity is critically important to the livelihoods, culture and social well-being of the people living there.

In many Pacific Small Island developing states marine resource use is dominated by the high economic return of tuna, however the value and importance of small scale fisheries, with direct relevance to human well-being, food and nutrition security, should not be marginalised within the 'blue economy' dialogue (Brodie et al., 2020b). Healthy, biodiverse ecosystems such as normally found within atoll lagoons, support sustainable provision of ecological and economic services such as food, shelter, trade, and resilience to climate change impacts. Additionally, in many South Pacific countries women are the major fishers of shellfish and other nearshore invertebrate fisheries (Fay-Sauni & Sauni, 2005).

Nearshore fisheries, such as te bun cockles in Kiribati lagoons for example, are considered important food sources during times of hardship and for those that cannot fish offshore. Some families may rely solely on nearshore marine resources for protein and these resources are vital for the nutritional livelihoods of low socio-economic families (Fay et al., 2007). Overfishing then becomes a major issue in urban areas and sustainability of resources declines. Human development and climate change impacts influence coastal stability and the health of nearshore lagoon habitats in Kiribati (Brodie et al., 2020b; Tabunawati, 2024). Community education via school curricula and promotion of community-based conservation, in ways meaningful to different stakeholder groups, in combination with national policies that provide solutions to urban migration is the way forward.



> "There is still time, still hope, for the people of Vunisavisavi, our community does not plan to go down without a fight. We must be resilient, plant more trees and reduce the burning and cutting of trees. This is a special place, we will do everything we can to make sure our future generation have the same benefits that we enjoyed, growing up near the ocean on royal ground"
>
> Meredani Koco
> Vunisavisavi
> Cakaudrove
> Fiji
> (POCCA research team interview, 2023)

Demonstrating the impact of saltwater inundation in Vunisavisavi Village, Fiji (Photo: POCCA team, 2022).

8.6 Policy gaps and recommendations

The majority of nations in the Pacific are long-standing signatories to the global climate, ocean and biodiversity framework conventions such as the United Nations Framework Convention on Climate Change, the United Nations Convention on the Law of the Sea and the Convention of Biological Diversity (CBD) plus targets in the Global Biodiversity Framework (GBF). The GBF is a key context shift that recognises the lack of resources and capacity to improve policy and drive conservation, and specifically provides support to developing countries to do this. Agenda 2030 and the Sustainable Development Goals include Target 14.2, which aims to sustainably manage and protect marine and coastal ecosystems. Additionally, for Small Island developing States (SIDS), the SAMOA Pathway (UN General Assembly, 2014) recognises the critical nature of 'healthy, productive and resilient oceans and coasts' via Article 53. These policy instruments all recognise the vital need for ocean and marine protection but may sometimes lack explicit recognition of the value of biodiversity and holistic approaches to environmental management needed on islands. Biodiversity policy and governance however must put Pacific peoples and cultures at the heart of efforts to conserve biodiversity and build climate resilience, and this is strongly reflected in the 2050 Strategy for the Blue Pacific Continent which provides a regionally developed overarching framework to advance the region's goals via seven key thematic areas, which include emphasis on climate change and disasters, people centered development and ocean and the natural environment (PIFS, 2022).

At a national level in Pacific SIDS, the funding and human resources available to plan, implement and successfully monitor and evaluate progress via national government agencies is limited, and in some developing countries there may be very few staff working on biodiversity related reporting. This capacity gap is acknowledged in the GBF, which seeks to provide assistance under Target 19. At a regional level this capacity gap is also partially addressed through the willingness of Pacific nations to work together via regional policy development forums led by agencies such as the Pacific Forum Secretariat (PIFS) and the Office of the Pacific Ocean Commissioner (OPOC). These arrangements facilitate regional governance and policy frameworks such as Pacific Island Regional Ocean Policy (PIROP – see Vinceet al., 2017), Framework for a Pacific Oceanscape (FPO, 2012) and continued regional dialogue via the Pacific Ocean Alliance and associated Council of Regional Organisations of the Pacific (CROP) agency forums which unite Pacific based agencies, such as Forum Fisheries Agency (FFA), Secretariat of the Pacific Regional Environment Programme (SPREP), Pacific Community (SPC), and the University of the South Pacific (USP). This regional approach results in directly relevant collaborative forums like the Pacific Islands.

Conference on Nature Conservation and Protected Areas aims to foster partnership development through the Pacific Island Roundtable for Nature Conservation (PIRT) and its thematic working groups. PIRT partnerships produce government endorsed, strategic frameworks specifically focused on nature conservation, and addressing biodiversity loss i.e.,the Pacific Islands Framework for Nature Conservation and Protected Area 2021-2025 (SPREP, 2021), which identifies the key regional priorities for action via extensive consultation.

These priorities include transformative action, conservation and ecosystem management, livelihood and heritage, broad strategic guidance and the region's response to threats.

The importance of reducing biodiversity loss is well recognised by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, 2019). The global loss of biodiversity and genetic diversity is the largest and longest known planetary function crisis boundary (Rockström et al., 2009; Steffen et al., 2015) and as argued above, this crisis is particularly pronounced in the Pacific. It is concerning therefore that climate change and ocean associated policies across the Pacific have, until recently, been poorly connected to biodiversity policies and regulations because of a lack of effective communication and integration across national management agencies. In acknowledgement of this disjuncture in recent years there has been concerted effort to mainstream biodiversity, and a recognition that biodiversity is a key foundation for environmental and community resilience to the impacts of climate change. In several PICTs such as the Solomon Islands and Fiji, we have seen the emergence of new national integrated ocean policies that sit under or alongside climate change policies in an economic framework. These emerging policies strive to create an enabling environment for increased cooperation and dialogue with environmental managers that recognises the vital need for policy and regulations that strengthen sustainable environmental practices and include human development in balance with nature. As detailed by Harden-Davies et al., (2020) the development of a new international legally binding instrument for the conservation and sustainable use of marine biodiversity beyond national jurisdiction (BBNJ agreement) was developed (and adopted in June 2023) as part of the United Nations Convention on the Law of the Sea. They argue that '(l)egal recognition of rights of nature is emerging worldwide as a fresh imperative to preserve ecological integrity, safeguard human wellbeing, broaden participation in decision-making and give a voice to nature' (Harden-Davies et al., 2020, p. 1).

Various policy frameworks also emphasise 'Nature-Based Solutions (NbS)' and promote climate adaptation solutions that work with nature and thereby also deliver biodiversity outcomes. However, just how effective these can be in the face of policy that enables extractive industries such as mining and logging, and how they work in concert with Environmental Impact Assessment (EIA) legislation, remains to be seen. Certainly, there is a challenge for most Pacific Island countries to balance economic development imperatives and conservation of natural resources and ecosystems. The National Climate Change Policies, Green Growth Framework, Integrated Coastal Management Plan Framework and National Disaster Risk Reduction Policies for some of the PICs provide an enabling policy framework at the national level. The National Adaptation Plan (NAP) also provides an opportunity to elaborate and firmly embed ecosystem-based adaptations and NbS as climate change adaptation and mitigation strategies. While ecosystem- based and nature-based approaches are likely an essential element of integrated responses to climate change and biodiversity loss, it is essential in the Pacific context that policies and implementing these approaches in the region put Pacific people at the centre of decision-making and learn from culturally embedded practices and traditional and Indigenous environmental knowledge of the Pacific.

There is potential for Pacific Island countries to take a lead role is shaping global policy and practice around market-based approaches to biodiversity and climate change.

The risks and opportunities surrounding payments for ecosystem services (PES) schemes and carbon or biodiversity credits, for example, are particularly important for the Pacific. On one hand these mechanisms could leverage significant private finance for conservation, while on the other hand Pacific countries will need to control the terms of these projects in order to safeguard the interests of local communities. Some private standards are beginning to reflect integrated approaches. For example, Plan Vivo (a global voluntary carbon standard) has launched a biodiversity standard, and there is a growing understanding that in the PES business there is a need to look 'beyond carbon'. Programmes and projects integrating additional layers, such as biodiversity and even community/culture/Indigenous standards are likely to enter the market as understanding of the importance of Indigenous Pacific ecosystems and the wide-ranging services that they provide becomes clear to the global community.

Moving forward will therefore require revision and updating of existing laws, policy lens shifts to include emphasis on Indigenous peoples and knowledge and adequate tracking of the effectiveness of new integrated ocean and climate policies in safeguarding biodiversity. These regional priority issues will be influenced by pressures from demographic change, changing consumption patterns, and economic development imperatives. A clear example is the need for policy to confront and address resource extraction such as commercial mining, forestry, and fishing. Deep-sea mining with its risk of impacts on biodiversity (Niner et al., 2018; Paulus, 2021) is highly controversial in the Pacific with countries such as; Nauru Kiribati, Cook Islands and Tonga exploring the potential economic benefits because of their existing overreliance on single source revenue (Farran, 2022). The increase in global demand for electric cars and devices has contributed to the clamor for rare metals, much of which is found on the Pacific Ocean seabed. Deep-sea mining impacts are predicted to occur beyond the immediate mining area and therefore mining by one country may impact waters of a different nation (Luick, 2022).

As detailed by Blasiak et al., (2019), there is a need for greater transparency and coherence in funding for sustainable and healthy oceans. Private and philanthropic finance could also play a greater role, provided this can be governed so as to balance immediate community needs against longer term outcomes. Strengthened protection for biodiversity and improved communication to a wider range of critical stakeholders, including the private sector, will be required. This must be reflected in broad enabling policies for sustainable systems that include more explicit inclusion in national and provincial policy, and this in turn will need to link to associated development cooperation and bilateral trade agreements.

The endorsement of the 2050 Strategy for the Blue Pacific Continent by Pacific Islands Forum leaders in July 2022 provides an 'overarching blueprint to advance Pacific regionalism… articulating the region's long-term vision, values and key thematic areas and strategic pathways….'Amongst the seven key thematic areas is emphasis on climate change and disasters, people centered development, ocean and the natural environment (PIFS, 2022).

8.7 Conclusion

Biodiversity is culturally and socially embedded in the Pacific and is valued by humans in a wide variety of ways, many of which cannot be easily quantified or expressed in monetary terms. For example, healthy diverse marine, freshwater and terrestrial habitats are all places that give families quality time together and bring wellness and peace of mind to the human spirit. These places create lasting memories of tranquillity and an appreciation of the special role of nature in our lives that needs to be seen and experienced by the next generation. We need to find solutions and resilience to climate change as currently these special places are slowly being lost and degraded over time.

Resilience to climate change via active conservation of biodiversity is an urgent task, not only for PICTs, but also for the global community. Enhancing biodiversity, by recognising its value and prioritising its conservation and restoration, can directly build resilience to climate change impacts now and into the future. These solutions combine nature-based interventions with Indigenous and local knowledge and practice to influence policy for climate resilience and the preservation of culturally and economically important biodiversity. Environmental policy and governance must put Pacific peoples and cultures at the heart of efforts to conserve biodiversity and build climate resilience. Legislation needs to acknowledge the role of both Indigenous and scientific knowledge systems in protecting biodiversity. Hence, a review of existing environmental regulations and a new vision of resilient ecosystem conservation which incorporates Indigenous and local knowledge, working in harmony with Western science, will go a long way in protecting Pacific Island biodiversity in the 21st century and beyond.



> To build resilience from water insecurity, the Barana Community youths are actively involved in nature based adaptation activities by replanting trees along the Mataniko River and community watershed. With the help from civil society, the community also established a Nature and Heritage Park Plan

Samson Hohosi
Barana community
Guadacanal
Solomon Islands
(POCCA research team interview, 2023)

Rainforest restoration project to help with fresh water supply in Barana Community, Solomon Islands (Photo: POCCA team, 2022).

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Chapter 9

Thirst for life: Water Security and Changing Climate in the Pacific

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Back-to-back tropical cyclones in Vanuatu in 2023, impacted on water supply and people such as those in Epau Village (in photo) have to rely more on water tanks (Photo: POCCA team, 2023).

Abstract

Climate change and water security are inseparable issues in Pacific Island Countries and Territories (PICTs). The impacts of climate change on the availability, equitable accessibility, and good quality of water for people and the environment cannot be overstated. Availability of good quality water (for drinking, cooking and other household purposes) is very limited in many PICTs and they are amongst the most precious local resources. Needless to say, water connects and sustains the lives of people and the environment. Through eight case studies, we demonstrate in this chapter the diversity of impacts of climate change on high islands and atoll countries across the PICTs. We also demonstrate the challenges of one a dimensional- top-down approaches of trying to address a multi-sectoral, complex issue as water security in PICTs. Most importantly, we demonstrate some workable examples of the 'marriage' between the integration and recognition of local traditional knowledge systems, relationships, structures, and processes to improve water security for the people and environment and building the resilience of local water sources against climatic and non-climatic stressors. Finally, is the need to learn from the successes of the 'meet in the middle' (integration of the community based and national governments approaches), and reflect them more in water security policies, implementation, monitoring, and evaluation in PICTs.



> There is a proposal to increase the number of water tanks in every household so there will be enough water for everyone and to provide desalination machines for every house during drought season for people's needs

Vasa Saitala
Community researcher
Tuvalu
(POCCA research team interview, 2023)

Water tanks being delivered to the people on Funafala Island, Tuvalu to help in their water supply (Photo: POCCA team, 2023).

9.1 Introduction

Water, water, everywhere, And all the boards did shrink; Water, water, everywhere, Nor any drop to drink.
(*The Rime of the Ancient Mariner*, Samuel Taylor Coleridge, 1798)

E a Ulu tafega, ae selefutia ai Vaisigano
It is the mountain brook Ulu that floods and destroys the Vaisigano flood plain downstream
Samoan proverb

9.1.1 The limited water we have is our precious resource

The two quotes above represent two realities in Pacific Island Countries and Territories (PICTs), related to water availability, accessibility, and quality. First, PICTS, have very little land mass and are part of the largest ocean on the planet, thus the term – Big Ocean StateS (BOSS) (Hume, 2021; Morgan, 2022). The islands are diverse in their sizes and are spread across the Pacific Ocean. Achieving water security on small islands within a large ocean is an ongoing challenge. The 16 PICTs included in this POCCA report are scattered around 25 million square kilometres of ocean with only 0.5 million square kilometre of land, with PNG comprising 90% of this (Wilson et al., 2023). The PICTs environment, water resources, and rainfall are highly influenced by the large ocean, climate change and climate variability. Some PICTs consist of a few sparsely inhabited islands, others are more densely populated island groups and some have no confirmed freshwater (being dependent on rainwater and desalination) (see Table 9.1). In addition, many atolls can only source limited water supplies from fragile shallow water lenses. Water quality for drinking is also often very poor. Most of the water quality of drinking water consumed by communities is not monitored and tested. Wilson et al., (2023), shared that about five Pacific Island Countries (PICs) have dedicated water quality and preservation policies in place but are only partly implemented. Eight Pacific Island countries do not have water quality policies in place. Consequently, there is a need for various governance and Water Resource Management (WRM) strategies and approaches focusing on different scales and levels of capacity and socio-cultural settings. With the limited water resources in different PICTs, there is a strong need to focus on protecting, preserving and ensuring that there is access to good quality water for both people and the environment (Wilson et al., 2023; Ojha & Schofield 2022; Paeniu et al., 2016).

9.1.2 The connectivity of the system

The second quote above is a Samoan proverb highlighting the connectedness between waterways, communities, the land, and sea (ridge to reef) with reference to water availability and water quality. It speaks of the suffering the people and the low-lying environment experience because of heavy floods flowing from the highlands. The security of water in the low-lying flatland depends on the practices and land use patterns in the highlands.

This is because water connects communities beyond districts and provinces and how water is used in a place will affect other communities. For example, a study of the Waimanu Catchment in Viti Levu, Fiji shows that unsustainable land use practices such as intensive farming on the highlands contribute to poor quality of water ways along the Waimanu River on the flatland. The water quality declines down river when the rainfall reaches around 100 millimeters and worsens exponentially when it reaches 300 millimeters or more (Begg et al., 2022). It is crucial to consider the connectedness of both the environment, waterways and governance systems using both government and traditional governance approaches. Already many PICTs have limited water availability due to their small size and this is exacerbated by climate change (ADB, 2020).

Water is an important aspect of various environment, infrastructure, institution, politics, and socio-economic aspects of development it would be most appropriate to adopt an interdisciplinary and multi-sectoral approach to capture the impact of water security on development at different levels of society (Lankford et al., 2013). The complexity and diversity of water security is best captured by Ojha & Schofield (2022), who described water security as 'the sustainable and equitable access to water for communities, economy and ecosystems, as well as being able to minimise the risk of water-related disasters.' Water security encompasses multiple sectors and different socio ecological zone scales, therefore water security is a complex, but critical goal to achieve for healthy and active living of people and environment in PICTs (ADB, 2020).

How can we improve water security in response to climatic and non-climatic stressors? This chapter addresses the question of what is needed to improve water security in PICTs. We are addressing this question through:

a. Contextual information on water security in PICTs and water availability, accessibility and quality for both people and the environment;

b. Using case studies, we highlight how a changing climate exacerbates water security issues in different PICTs – depending on the island types and water resources;

c. Analysis of how PICTs have, over the years, invested resources to improve water security in response to both climatic and non-climatic stressors and improve wellbeing and livelihoods of Pacific Island people and their environment;

d. Finally we will highlight through case studies the need to focus more on water security governance mechanisms at national, sub-national, communities, whole of island and household levels. This is to be done through a combination of government policies and traditional relationships between people and their environment, to ensure that we are protecting, preserving and managing our 'precious' limited water resources to enable availability and accessibility to good quality water all the time.

Information and data used in this chapter were based on:

a. Desktop review of peer reviewed and grey literature available online;

b. More than 100 accumulative years of research and experiential knowledge of authors, through sharing the case studies from their own research across the Pacific Islands;

c. POCCA researchers collected additional information and case studies to fill information gaps and add value to evidence of impacts of climate change on water security in Pacific Island communities and how water security governance at community and national levels helps build and sustain availability and accessibility of quality of water for people and the environment.

9.2 Sources of drinking water and governance across the Pacific Islands

There are three common sources of water in PICTs – namely rainwater, groundwater, and surface water (Table 9.1). Large and high island countries such as; PNG, Solomon Islands, Vanuatu, Fiji, Federated States of Micronesia (FSM), Cook Islands and Samoa rely on rivers, streams, groundwater and rainwater collected/harvested directly and stored in water tanks for water security. But there are low lying islands in these countries that rely on limited groundwater and rainwater only. For example, the Northern Cook Islands are low-lying atolls versus the Southern Cook Islands, which are higher volcanic or raised limestone islands – these geological/geographic differences pose challenges to accessibility/management (security) of water resources in such countries at island and national scales. Some raised islands such as Tongan outer islands rely on groundwater, limited streams, and harvested rainfall. Atoll island countries such as Tuvalu, Kiribati, Republic of Marshall Islands (RMI) and Tokelau do not have rivers. They rely on harvesting rainfall and limited groundwater for water security. Nauru does not have rivers and no viable ground water and relies heavily on desalinators for daily supply of fresh water. The use of desalinators is also an important drought response in FSM, RMI, Kiribati, Tuvalu, and Northern Cook Islands. New initiatives are starting to mainstream drinking water for significant population centers in atolls such as Tarawa in Kiribati and Funafuti in Tuvalu. Use of desalintators to supplement water supply in non-drought times is part of the new initiative.

Table 9.1 shows the diversity of geological settings and water resources in the Pacific region.

Different methods of rainwater collection can be found in countries that heavily rely on rainwater harvesting and storage as the only source of water. For example, Tuvalu and Kiribati, use tanks to store rainwater that has been collected off the rooftops of buildings. Others, such as in Majuro (RMI), use a sophisticated large-scale system whereby rainfall from the airport's paved runway is diverted and stored in a series of giant open reservoirs. Surface water is found on high volcanic islands in the form of streams, springs, freshwater lagoons, lakes, and swamps. Groundwater is found in aquifers, which occur within layers of soil, sand, and rock. Perched aquifers are found above water tables or within cavities of vertical volcanic dykes while basal aquifers are located at or below sea level (Falkland, 2002).

Some PICTs also use non-conventional sources of freshwater. These include desalination, importation, substitution, and the use of treated wastewater. The desalination of brackish water and seawater is usually utilised by low-lying islands, often during periods of extended dry conditions, either through distillation (e.g., vapour compression) or membrane process (e.g., reverse osmosis, or electrodialysis) (Huang et al., 2024). During extreme drought events, freshwater is also imported from larger islands and delivered to the smaller outer islands by barge or boats. To supplement imported freshwater, the outer islands also rely on coconut water as a substitute for drinking water. But droughts have decreased the sizes of coconuts on the trees (Iese et al., 2021).

Country	Form (generalised)	Total Renewable Water Resources ($mm^3 \cdot yr^{-1}$)	Average Rainfall ($mm \cdot yr^{-1}$) (spatial range)	Water Use ($mm \cdot yr^{-1}$)	Total Rainfall ($mm^3 \cdot yr^{-1}$)	Rainfall Productivity ($SGDPm^{-2}$)	Primary Water Resources*
Cook Islands	Volcanic, volcanic & limestone, atoll	56	2,040 (1,574 – 3,063)	4.4	140	0.48	SW, GW, RW
Federated States of Micronesia	Volcanic, atoll, mixed	2,034	4,115 (3,028 – 5,000)	NA	2 900	0.08	SW, GW, RW, D
Fiji	Volcanic, limestone, atoll, mixed	28,600	3,040 (2,000 – 10, 000)	70	56 000	0.05	SW, GW, RW
Kiribati	Atoll, coral islands, limestone	21	2,000 (1,000 – 3,200)	NA	1 600	0.09	GW, RW, D
Marshall Islands	Atoll and coral islands	1.6	3,378 (3,028 – 5,000)	1.7	610	0.24	RW, GW, D
Nauru	Limestone	-11	2,167 (1,500 – 4,042)	48	42	0.42	D, RW, GW
Niue	Limestone	132	2,180 (1,000 – 4,002)	0.002	570	0.03	GW, RW
Palau	Volcanic, limestone	1,160	3,784 (3,028 – 5,000)	5.5	1,700	0.1	SW, GW, RW
Papua New Guinea	Volcanic, limestone, coral islands, atoll	801,000	3,142 (1,000 – 8,000)	392	1 100,000	0.01	SW, GW, RW
Samoa	Volcanic	1,328	3,000 (2,500 – 6,000)	12.4	8,400	0.06	SW, GW, RW
Solomon Islands	Volcanic, Limestone, atoll	44,700	3,028 (2,000-4,500)	NA	92,000	0.01	SW, GW, RW
Tonga	Volcanic, Limestone, atoll	401	2,062 (3,028- 5,000)	NA	1,300	0.20	GW, RW
Tuvalu	Atoll	1.0	2,850 (2,737- 3,498)	0.2	74	0.24	RW, GW, D
Vanuatu	Volcanic, Limestone	9,970	2,338 (1,400-4,000)	12	29,000	0.18	SW, GW, RW

***Table 9.1**: Sources of water for different Pacific Island Countries.*

*Notes: * Primary water resources for selected countries we considered via a broad representation of freshwater systems in the Pacific region and provide an indication of vulnerabilities across countries (SW-Surface Water, GW- Ground Water, RW-Rain Water, D-Desalination).*

During the field visits of POCCA researchers, many key informant participants from Vanuatu, Papua New Guinea, Fiji, and Solomon Islands shared the critical role their traditional knowledge of knowing where the water sources were, conserving water sources to last not only for normal but also times of disaster, and the use of traditional water holding tools such as bamboos to carry water and store water for household purposes. The shift to modern sources and water storage facilities such as water tanks, and centralised water supply have led to the loss of knowledge of traditional water sources, water storage and use of traditional tools to carry and store water. Consequently, they are only relying on water stored in water tanks for their water security. Their children and younger generations are not interested in learning the traditional way of protecting, preserving, storing, and managing natural water sources as it requires more time and work to do. Water resources in the Pacific are under threat due to climate variability, climate change, geological hazards, population pressures, pollution, and weak water management.

9.3 Water governance at the global and regional levels

PICTs are subject to multi-level environmental governance arrangements that are intended to safeguard water resources and freshwater dependent ecosystems. Given the pressing issues of water security in the region, many international and multilateral initiatives are concerned with water security and sanitation. Increasingly, however, water governance agreements reflect an integrated management paradigm that situates freshwater resources in a wider environmental context – framing water systems in a 'ridge to reef' context.

An overarching set of targets is given by the 2030 Agenda for Sustainable Development and Sustainable Development Goals (SDG) 6, which aims to 'ensure availability and sustainable management of water and sanitation for all'. Specific goals under SDG 6 encompass universal access to safe and affordable drinking-water, adequate and equitable sanitation, and hygiene for all, and ending open defecation. SDG 6 is also seen as integral to the achievement of numerous other social and environmental elements of the SDGs. Progress against SDG 6 across the Pacific region is tracked by the UNICEF/WHO Joint Monitoring Programme (JMP) and various other agencies at country and regional levels.

Overall, regional progress towards the various water security goals is lagging behind the rest of the world. Access to basic sanitation services remains low at around 30%, while access to basic drinking water services is at around 55% (WHO & UNICEF, 2019; SPC, 2024). However, these percentages are skewed by the large population of PNG. About 75% of most PICTs and 50% of PNG population are using safely managed drinking water sources (Pacific Data Hub, 2024). The situation varies widely from country to country and between rural and urban areas, but most PICs continue to face considerable challenges in meeting the goals. The latest UNICEF data suggest that basic sanitation services across 14 PICTs are expanding at just one-eighth the rate required to achieve SDG 6 (UNICEF, 2023).

The SIDS Accelerated Modalities Of Action (S.A.M.O.A) Pathway recognises the issues related to water security and climate change and prioritised the need to 'develop institutional and human capacities for the effective, inclusive and sustainable implementation of the integrated management of water resources and related ecosystems, including supporting women's engagement in water management systems' (UN SIDS, 2024).

The wider effort to deliver 'clean water and sanitation for all' subsumes many earlier complementary programmes and agreements that have addressed water quality and quantity issues in the PICTs over recent decades. The Pacific Regional Action Plan on Sustainable Water Management (RAP-SWM) was endorsed by Pacific Island Countries more than two decades ago in 2002. Coordinated by the South Pacific Applied Geoscience Commission (SOPAC) with support from the Asian Development Bank (ADB), this Plan drew on a broad consultative process to define regional needs and actions across the areas of water resource assessment and management, water supply and sanitation systems, climate impacts on water resources, community participation in sustainable water management and several aspects of education, communication, technology and institutional arrangements for water management (SOPAC & ADB, 2003).

In relation to institutional arrangements, the RAP-SWM called for development of a shared vision for managing water resources in a sustainable manner and for establishment of national legislation, policies and plans appropriate to the context of the respective island country and its people. It also called for resourcing of these institutional arrangements, including through opening avenues for appropriate financing (SOPAC & ADB, 2003). The Pacific Partnership on Sustainable Water Management (PPSWM) was established in 2002 with initial funding from ADB to support and coordinate partnership activities for the implementation of the RAP-SWM and related policies and frameworks.

At the regional scale, the key mechanisms underpinning actions were the Pacific Wastewater Framework for Action (2001), and the Pacific Framework for Action Drinking Water Quality and Health (2005). These were developed with assistance of UNEP and WHO respectively, and while their primary focus was on human health and sanitation, these frameworks already contained important links to wider environmental health and resource management. For example, the first recommendation of the Pacific Framework for Action Drinking Water Quality and Health stated that 'Protection of water sources such as springs, rivers, groundwater and rainwater catchments from contamination and overuse must be a priority to ensure quality and quantity' (WHO, 2005 p.p. 4). This framing connected with both a recognition in the region of the fundamental connections between human and environmental health and international narratives of Integrated Water Resources Management and their expression in the Pacific through IWRM programmes (e.g., UNDP, 2004) and then later 'ridge-to-reef' approaches (UNDP, 2016).

Alongside the development of a holistic ridge-to-reef perspective in policy and plans, the vital importance of climate change and the need for adaptation across the region has seen water governance increasingly integrated with climate resilience.

The Disaster and Community Resilience Programme (DCRP) of the Geoscience, Energy and Maritime Division (GEM, formerly SOPAC) of the Pacific Community draws together many of the different lines of work on water security within a wider resilience framework. It is tasked with implementing the Framework for Resilient Development in the Pacific (FRDP) 2017-2030, a voluntary regional agreement which aims for integrated action on the interrelated issues of disaster risk reduction, climate change adaptation, water security and sanitation, hazard and risk understanding, ridge-to-reef solutions and natural resource management at the regional scale. Clearly, climate change exacerbates water security issues across the PICTs, and measures to address water security and the health of water-dependent ecosystems may also help communities to mitigate and adapt to climate change via 'nature-based' solutions (Kaspersma et al., 2023).

9.4 Impacts of climate change on water security in PICTs.

Climate change and water security are inseparable issues. We experience the impacts of climate change through water availability, accessibility, quality, and stability. The relationship between climate change and water security is more evident in PICs than in many other regions of the world, Pacific water sources are highly exposed to both climatic extreme and slow onset events. Key climate change risks to water security in Pacific Islands include sea level rise and increasing intensity of cyclone winds and rainfall and droughts. These risks are likely to get worse even under the most optimistic but less likely Representative Concentration Pathway 2.6 (Very low emission scenario).

Pacific Islands are prone to many climate-related hazards, based on their location and low elevation. The IPCC warns that if the world follows the high-emissions scenario, most of the world's low-lying regions may exceed the ability to adapt to change beyond 2100 (IPCC, 2019). The science is clear, with increasing temperatures due to global warming, there is a change on the water cycle, an increasing amount of water in the atmosphere and the distribution is more uneven in a changing climate. More water in the atmosphere leads to increasing intensity of rain, causing floods. Shifting distribution of atmospheric moisture causes severe droughts in other areas of the Pacific Islands, further impacting on the availability, accessibility, and quality of water.

Climate hazards are widely recognised as a critical threat in the Pacific and often increase the impacts of the existing challenges facing the water sector (Holding & Allen, 2016). Pacific Islands have uniquely fragile water resources due to their small size, lack of natural storage and vulnerability to hazards. There is growing evidence of direct climate impacts on water across the area. Water security challenges in many Pacific Islands are largely based on climate impacts to the quality of water and increased variability of rainfall patterns and more intense droughts significantly increase their vulnerability. For example, the droughts of 1997–1998 and 2015–2016 affected more than 1 million people in rural parts of PNG, with severe impacts on water, food, agriculture, education, health, and the economy (Papua New Guinea National Disaster Centre, 2016).

Agriculture in Pacific Island countries is almost totally dependent on rainfall, making economies and livelihoods particularly vulnerable to drought and rainfall variability (Iese et al., 2020; 2021).

Projections of climate change impacts differ between and within the PICTs (Table 9.2 below) but increasing water security risks are common in all assessments. In particular, the combined impacts of more intense cyclones and sea level rise will bring more disruptions to water supply systems and increase the salinisation of scarce groundwater resources mainly in atolls and low-lying islands.

As summarised in Table 9.2, extreme rainfall is going to increase with high level of confidence in the Pacific Island Countries included in the analysis. Increasing extreme rainfall provides an opportunity for both atolls and high islands nations to increase their capacity to harvest and store rainwater to improve water security.

For higher islands that rely on river systems for drinking water such as Fiji, increasing rainfall could also mean increasing floods and costs of water treatments to improve water quality for drinking. There is low to medium confidence on projection of frequency and duration of droughts. However, as Iese et al., (2021), shared, based on their analysis for Samoa, Tuvalu and Vanuatu, the decrease is apparent only for moderate and severe drought. For extreme drought, the multi-model median indicates little change, while the range of uncertainty, albeit large, is skewed towards an increase for most metrics. This implies that future drought events, when they occur, will tend to fall more often under what is currently classified as the extreme drought category rather than the moderate or severe drought category.

Country	Mean rainfall	Drought Frequency and duration	Extreme rainfall frequency and intensity	Tropical cyclone frequency
Cook Islands	Similar	Similar	Increase	Decrease
FSM	Increase	Decrease	Increase	Decrease
Fiji	Little change	Slight decrease	Increase	Decrease
Kiribati	Increase	Decrease	Increase	No projections
Marshall Islands	Increase	Decrease	Increase	Decrease
Nauru	Increase	Decrease	Increase	No projections
Niue	Slight increase	Slight increase	Increase	Decrease
Palau	Increase	Decrease	Increase	Decrease
PNG	Increase	Decrease	Increase	Decrease
Samoa	Little change	Similar	Increase	Decrease
Solomon Islands	Slight increase	Slight decrease	Increase	Decrease
Tonga	Little change	Slight decrease	Increase	Decrease
Tuvalu	Little change	Slight decrease	Increase	Decrease
Vanuatu	Little change	Similar or slight decrease	Increase	Decrease

Table 9.2: *Summary of climate change projections for the Pacific based on the Pacific Climate Change Science Program. The colours in the table indicate the confidence rating for each projection: blue = high; yellow =medium; pink = low. FSM = Federated States of Micronesia; PNG = Papua New Guinea. Source: Falkland & White, 2020; Schofield & Ojha 2024.*

9.5 Case studies: Multi-hazard impacts - water security, national governance actions and policies

The first three case studies in this section (two atoll islands and one high island) outlines the current status of water security in the studied countries, multiple-hazard nature of impacts on water security and how different countries try to improve resilience through policy formulations and top-down actions. The fourth case study is a policy analysis related to water security in Tonga.

9.5.1 Case study 1: Compounding challenges to water security in Fongafale Island, Tuvalu.

Fongafale, the administrative centre of Funafuti atoll, Tuvalu, stretches across a narrow 12 kilometre strip of land and is home to over 4000 people, including residents from outer islands who have migrated for better opportunities (Tui & Fakhruddin, 2022). The island hosts all administrative and commercial activities, alongside the fully operational main international airport. However, Fongafale's small land mass, flat topography with a maximum elevation of just five meters above sea level, and growing urbanisation present significant obstacles in securing adequate water resources for its population.

9.5.2 Water sources and challenges

Primary sources and emerging issues

Rainwater harvesting is the primary source of water for Fongafale, as in many other atoll islands across Tuvalu. This is stored in storage tanks and groundwater, desalination plants, and bottled water imports. However, over-reliance on rainwater and lack of sustainable alternatives exacerbates water insecurity, which is further compounded by the impacts of climate change such as coastal erosion and rise in sea level.

Land constraints and water security

The limited land area is a challenge for different needs and usage of the space, particularly in the context of water security. Tuvalu's reliance on rainwater storage and desalination plants to meet its water needs is threatened by the increasing demand for land due to population growth and urbanisation, which can lead to conflicts over land use and management (GEF, 2017; Kinrade et al., 2014).

Alternative sources of water are limited and contaminated by human activities. Groundwater resources have been contaminated by saltwater intrusion and waste leachate, making them unsuitable for human consumption. As desalination plants are unreliable and expensive, bottled water imports are becoming increasingly more popular, contributing to the island's reliance on

external sources. The storage capacity of water tanks is insufficient to meet the growing demands of the population, and maintenance remains a challenge due to the costs. The lack of sustainable alternatives and the limited availability of these sources further reduce the resilience of the community (Iese et al., 2021).

As Tianamo, Leader of the Papelise Community in Tuvalu, poignantly expressed, 'Matou e inu ki vaiua. Te fakalavelave nei me se lava a tane vai iluga ite omotou fakai tenei,' which translates to 'Our main source of water is rainwater, and it is very difficult for us to survive because we don't have enough water tanks to accommodate every household.' This statement sheds light on the water challenges confronting the community, stemming from insufficient infrastructure and resources to store rainwater for every household.

Pollution challenges and urbanisation

Pollution, stemming from human activities, is a growing hazard to the island's water sources. Fongafale is undergoing rapid urbanisation and population growth, exacerbated by the atoll's limited land area and inadequate waste management practices. These factors are anticipated to contribute to a surge in environmental pollution. For instance, during a community visit to Funafuti as part of the POCCA Tuvalu community engagement, concerns were expressed by members of local communities about the growing problem of waste management, which is contaminating water ways.

The Tafua Pond in Funafuti is a prime example of the pollution problem facing the island (Figure 9.1). The pond is heavily polluted by pig waste and serves as a garbage disposal site, making its water unsuitable for drinking (SPC, 2021). Additionally, the Tilapia fish *(Oreochromis niloticus)* have been introduced to the pond as a protein source for pigs.



Figure 9.1: *Aerial photo of Tafua Pond located at the north end of the Funafuti airstrip. The pond was evaluated as a prospective location for environmental restoration and milkfish (Chanos chanos) production (Webb, 2005, SOPAC AP archives, 1984).*

Climate change vulnerability

Climate change is increasing Fongafale's vulnerability to extreme weather conditions and sea-level rise, further reducing the reliability of rainwater harvesting and storage systems. This adversely impacts the management, supply, and quality of water resources, posing a severe threat to the island's water security (McCubbin et al., 2015).

Dependence on rainwater harvesting for freshwater is driven by the limited availability of groundwater and surface water sources, as well as the constraints of water storage capacity and increased demand of households (Pacific Calling Partnership, 2019). Consistent rainfall is necessary for maintaining water security in this context. Climate change is projected to bring about periods of heavy rainfall that exceed storage capacity, followed by extended dry spells leading to shortages in domestic water supply (Pacific Calling Partnership, 2019). The challenge of expanding storage capacity is compounded by financial constraints in both supplying and maintaining these tanks. Moreover, the combined impact of diverse drought and rainfall patterns can have severe consequences on water security.

Coastal erosion, intrusion, inundation and droughts

Given Tuvalu's low-lying geography, the most immediate and severe climate change impacts will be increasing risks of coastal erosion, flooding, and inundation. The extent of these effects depends on the coral reef and mangrove ecosystems, which serve as the islands' primary natural barrier against waves. Salt water intrusion due to rising sea level and extreme high tides have inundated water wells in Funafuti. Saltwater infiltration into pulaka pits (which are used to cultivate the traditional root crop Pulaka *(Cyrtosperma chamissonis))* and wave over-topping have already been observed, prompting government intervention to assist affected individuals (Ministry of Natural Resources, Environment, Agriculture and Lands Department of Environment, 2007). Coastal erosion can be seen across all islands, and this is exacerbated by human activities such as coastal aggregate mining and infrastructure projects. People on Funafuti Island have experienced worsening droughts and their diverse impacts on the environment and people as in 2011 and 2021 (Iese et al., 2021; Iese et al., 2022).

Water governance and management

Effective water governance and management frameworks are important for ensuring sustainable development, equitable access, and efficient utilisation of water resources. However, Fongafale faces significant challenges in this regard due to the government's limited capacity for water management. As Sitia Maheu, a resident of Kavatoetoe community, pointed out:

> kote fakafouga o alavai io me ko paipa a kaiga mai ite matagi malosi. Nala se pokotiaga kote togiga o mea konei ke fakafou me se fakatupe nete malo a mea konei kae fakatupe loa nete kaiga.
>
> *the major challenge is repairing the water catchment of each household and water tanks because the family must fend for themselves. The government won't be able to help every house in the community.*

This lack of a robust governance system has led to difficulties in water availability and accessing water for many communities, indicating the need for a comprehensive framework that addresses water-related issues at the household level.

Resilience and community involvement

Resilience or the capacity to recover from difficulties, is a critical aspect of water security. The Sustainable and Integrated Water and Sanitation Policy in Tuvalu (2020), indicates that the country has abundant rainfall resources to sufficiently meet the people's needs. However, Fongafale currently faces water shortages due to challenges in managing the already limited water resources. Inefficient practices, such as using clean drinking water for flushing toilets and leaks from collection and storage systems, contribute to water pollution and insecurity.

Despite the policy's assurances, Fongafale's resilience is undermined by both human activities and climate change impacts. Rapid urbanisation is diminishing the community's long-term resilience, as highlighted by Peter Kinrade et al., (2014). Furthermore, the uneven distribution of water during dry seasons, coupled with inadequate storage capacity and maintenance, has led to a lack of resilience and inequitable access to water resources. Government officials are often prioritised over communities when refilling water tanks, leaving many households to wait for days or even weeks.

To address these challenges, there is a need to revive and strengthen traditional concepts and governance mechanisms of Lotofenua, which emphasises community solidarity and warmth. By involving the community and the Falekaupule (Council of Elders) in decision-making and action, a sense of ownership and resilience can be fostered.

The Government of Tuvalu has implemented policies and frameworks to mitigate water management problems. However, sustainable solutions require a collaborative effort between the government and the community, incorporating traditional water conservation knowledge and practices, as well as nature-based solutions. For example, the use of communal processes to establish rules for local communities on regulating access and use of water during droughts.

9.5.2 Case study 2: Water security in Tarawa, Kiribati

Tarawa, an atoll of the Republic of Kiribati, is made up of two distinct sub-regions, South Tarawa, and North Tarawa. Given the presence of a more urbanised center, South Tarawa has seen an immense and uncontrolled migration of residents from outer islands. In South Tarawa, the freshwater lens is considered highly polluted due to overcrowding and lack of proper sanitation facilities. Around 50,000 people – almost half of Kiribati's total population – live on South Tarawa's land area of 15.76 square kilometres. This makes for a population density of 3,184 per square kilometre with some areas, such as Betio, having densities as high as 10,610 per square kolimetre.

9.5.2 Access to water and water quality

Traditionally, fresh water in Kiribati is sourced from intricately designed wells, dug 2-3 meters into the ground to access the freshwater lens and to a lesser extend from rain stored in hollowed out logs or from water tanks. Modern replications of these two methods are geographically still the most widespread means of accessing freshwater within Kiribati, especially within North Tarawa and in the outer islands.

In South Tarawa, approximately 95% of residents have access to basic water supply from a mix of rainwater stored in water tanks, well water and water provided by the Public Utilities Board (PUB). However, rainwater is constrained during dry seasons, well water is frequently intruded by salt water and PUB water accessibility is limited to three days a week and runs on an average of only one hour a day.

Climate change has impacted good water availability accessibility and quality, particularly:

- *Reduced rainfall* – Prolonged periods of low rainfall have resulted in a diminished supply of rainwater to meet the demand for freshwater. Additionally, the freshwater lens would also be impacted by this eventually leading to increased risk of saltwater intrusion into wells.

- *Saltwater intrusion and inundation* – Saltwater intrusion and inundation into wells is experienced in Tarawa. Many water wells that were used for drinking before are now brackished and are only used for washing. Relocation of wells or establishing new wells are needed to improve availability and accessibility to good quality water for drinking.

In South Tarawa, unstructured urbanisation and rapid population growth coupled with prolonged periods of drought and coastal inundation have resulted in issues around access, quality, and quantity of safe and usable water. When adapting to reduce the impacts of climate change on water security on Tarawa, the most frequently discussed issues are:

- *Limited space for new wells* - As existing wells dry up or become unusable due to saltwater intrusion or inundation, attempts are made to dig new wells in more suitable locations. However, there is a scarcity of available land for establishing new wells on South Tarawa. This scarcity of available land is also added to by a mix of informal and formal dwellings occupying most of the space. Issues arise when determining suitable locations for new water wells due to conflicts between landowning units, which are typically family-based, and the leasers for the land.

- *Cultural and spiritual conflict* - In the same context of limited space, conflicts have emerged as grave sites or areas of cultural significance are disturbed or destroyed to make room for water wells or rainwater storage tanks. This situation creates cultural and spiritual conflicts within the community, highlighting the tension between the practical need for resources and the preservation of cultural heritage.

- *Pollution concern* - Rapid and unstructured urbanisation as well as population growth and a lack of associated infrastructure development has resulted in a lack of capacity to dispose and manage household and industrial waste adequately. Consequently, wells are frequently contaminated with waste rendering the well water unusable. Additionally, there is an increase in the risk of groundwater contamination through leaching of harmful substances, posing a threat of waterborne diseases.

- *Poor water quality* - The combination of inadequate fresh water supplies and degraded sanitation systems is having a devastating impact on the population. Kiribati has the highest infant mortality rates in the Pacific. For every 1,000 children born, 46 are dying before their fifth birthday – compared with just five in Australia. This is largely a result of two to three outbreaks of acute diarrheal disease occurring in South Tarawa every year due to the extremely high incidence of water-borne disease. Testing in December 2021 showed 73% of the 1,875 households that participated in the water quality programme had unsafe or likely-unsafe drinking water due to bacterial contamination. Public water, which is only available to some households and even then, only on every two to three days per week, is also contaminated. Only one-third of piped sources, and less than 25% of the 22 public rainwater tanks, were found to provide safe water after testing (Child Fund Alliance, 2023).

In North Tarawa, where population densities are low, lifestyle is centred around traditional methods and village-based living, access to water relies on contemporary adaptations of traditional wells and rainwater collection techniques (Figure 9.2). A mixture of the use of traditional wells for washing and sanitation needs, and rainwater collection for drinking and cooking help to manage water, both before and during droughts. Unlike South Tarawa, the key challenges identified are less pressing in North Tarawa, primarily because there is ample space for the construction of new wells, if required.



Figure 9.2: *Common freshwater sources in Tarawa, Kiribati. Top left and top right: Traditionally built well in North Tarawa (using coral and limestone) coupled with modern technology (pumps and PVC plumbing). Middle top: mobile desalination plant in South Tarawa. Bottom left: modern well in South Tarawa using concrete culvert and rotomold. Bottom right: Rainwater collection tank in North Tarawa. (Pictures: USP POCCA)*

National plans, policies and projects to improve the availability, accessibility and good quality of water for local populations

Multiple projects, the largest of which is funded by Green Climate Fund via the Asian Development Bank, has sought to provide access to all residents of South Tarawa through the South Tarawa Water Supply Project (2018 – 2028) which includes building two desalination plants, rehabilitating and expanding the water supply network, and building a solar photovoltaic system. Furthermore, various sources of international aid (e.g., AUSAID and Taiwan-AID) have facilitated government and non-governmental agencies to enhance access to safe and sustainable water security practices as well as to enhance WASH capabilities through the implementation of various education and awareness programs.

At a national level, the Kiribati National Water Resource Policy (NWRP) provides a framework for leadership and coordinated action in the supply of safe, adequate, and financially, technically and environmentally sustainable water services to rural, outer island and urban communities in Kiribati and for the protection, conservation, sustainable use and efficient management of Kiribati's water resources. The NWRP is implemented through the Tarawa Water Master Plan and the National Water Resources Implementation Plan. However, despite these developments, there are also concerns by local residents, as reflected in these words by Pelenise Alofa;

> Here in South Tarawa we are not food secure, we are not water secure. We think we are because we have desalination plants and supermarkets, but this to me is fake sense of food and water security. There is better food and water security in North Tarawa and in the Outer Islands. This is because there, people live off the land and the ocean, they use modern tools to access traditional methods for capturing and storing food and water, they are healthy and secure. Here in South Tarawa, we are at the mercy of imported and processed food, we don't use as much traditional approaches to harvesting and storing water. If a crisis were to happen, fuel shortage, supply ship not arriving, or a cyclone, we the people of South Tarawa will be the ones suffering, not our brothers and sisters in the North or in the outer islands.

9.5.3 Case study 3: Water security issues and diversity of responses from government and community in Solomon Islands

The Solomon Islands faces significant water security challenges exacerbated by climate change, impacting urban and rural communities differently. This case study compares the water security issues in Gizo Township, an urban centre, with those in the rural Langa Langa Lagoon, highlighting the resilience and adaptation strategies employed in each context while also examining the overarching national governance framework.

Gizo Township, the second-largest town in the Solomon Islands and the urban centre of the Western Province, is grappling with severe water scarcity. A population of approximately 3,547 is increasingly affected by climate-induced droughts, particularly the significant event in 2015 that disrupted rainwater collection. The resulting scarcity led to heightened costs for bottled water, school closures, and limited business operations.

Women and girls, who bear the primary responsibility for water collection, face increased burdens, often travelling long distances to secure water. This situation exacerbates gender inequalities and compromises health, particularly for vulnerable groups such as pregnant and lactating mothers. The urban infrastructure is under strain, reflecting inadequate capacity in water management and governance.

In contrast, the Langa Langa Lagoon in Malaita Province, Solomon Islands, is home to 60 traditionally built artificial islands inhabited by about 5,000 residents. This community was established in the early 16th century as people from the mainland sought refuge from war and sorcery. The islands face unique challenges in securing clean drinking water, as residents often rely on traditional methods to access water from the mainland, paddling for up to 45 minutes in dugout canoes to transport water back and forth. This dependence on limited water sources is further exacerbated by climate variability, including cyclones and droughts.

Despite these challenges, the community demonstrates resilience through traditional practices and resourcefulness. They gather food and water from the mainland using dugout canoes, showcasing adaptive strategies that have evolved over generations. However, the lack of infrastructure and institutional support limits their capacity to effectively manage water resources.

Water governance in the Solomon Islands is characterised by a fragmented approach, with responsibilities divided between the Ministry of Energy, Mines and Rural Electrification and the Ministry of Health and Medical Services. While initiatives such as the National Adaptation Programme of Action aim to address water security, there is insufficient data to evaluate the effectiveness of these strategies in mitigating climate-related vulnerabilities.

The lack of effective coordination among ministries hampers the implementation of comprehensive water management policies. Additionally, limited financial resources and technical capacity hinder local governance efforts, particularly in rural areas where community engagement and inclusion of marginalised groups, such as women and youth, are often overlooked.

The water security issues faced by Gizo Township and the Langa Langa Lagoon illustrate the diverse challenges and adaptive strategies present in urban and rural settings within the Solomon Islands. Enhancing resilience requires a holistic approach to governance that integrates local knowledge, addresses gender inequalities, and fosters collaboration among stakeholders. By strengthening institutional frameworks and promoting community involvement, the Solomon Islands can better navigate the complexities of water security and climate change adaptation.



Figure 9.3: Members from Firifau artificial island in Langa Langa Lagoon using their dugout canoes to transport buckets and drums of fresh water sourced from the mainland, over 45 minutes away. (Source: POCCA Team 2023)

9.5.4 Case study 4: Addressing the water crisis in Tonga - gaps, challenges and solutions

This case study showcases the challenges and opportunities of improving water security in Tonga from policy and national government approaches. It is also a reflection of the reality across many countries of the Pacific Islands. Governments are trying their best to address the water crisis in a complex and multisectoral environment. To address the water crisis in Tonga, understanding the challenges and potential solutions is paramount. Tonga faces significant hurdles in water resource management, with limited access to safe drinking water, inadequate

sanitation, and unsustainable water supply. The fragmented nature of water policies, acts, and frameworks complicates governance, spanning various sectors and ministries. While recent legislation like the Water Resources Act of 2020 has been introduced, implementation remains fragmented across ministries such as the Ministry of Health and Ministry of Lands and Natural Resources, as well as the Tonga Water Board under the Ministry of Public Enterprises.

The management of water resources faces ad-hoc regulation due to capacity, budget, and skilled personnel constraints. Water testing for contamination is sporadic due to resource limitations, posing health risks. Community Development Plans (CDPs) that were developed under the Ministry of Internal Affairs with the facilitation of MORDI Tonga Trust highlights water-related issues as urgent needs, yet they are not integrated into Tonga's Strategic Development Framework (TSDF II) effectively. Monitoring Sustainable Development Goal 6 (SDG 6) progress is irregular, with fragmented donor-supported projects and training.

The Tonga Strategic Development Framework (2015-2025) mentions improved infrastructure services as a significant component of the development plan. However, water supply is not mentioned nor has the Government prioritised it. The implications are that SDG6 will not be achieved despite 84% of villages ranking it as a priority and 56% ranking water supply as their highest priority (White et al., 2020). The ADB and governments of Australia and Tonga pooled funds to implement the Nuku'alofa Urban Development Sector Project (2012-2020) that saw the rehabilitation of 17 well fields, construction of 12 new well fields and the installation of a new four million litre reservoir and several pumping stations, which provided residents a regular water supply. The project also built new sanitation facilities in poor households and new public conveniences along the waterfront and other public spaces. The waste management utility, Waste Authority Limited (WAL), also upgraded its truck fleet and expanded the waste management landfill (Wilson et al., 2023).

The current situation in Tonga regarding water resources presents a multifaceted challenge. Access to safe drinking water remains limited, particularly in rural and remote communities, where reliance on untreated water sources poses health risks due to potential waterborne diseases. Inadequate sanitation facilities exacerbate the problem, contributing to poor hygiene practices and environmental contamination.

Open defecation persists in some areas, further endangering public health and degrading the environment. Compounding these issues is the aging and inadequate water supply infrastructure, characterised by outdated pipelines, storage facilities, and treatment plants, resulting in water losses, inefficiencies, and service disruptions. Insufficient investment in infrastructure maintenance and upgrades worsens the situation, perpetuating challenges in ensuring a reliable and safe water supply.

Several gaps and challenges exist in Tonga's water management framework. Firstly, the policy and regulatory framework lack coherence, integration, and enforcement mechanisms,

leading to inefficiencies in implementation. Fragmented governance structures and overlapping mandates among government agencies further complicate effective water governance. Inadequate legal frameworks, outdated regulations, and limited institutional capacity hinder resource allocation and enforcement of standards, while weak coordination between stakeholders and insufficient engagement exacerbates the water crisis.

Variance occurs in water supply infrastructure, including insufficient coverage, poor quality, and limited access to basic services, particularly in rural areas. Inadequate investment in infrastructure development, maintenance, and upgrades exacerbates challenges associated with aging and deteriorating infrastructure. Limited financial resources, technical expertise, and institutional capacity constrain efforts to improve water supply infrastructure and services, while climate change impacts, such as extreme weather events and sea-level rise, pose additional strains on existing infrastructure and exacerbate water-related risks.

Water quality monitoring and sanitation standards also face challenges in Tonga, with inconsistent enforcement leading to contamination of surroundings and inadequate sanitation facilities. Weak enforcement mechanisms, inadequate human resources, and limited public awareness hinder efforts to improve water quality and sanitation practices. Socioeconomic factors such as poverty, cultural norms, and education levels further influence access to and utilisation of water and sanitation services.

Addressing Tonga's water crisis requires comprehensive solutions and recommendations. Strengthening the legal and regulatory framework for water resource management through policy reforms is crucial, including the development of a National Water Policy and enactment of updated water acts. Enhanced coordination and collaboration among government agencies, civil society organisations, and community stakeholders are essential to improve water governance, accountability, and transparency.

Furthermore, increasing investment in water supply infrastructure development, rehabilitation, and maintenance is imperative, with a focus on prioritising underserved communities and vulnerable populations. Adopting innovative financing mechanisms such as public-private partnerships and community-based initiatives can mobilise resources for infrastructure projects and ensure their sustainability. Strengthening water quality monitoring systems and sanitation standards, along with promoting hygiene education and community-led sanitation initiatives, are essential for improving sanitation practices and reducing health risks. Aligning development needs with goals, integration at national and community levels is essential. This involves aligning CDPs with national and ministry plans, facilitating a holistic approach to address water issues effectively.

The current situation in Tonga reflects challenges in access to safe drinking water, sanitation, and sustainable infrastructure. Inadequate policies and regulations, coupled with aging infrastructure and insufficient resources, exacerbate these issues. Weak enforcement mechanisms and limited data exacerbate water quality concerns.

Bridging the gap between development needs and goals, integration at both national and community levels is essential. This necessitates aligning CDPs with national and ministry plans, fostering a holistic approach to effectively address water issues. The current situation in Tonga underscores challenges in accessing safe drinking water, sanitation, and sustainable infrastructure. Inadequate policies and regulations, coupled with aging infrastructure and insufficient resources, exacerbate these issues. Weak enforcement mechanisms and limited data exacerbate concerns regarding water quality.

Solutions to Tonga's water crisis require comprehensive reforms and collaborative efforts. Strengthening the legal framework and institutional capacity for water management is paramount, alongside enhancing coordination among stakeholders. Investment in infrastructure development, maintenance, and innovative financing mechanisms can help bridge gaps in water supply infrastructure. Strengthening water quality monitoring, sanitation standards, and promoting hygiene education are imperative for safeguarding public health. Investing in infrastructure development, maintenance, and innovative financing mechanisms can address gaps in water supply infrastructure. Strengthening water quality monitoring, sanitation standards, and promoting hygiene education are imperative for public health.

Meeting national development and SDG targets demands prioritising rural water infrastructure, enhancing data collection and monitoring capabilities, and fostering multi-stakeholder partnerships. In conclusion, addressing Tonga's water crisis necessitates holistic strategies encompassing policy reforms, infrastructure investments, and community engagement. Addressing the identified gaps, challenges, and solutions, Tonga can make significant progress toward meeting its national development targets related to water supply, sanitation, and public health. Aligning efforts with Sustainable Development Goal 6 (Clean Water and Sanitation) will contribute to achieving universal access to safe drinking water and sanitation, ensuring sustainable water resource management, and promoting public health and environmental sustainability.

9.6 Protecting our precious: Marrying national and local governance mechanisms to increase water security

This part of our chapter presents three case studies from different PICTs arguing that to improve water security in a changing climate, there is a strong need to focus on understanding and improving governance mechanisms for water security at the national level, island level, ridge to reef, community and household levels.

Most importantly, the following case studies (case studies 5, 6, 7) marry both national and traditional governance systems as well as traditional knowledge and scientific knowledge of water availability, accessibility, management, and climate change.

9.6.1 Case study 5: Water security and climate change in Samoa

The Samoa Independent Water Schemes Association (SIWSA,) is a non-government organisation formed in 2007 to support 34 Independent Water Schemes (IWS) servicing 36,000 people in 54 villages. IWS range in size from 15 to 400 household connections (Samoa Independent Water Schemes Association Web Site). SIWSA provides a focal point to channel and administer government and donor funds (European Union and Asian Development Bank) for technical design, construction, and maintenance of water infrastructures, replacing old pipes, rehabilitation of water catchment areas, collaborating with the Ministry of Health to conduct regular water quality testing, and capacity training for village water committees charged with operations and management of village water supply.

IWS are not without challenges. However, the benefits far outweigh the negatives as suggested by the President of the IWSA (personal communication, May 17,2023). IWS provides affordable and improved drinking water supply for all households connected to the system. IWS started as a village(s) self-help initiative to provide reliable and safe drinking water for the community by means of utilising village water resources. Additionally, IWS provides water for households remotely located from government water mains where connection is uneconomical. A contextualised and basic variation of integrated water resources management (IWRM) best describes water resources management approach by the villages with IWS (Tauaa, 2017; Apelu-Uili, 2015). Considering the small size of the country's watershed areas located within village customary lands allows for better coordinated development and management of village water and land resources under the purview of the council of chiefs or local government (Meleisea, 1987; Amosa 2010; Huffer & So'o 2000). The council of chiefs monitors and oversees the work of the village water sub-committee.

The latter are tasked with daily operations such as maintenance work, catchment inspections to check against encroachment of village farming activities such as cattle farming and monitoring village reforestation projects. Women play an important role in safeguarding village bathing and drinking water pools in addition to monitoring the use of standalone Ultra Violet (UV) Filtration System Kiosks in several villages with IWS to guard against waste and unnecessary usage https://www.samoagovt.ws. Fresh water pools in 80 percent of IWS serve as water storage and an alternative water source in the dry season.

Water governance of IWS is embedded in the 'fa'amatai' (chiefly) system of local government providing the social, economic, and administrative system for development and management of village water resources. Values and principles of good governance, transparency, accountability, inclusivity are integrated with Indigenous values of caring for the vulnerable members of the community, respect for nature and the sacred space between people and nature that governs the villagers' relationship in the management of water, land, and ocean resources IWS in Samoa demonstrates how donor resources and expertise amalgamated with traditional structures of governance and administration can positively influence the delivery and safeguarding of water resources among the village communities in this case study.

Placing the responsibility of water management directly in the hands of the community and giving them the resources to operate, manage and safeguard their water resources is a key dimension of rural household water security and an important component of national water security (ADB, 2020). IWS in Samoa demonstrates how investment in water development can go a long way towards addressing water security at the village- household level where governance structures are already in place to enable water service delivery that is doable and sustainable.

9.6.2 Case study 6: Addressing water security in Fiji through cultural and hybrid village development networks

Fiji's climate is dominated by the Southeast trade winds with an average annual precipitation of 1500 millimetres on the smaller islands to 4000 mm on the larger islands; wet season runs from November to April generating 80% of annual total rainfall during this period. The other 20% of the annual rainfall falls during the dry season (May to October). The wet/cyclonic season are characterised with tropical disturbances and the El Niño generating high intensity rainfall and flooding whilst the dry season exacerbates drought conditions prompted by La Niña episodes leading to decline agricultural productivity, limited rainfall disrupting hydro-electric power generation in Viti Levu and further aggravates water crisis with increased water shortages during these periods (Carpenter et al., 2003).

Fiji, like other PICTs share similar challenges to water security signifying the pressing need to develop effective interventions from communities to national levels. More recently Fiji is experiencing a water crisis with increasing water cuts and unavailability of water due to aged infrastructure. In 2015 the Millennium Development Goal (MDG) 7 that focused on environmental sustainability was achieved globally and Fiji achieved its targets for both water supply and sanitation resulting in the increase in urban population access to safe water from 94% in 1990 to 100% by 2012 and the proportion of urban population access to sanitation increased from 85% to 92% over the same period (ADB, 2019). Recently, Fiji scores relatively high in universal access to safe water; according to the UNICEF JMP & WHO (2020), report it was stated that 94.3% of Fiji's population have access to basic water supply services. Overall, 98% of urban dwellers and 89% of rural dwellers access water services with 2% of remote areas and island dwellers access surface water; these further averages 10 deaths per year from water related diseases (Overbeek et al., 2022).

Over the years, Fiji has also made significant progress with major investments in maintenance of existing and construction of new water sources & catchments, upgrading distribution systems with rural water projects. Water Authority of Fiji (WAF) recorded a total of 156,571 water connections and 33,392 wastewater connections with 12,565 water tanks distributed to rural communities and 353 completed rural water supply projects benefiting an estimated 73,832 population between 2017 to 2023 (Ministry of Finance, 2024). However, despite the current progress, water insecurity still persists due to the current challenges the sector encounters; these are mainly economically unviable water utility, climate change, ageing infrastructure, environmental impact, skills and capacity gaps.

The current major water challenge that Fiji encounters is the ageing infrastructure that has been overworked due to the increasing population growth leading to constant breakdowns and costly recovery operations. The greater Suva area is supplied with two main water treatment plants that are more than 40 years old: Tamavua – built in 1961 supplying 60 million litres/day and Waila – built in 1982 supplying 95 million litres/day. WAF has also responded to 150 pipes burst since March 2023 exceeding the global benchmark for pipe networks burst of 13 for every 100square kilometre of network. This is further aggravated by leaked water that costs WAF FJ$23 million annually and water scarcity causes further challenges to communities; although Fiji's four main water sources (surface water, ground water, rainwater and sea water) are accessible; surface water is most favourable for major towns and these impacts the volume of water availability. WAF being mandated to ensure that all Fijians have access to clean and safe drinking water has recommended 10 priority action areas to assist in the achievement of water security; complete water corporatisation, diversify water sources to build climate resilience, future proof infrastructure, smart water network, action on sanitation through innovation, living lab, new financing and contracting models, improving environmental performance and water living (WAF, 2023). Community-Based Water Management (CBWM) has been considered as

the dominant model for rural water services in the Pacific; however, research evidence from the Pacific has shown that communities do take ownership and responsibility to manage water systems, but they have low sustainability and limited scalability. Consequently, the concept of rural 'village' in Fiji extends well beyond its physical borders where urban dwellers who are related to the village remain heavily invested in their rural village's development aspirations. This has increasingly become a trend across Fiji, where social networks through solesolevaki and soli and other collective self-help, reciprocity and giving promotes social cohesion, support, and good relations within and beyond families, tribes and community at large (Love et al., 2023).

Networks and culture as WaSH enablers: the case of Galoa Island, Kadavu, Fiji

The island of Galoa is located adjacent to the village of Wailevu in Kadavu and they both share traditional and cultural ties. The small, predominately sand-based island of Galoa has limited freshwater sources. As the population of the island increased so has the demand for freshwater supply prompting the community to seek alternatives. The solution that the community discovered was to revisit and enhance their cultural ties with the neighboring village of Wailevu. The adjacent village of Wailevu is located in the much larger volcanic island with abundant freshwater sources. The communities of Galoa and Wailevu are located in the same tikina (district) of Nabukelevu. Hence, leveraging to an extent their social networks and drawing on their strong socio-cultural linkages; the customary elders of Galoa visited the mataqali (land owning clan) of Wailevu in the early 2000s to request access to one of their hinterland water sources. Capitalising on their traditional ties and connections, their request was granted and two weeks' thereafter, the construction of a dam for the island began, water pipes were laid out and connected to the households on Galoa (see Figure 9.4).

The deal was formalised through an official agreement that was signed between the two parties including the mataqali village leaders in each village. Complementary to the formalisation of the deal, the villagers of Galoa island provided gifts to the Wailevu community that included tabua (whales tooth), kava (yaqona), bags of flour, sugar, and rice with a sum of money that Wailevu used to open a village investment account with Unit Trust of Fiji. Additionally, the villagers of Galoa island did not work in isolation, their immediate and extended families that resided in urban areas both locally and abroad supported extensively the water accessibility project of their island. The support from urban communities of Galoa included fundraising for the compulsory contribution towards the cost of the water system through a combination of mats sales and fundraising efforts soli (free will giving) led by the women. Since 1998 till 2003, the village fundraising along with the contributions from their urban relatives amounted to FJ$30,000 for the water system installation and the water supply became operational in 2004. This signifies the importance of socio-cultural ties and resilience.

The use of customary and contemporary practices, processes and norms to address contemporary water access challenges is a creative, constructive and agentive adaptation that reflects on the principles of good governance and humanity (Love et al., 2023).

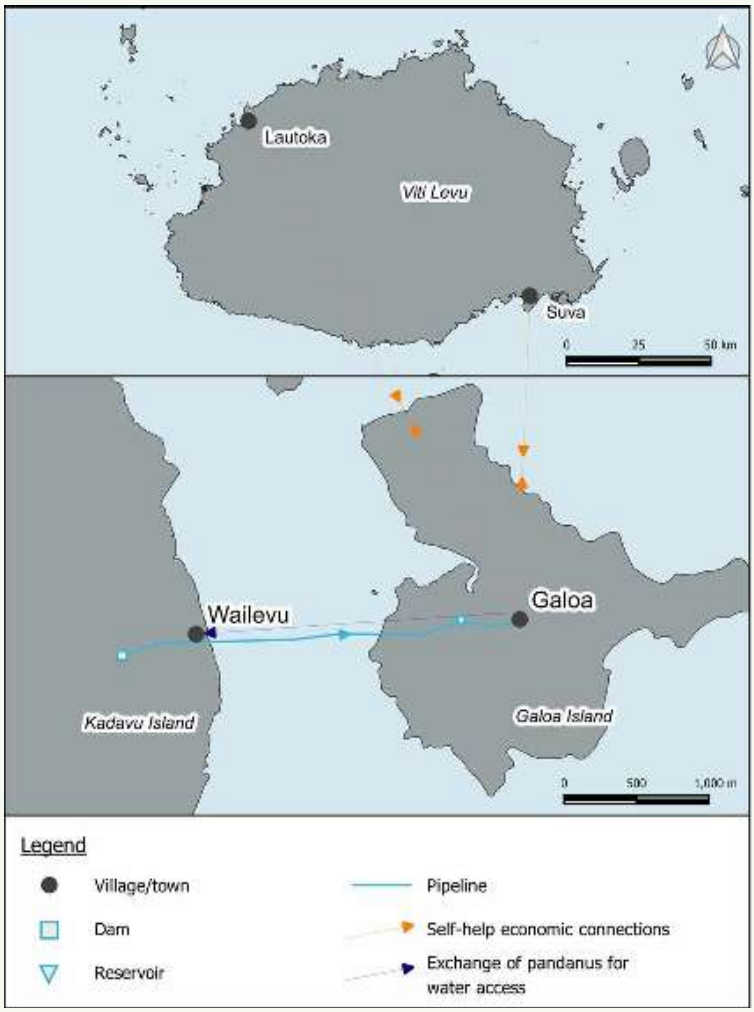


Figure 9.4: *shows Galoa and Wailevu villages, with the location of Galoa water supply source and economic connections (orange arrows), leveraged to support water system installation. Source: Map by R. Sanderson with data from The Pacific Community (SPC) Statistics for Development Division & Open Street Map.*

'Hybrid' village development committees as adaptive response to water governance

Fiji, like many PICs have long-standing traditionally structured community governance and is relatively uniform. In this context, a community is classified as either a koro (a registered Indigenous village). In Indigenous Fijian or iTaukei villages, a community is governed through reference to customary leadership positions, headed by the Turaga ni Koro (TnK) who is chosen by the villagers and paid a small stipend by the government. A Village Council (Bose va Koro) presides over various village committees. According to the 2016 Ministry of I-Taukei Affairs Draft Village By-Laws, every koro should have 11 standard committees.

Including a water committee, health committee, development committee, natural resource management committee, school committee, and more. These committees form part of the quorum for discussions at Village Council meetings, where decisions made are recognised by the state as being official. Village development committees are one of the most important of these various committees. In 2021, four 'hybrid' village development committees identified consisted of both rural village-based members and extra-local members, meaning people from the village but who now reside elsewhere - in urban centers within Fiji or overseas (Love et al., 2023).

The composition of the four Village Development Committees (VDCs) studied varies, ranging from 4 (Waciwaci) to 21 (Vuninuku). All the hybrid VDC included both urban and village-based members except for Waciwaci village who also has members of their VDC who are based in overseas. The membership of the VDCs reflects on the significant levels of out-migration (rural urban drift) across the country. The VDCs also varied in how they are operated in the case study sites, there are VDCs who met monthly in conjunction with the Bose va Koro village meetings, there are also those that have their meetings outside of the village, to areas where their fellow villagers reside in urban areas across Fiji. However, the villages across the country are faced with high levels of out-migration where individuals leave for educational and employment opportunities both locally and abroad; this poses significant challenges for rural development planning (policy & implementation), village governance and self-reliance. In Nalotawa, there were only three young men permanently resident in the village in 2021, while in Waciwaci the decline of young people meant that 'we just don't have the manpower to carry out the (necessary) physical activities in the village' (Waciwaci-VB-M). However, the village receives influx of individuals and families returning for retirement and special occasions such as weddings, funerals, or other special events. This can place considerable stress on rural WASH services and infrastructure, with the influx of large numbers of people during holiday periods posing a particular challenge. In this light, the 'hybrid' committee membership structure is an innovative adaptation. In Nalotawa, the community now uses an urban–rural membership structure for all their standard village-based committees – water committee, health committee, and natural resource committee. This signals a significant shift in how communities are structured and managed, underscoring the fact that the 'whole community' is not simply those who currently or permanently reside in a village. Maintaining a connection to culture and land (vanua), supporting villager's education, providing guidance and support for village development activities (e.g., participating in soli and writing funding proposals), and building financial capacity were the most prominent objectives of the VDCs.

The specific activities of VDCs depend on the development priorities identified through village processes (e.g., Bose va Koro meetings). In the four case-studies, the key development activities led by the VDCs included:

- Vuninuku: Installing a reservoir tank, household water tanks, solar panels, the construction of a village hall, and early childhood center;

- Nalotawa: Upgrading the reservoir tank, supplying solar panels, leasing more land for yaqona farming;

- Waciwaci: Construction of reservoir tank and the provision of private taps for each household in the village; and

- Wailotua No. 1: Water system upgrade/Unit Trust of Fiji and community hall upgrade and extension (evacuation shelter for floods and cyclones).

The VDCs overall role is to prioritise, plan, fund, and progress community development aspirations, with the bulk of the funding coming from fundraising or soli. In Cikobia-i-Ra, the VDC worked towards having an annual operating budget to cover the expenses of the church, community projects, and other initiatives such as water and sanitation improvements. This operating budget is all raised through fundraising or 'love gifts' as commonly referred to as soli. The use of the village development committee to manage and coordinate development efforts in the village including water management is testament of the importance of good governance that is inclusive to drive community development and progress (Love et al., 2023).

The household survey data from eight rural communities demonstrates the strong socio-economic linkages that exist between urban and rural family groups. The qualitative data from these same communities showed that these networks provide not just family support but also community-wide support; infrastructure improvements that stand for the 'social whole', like water systems, community halls, and schools. This was especially evident in Nabubu, Rukuruku and Galoa. The Galoa case-study underscores the important point that leveraging micro-proximal rural-to-rural relations, not just urban-to-rural networks, can also be critical. The activation of (neo)customary practices (and values) to further build cooperation and trust between Galoa and Wailevu highlights the productive side of 'bonding social capital'. When people and culture – rather than a government or its agents – enable agreement making between similar but differentially situated groups to ensure equitable access to safe, reliable, and adequate water, they must be appreciated as critical components of the local WASH enabling environment.

This 'hybrid' membership structure of the VDC, made up of both rural and extra-local (urban or international) members, is an innovative adaptation that has been beneficial for communities and an innovative response to high levels of out-migration. Functionally, urban-based members have provided critical human and fiscal resources that have enhanced rural WaSH outcomes. Moreover, some VDCs operate as an important post-disaster buffer, providing a source of adaptive capacity in response to emergencies. In the case of this very small sample, the government had only rarely (and reactively) engaged with VDC members in town, and none had ever had any engagement with non-government organisations.

If this was to be replicated across a larger study size, development actors can be said to be missing an important and influential human resource: village sons, daughters, and place-based common interest associations based in town who are already active in, and focused on, rural community development (Love et al., 2022).

The role of cultural relations and hybrid village development networks situated in both urban, rural and remote areas foster mutual understanding and cooperation in water development projects and interventions. Recognising and enhancing existing cultural and social relations can ensure equal and inclusive participation of communities in ensuring a water secure future.

9.6.3 Case study 7: Marrying community based and national government approaches - Development needs first approach to building water security governance for resilience in Tonga

Water security is a pressing concern for rural communities in Tonga, particularly amidst the backdrop of climate change, which magnifies existing vulnerabilities. This case study investigates the Tonga Rural Innovation Project II (TRIP II), a collaborative initiative between the Government of Tonga, International Fund for Agricultural Development (IFAD) and the Mainstreaming of Rural Development Innovation (MORDI) Tonga Trust. TRIP II aims to integrate climate change adaptation, vulnerability reduction, and risk management into participatory Community Development Planning (CDP) to address the water security challenges facing these communities.

This case study examines the effectiveness of Tonga's community-driven approach in integrating climate change adaptation strategies to bolster water security. Through an analysis of CDPs spanning from 2007 to 2019 in districts such as Vahe Motu and Lulunga, the study seeks to evaluate the alignment of these plans with the Sustainable Development Goals (SDGs) and the targets outlined in the Sendai Framework. By comprehensively examining identified needs and priorities, the research endeavours to offer insights into the successes, challenges, and evolving nature of Tonga's grassroots development efforts.

Since its inception in 2007, Community Development Plans (CDPs) have played a vital role in fostering grassroots participation and empowerment in Tonga. Before this, community development efforts often lacked meaningful engagement with local stakeholders and tended to be top-down in nature. Recognising the importance of involving communities in decision-making processes and tailoring development interventions to their specific needs, the Government of Tonga initiated the Community Development Planning process.

Examination of plans from Tonga's Vahe Motu and Lulunga Districts reveals shared challenges. Reliance on fishing, farming, and weaving exposes both districts to water scarcity exacerbated by climate change. Rainwater harvesting, the primary water source, proves insufficient during prolonged dry spells, necessitating resilient water management strategies (Steiner et al., 2016).

The integration of DRR into CDPs emerges as a practical solution, aligning community priorities with resilience-building efforts (Steiner et al., 2016). Tonga's local officers advocate for this integration to combat plan inundation and ensure actionable outcomes. Empowering communities through capacity-building activities enhances resilience, enabling them to adapt to changing environments sustainably (Steiner et al., 2016).

Communities are better prepared for disasters when their capacities are built on their own knowledge, whether traditional or trained (Delica-Willison & Gaillard, 2012). Traditional practices guide community preparations, but gaps persist in long-term planning and complex disaster response efforts (Delica-Willison & Gaillard, 2012). Empowering communities through Community Development Plans (CDPs) enables them to identify and address urgent needs, including vulnerabilities during disasters such as water scarcity exacerbated by cyclones. Proactive measures outlined in the CDPs, aligned with Sustainable Development Goals (SDGs), promote sustainable development, and enhance community well-being (Steiner et al., 2016).

In contrast, top-down development initiatives in Tonga often lack sustainability and community ownership, hindering project success (Chambers, 2005). To break the cycle of poverty and empower marginalised communities, participatory decision-making and community engagement are crucial (Khan, 2006). By embracing participatory approaches, Tonga aims to build resilience from the ground up, ensuring that development efforts are tailored to meet the diverse needs and aspirations of its communities (Sen, 2001).

Lack of access to clean water is still an issue because although there have been water projects where new plastic water tanks were delivered to the island, the problem was more complex (see Figure 9.3). While there is a lack of water storage facilities, the roofs that harvest the rainwater are corroded and some do not have any spouts or downpipes, or most are broken if there are any. As for flushed toilets, the discussion has been covered earlier on to gain an understanding of why these are almost impossible to install, especially in the Lulunga District where access to water is limited.

The lack of community/evacuation halls is largely since there are many halls in each island, but most belong to various churches such as the Wesleyan, Church of Jesus Christ of Latter-Day Saints, Church of Tonga and most do not share the same belief and therefore keep insisting on a community hall for all to have access to. The lack of medical clinics or doctors on the islands is largely due to the lack of staff available from the hospital. As for the sporting equipment/field, there are fields on each island but building a gym to house sporting equipment has so far not been supported by any donor or the Government.

Figure 9.5 below shows the result of a community survey to determine the urgent needs for the Lulunga District for the years 2007, 2017 and 2019. It shows that lack of access to clean water supply ranks very high (second only to erratic telecommunications service) during all three years.

Other parts of Tonga have similar issues but different ranking of needs. For instance, a similar survey for Vahe Motu District (Figure 9.5) shows a different trend where lack of access to clean water supply is ranked 6th in 2007 and was not ranked at all in 2016 and 2019. service is better and more However, lack of flushed toilets appear towards the top of the list for 2007 and 2019.

The case study findings highlight the transformative impact of participatory community development planning in a rural Tongan community facilitated by MORDI TT. Through extensive workshops and consultations, community members identified key development priorities, particularly focusing on water-related initiatives.

These priorities included enhancing infrastructure, implementing conservation measures, and improving management practices, all while considering climate change projections and local vulnerabilities.

The findings underscore the effectiveness of Community Development Plans (CDPs) in Tonga since their inception in 2007. They reveal a significant shift towards decentralised governance and community-driven development, enabling local stakeholders to actively participate in decision-making processes and shape development interventions to address water security issues.

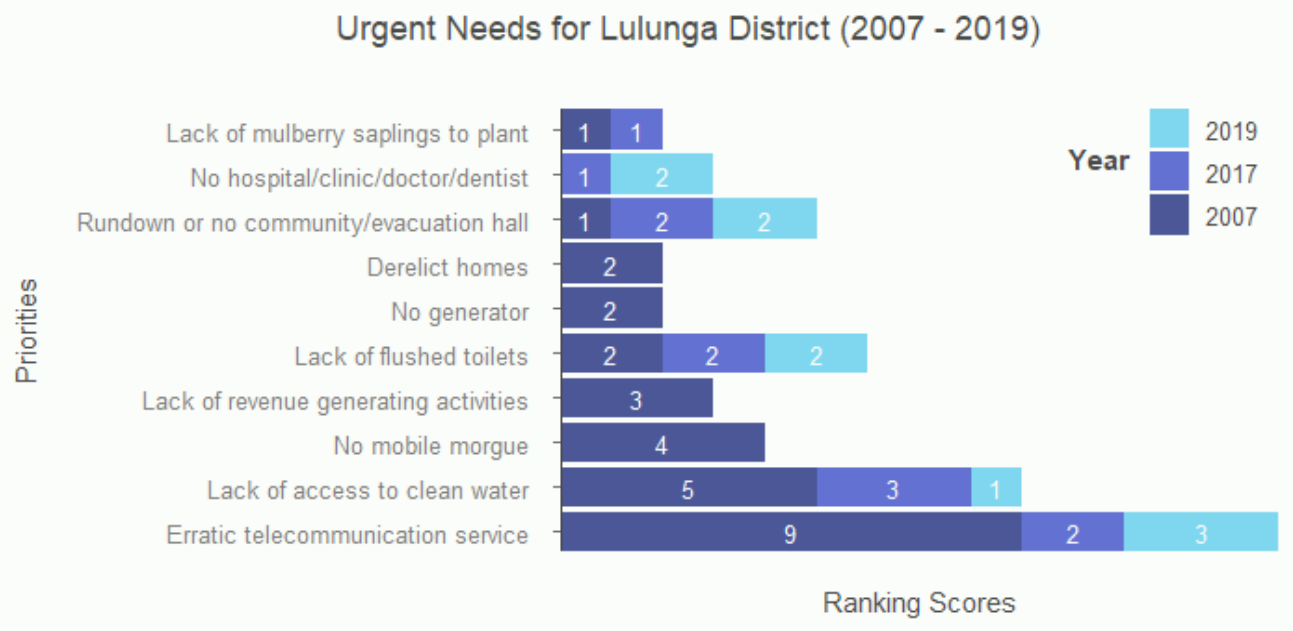


Figure 9.5: Compiled urgent needs for Lulunga District for 2007 – 2019 Data shared by Mainstreaming of Rural Development Innovation, Tonga Trust.

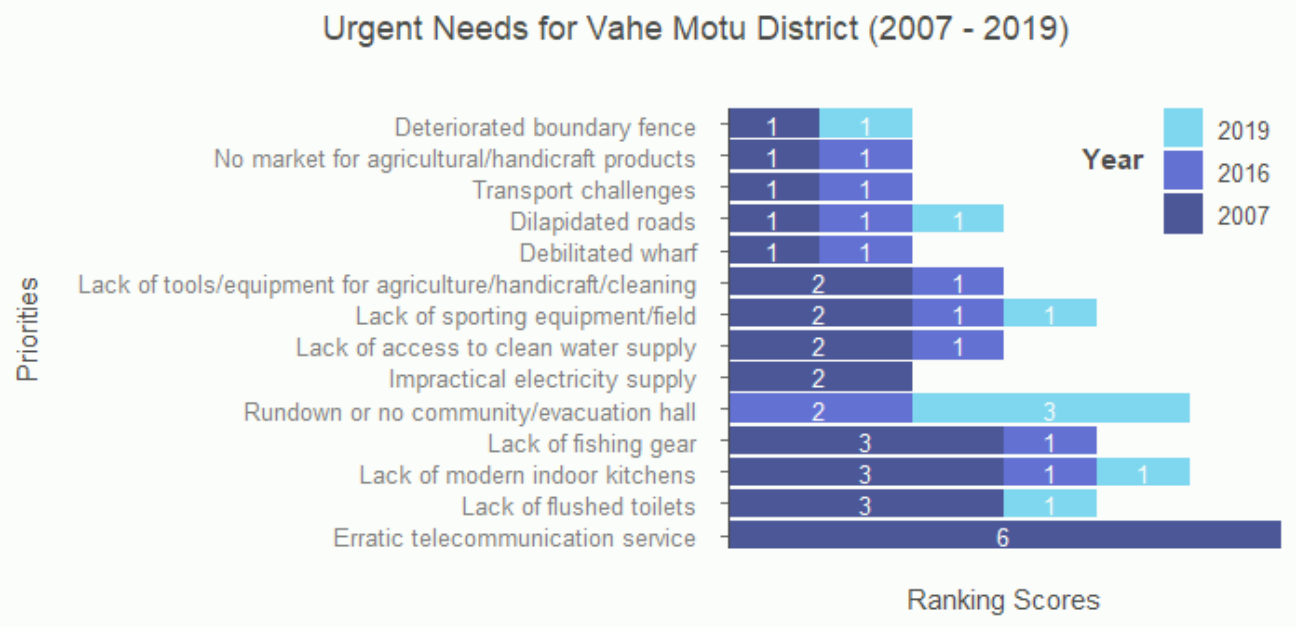


Figure 9.6: *Compiled Urgent Needs for the Vahe Motu District for 2007 – 2019. Shared by Mainstreaming of Rural Development Innovation Tonga Trust (MORDI TT).*

9.6.4 Case study 8: Measuring the health and quality of the rivers and waterways

One of the major gaps in our analysis of the many responses to improve water security governance is the lack of monitoring tools to know if the interventions contributed to the improvement of water quality or not. One critical study by one of the authors focused on identifying bioindicators of healthy waterways in New Zealand and Samoa to help monitor the quality of water and impacts of different interventions.

Freshwater health is critical in the lives of every living thing. Monitoring the state of freshwater health is vital in determining the health of streams and rivers that are sourcing drinking and recreational water use in the local communities of the PICTs. One way we can monitor the health of freshwater is by using freshwater macroinvertebrates, these little creatures inhabit waterways depending on the conditions or health state of the water. In other countries such as New Zealand (Macpherson & Macpherson, 2017) an index score is given to the macroinvertebrates according to their pollution tolerance and pollutant sensitivity. Freshwater macroinvertebrates that are pollutant sensitive are mostly likely to be found in freshwater ways that are more pristine and less impacted. However, freshwater macroinvertebrates that are pollutant tolerant are most likely to be found in freshwater ways that are polluted and less pristine. Predominantly habitat locations do contribute to the presence of invertebrates given certain water conditions. Water security is threatened daily; freshwater can be abundant but cannot be consumed. Freshwater can be flowing, yet the level of pollution deemed it a health risk and a threat to the environment and human lives that are dependent on it.

For Samoa, there is no provided index for the freshwater macroinvertebrate communities in the waterways of the inhabited islands. Traditional knowledge on freshwater macroinvertebrates do exist and the changing climate and anthropogenic activities threaten and impact the health of streams and also impacting on this knowledge as macroinvertebrates adapt to the changing climate in order to survive and thrive in their natural habitats (Figure 9.7).

To fully understand the level of freshwater health that is secured and safe for drinking and for recreational use for local communities; a chemical, microbial and macroinvertebrate analysis has to be done and used to measure the continuous changing health of our streams in our islands. This can better inform the existing traditional knowledge and educate our communities and children on ways that can minimise pollution in our freshwater ways.

Freshwater macroinvertebrate communities are important indicators of freshwater health and better understanding of their existence in the various freshwater conditions is much needed in research. This information can better sustain and prevent pollution levels that are detrimental to the health of our freshwater streams and rivers.

Water health is vital in the changing climate in all PIC – monitoring the health of streams, rivers and freshwater sources is one way to determine the health of water safety and security. Measures of freshwater pollution using chemical, microbial (bacteria) and macroinvertebrates are being used in the Pacific to determine pollution levels and inform water health in streams that feed pipe water in some countries such as Samoa.



Figure 9.7: *Freshwater Macroinvertebrates as indicator species for water quality*

9.7 Becoming uninhabitable: Analysis of cases and important key lessons for improving water security in PICTs

Our stories in the case studies showcase the strong connection between climate change, development, and water insecurity in PICTs. Climate change and unsustainable development policies and practices have contributed to countries making very poor progress in terms of providing water security. Only 55% of the total PICTs population have access to basic water and only 30% have access to basic sanitation (Wilson et al., 2023). The impact of climate change and the level of responses are diverse and context specific. Furthermore, part of the challenge has to do with the geographical, financial and capacity constrains which exacerbate exposure to climate change. This makes our adaptation even more challenging.

The case studies from atoll islands illustrate the challenges of limited water sources due to saltwater intrusion, inundation, droughts, limited lands and increasing populations. The reality is, the droughts are extremely harsh, but households and communities can recover, but the impacts of rising sea levels and coastal inundations and saltwater intrusion not only salinised wells but communities find it more difficult to recover or build back and revive the same well. The community and government responses of looking for new sites for wells have caused socio-cultural conflicts in atolls because of limited available lands. This emphasised the need to focus on strong and well enforced policies at the national level and also for local government responsibilities to look into in-country migration and reduce localised pollution. Evidence from atoll islands shows that worsening impacts of climate change on water sources and limitations of land will make these atoll islands uninhabitable for humans – not able to sustain human societies. This is even with the islands not 'sinking'. Several responses to droughts in atolls have generated both positive and negative experiences.

The use of bottled water provided relief, but they are costly and lead to more waste management issues as empty bottles often end up at landfills, water ways and the sea. There is a need to include approaches to greening strategies to improve the effectiveness of drought responses. The reliance on water tanks and desalination processes for water security have been attributed as the cause of loss of traditional method of acquiring water. Increasing rainfall harvesting and storage adaptations have been useful, but they are not enough to establish water tanks and water harvesting capacity at every household.

The increasing use of desalinators and reverse osmosis and further exploration of nanotechnology to improve water availability, accessibility and quality for people and environment could be transformational for water security on atolls.

There is also a strong need to increase water use efficiency and maintenance skills and knowledge of households. These households do not have water security in 'normal' times.

Increasing the access to water in normal times to prepare for droughts without knowledge of water use management and efficiency has been problematic in atolls and in PICTs generally. Households without knowledge of water use efficiency and managing water before an early phase of droughts, tend to use all their stored water quickly. Adaptation strategies digging more wells in scarce land has led to more social problems and conflict. One reason is that sacred cultural and spiritual sites are being dug up for wells thus provoking resistance by other members of the community.

As shared from Solomon Islands, droughts impact the most vulnerable groups such as women and people living with disability more. Water security is worsened by limited water management capacity as well as siloed, sectoral and disconnected policies in relation to water security governance. Different departments and sectors look after water availability, water accessibility, water quality and sanitation as in the case in Tonga. There is a disconnect between the community-based development priorities and national level priorities. There is a need for alignment and synergies.

Despite the challenges, there is empowerment in recognising and using localised approaches for water security governance as the case studies in Samoa, Tonga, Fiji have shown. Collaboration between chiefs, local resource owners and the community in relation to land and water is critical. As the Samoa and Fiji examples have shown, reciprocity and caring for one another and environment are key to water security and sustainability. The use of both traditional governance and modern governance systems have worked well in some instances. Engaging with the local traditional leadership and relationships are crucial as they are, in many cases, also have some authority over land and water resources.

Another example of collaborative water governance can work well is the case in Tonga where MORDI TT, Government of Tonga, international partners such as IFAD and local communities work together. This approach helps to provides the governance mechanisms for identification and prioritising needs such as water security as well as empower local communities through training and to mobilise their own resources to address the community's water security priorities. Another important aspect of this collaborative approach is the integration of climate change and disaster risk reduction knowledge into both the planning and implementation phases.

One common limitation identified is the lack of proper indicators and methodologies to monitor and evaluate the impacts of water security governance interventions at both the household, utilities and environment. Related to this is lack of monitoring and evaluation processes and tools to assess the quality of water for people and the environment.

Our case study 8 above shares the process and uniqueness of the approaches to identify and know the diversity of bio-indicators at different location and countries. In the development of these monitoring and evaluation tools for water availability, accessibility and quality, local contexts should be considered, including the local environmental indicators, capacity, and knowledge systems.

9.8 Policy implications

Few policy implications have been identified from our chapter.

a. There is a need for governments to integrate climate change and developmental approaches in water security policies for the environment and people. How climate change impacts the progress of SDG 6, and how to adapt to climate change in all aspect of water security and development should also be considered.

b. A comprehensive review is needed of national and subnational policies relating to water security to align different stakeholders' needs, strengthen coordination mechanisms and integrate national and community-based governance systems and policies.

c. Relook at how to increase access to resources for adaptation to overcome constrains such as finances to ensure every household can own sufficient water harvesting and storage infrastructures, learn skills to maintain water infrastructures and improve skills in water use management.

d. Conduct more research to explore the effectiveness of collaboration between traditional knowledge and different knowledge systems as well as traditional governance systems and national governance processes to improve water security for people and the environment.

e. Increase research to document the experiences of local communities not only on adverse impacts of climate change but more importantly how communities build resilience with the support of local environmental systems and human relationship to improve water security at the environment, household, community, island, and the national levels.

f. Increase the capacity to monitor, measure and evaluate the impacts of our interventions on water quality and accessibility to improve water security for people and the environment. Therefore, it is very important to continue to work on data generation, storage, and exchange of information on water availability, accessibility and quality to improve monitoring, evaluation and learning. A critical part of this process is developing methods to identify bio-indicators of water quality in our environment. For PICTs, healthy water is a strong foundation for healthy people and environment.



> “We use well water and rainwater for drinking but if rainwater finishes then we get water from the 3 wells located farther inland on the eastern side”
>
> Katarina Ankitino
> Abaokoro
> North Tarawa
> Kiribati
> (POCCA research team interview, 2023)

A water well in Kiribati that is often inundated with salt water (Photo: POCCA team, 2023).

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Chapter 10

Safe Livelihoods & Social Protection in the Climate Crisis

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A protective seawall in Abaokoro, North Tarawa, Kiribati does little to project from incoming waves (Photo: POCCA team, 2023).

Abstract

Indigenous mechanisms of participatory processes and recognition of the importance of relationships including kinship ties and local environments over time are essential for effective adaptation and social protection frameworks, which build the resilience of Pacific Island communities to climate change impacts in an equitable and sustainable manner. This chapter considers the way the compounding and cascading risks associated with the climate crisis are challenging these crucial relationships including at the household level, in local environments and among the wider Pacific diaspora. Discussion also considered the social protection needs in predominantly young and gendered Pacific community contexts. The discussion challenges and widens the dominant focus in climate adaptation literature on human security as financial investment, to consider the importance of actions that strengthen relationships within and between communities and places.

Glossary of key terms

Social protection	Social safety nets to protect people from the vagaries of social and economic risk
Human security	An array of social, psychological, political, cultural and economic factors which shape people's sense of well-being
Safe Livelihoods	Agro-ecosystems within inter-dependent networks based on kinship, political and social networks that produce surplus production



> ‘Let us continue to build on this spirit of togetherness and use our collective strength to create a brighter future for all. For the challenge of climate change, we have nothing but to work together’

Community participant
Tongatapu
Tonga
(POCCA research team interview, 2023)

Coastal inundation in Tonga threatening the livelihoods of people living near the coast in Tongatapu (Photo: POCCA team, 2023).

10.1 Introduction

For Pacific peoples and their communities ensuring safe livelihoods and social protection in response to rapid and slow onset climate change involves understanding intersecting relationships between communities and the natural world and interactions between social, cultural, political, economic and environmental realms of knowledge. Fundamental to these interactions are Indigenous kin-based relationships and the ways in which they are enacted between, across, and over generations and local places. The kin-based relations in Pacific communities, often expressed through dance and artistry, and characterised as plant and animal totems, intimately connect people with ancestral lands and waters. These connections are tangible such as respecting formal resource management practices like rahui, an Indigenous form of restricting access to a resource (Bambridge, 2016), but also intangible such as having a sense of belonging (for children see Freeman et al., 2022). Combined they underpin Indigenous Pacific understandings of livelihood security and reciprocity, and over time have allowed communities to adapt to gradual environmental change. But the climate crisis is challenging and disrupting these relationships and restoring good relations is fundamental to successful adaptation.

Formal, informal and hybrid processes of adaptation co-exist and are forms of 'social protection' and 'human security'. Moreover, the mobility of Pacific people and the transnational nature of many communities require the use of concepts that enable thinking across national boundaries. There are Indigenous forms of protection and security that revolve around communities but there are also new cross-border forms which highlight the limitations of conventional notions of national borders: all involve the enactment of social relationships, and these are gendered. In this chapter, we explain kin-based social relationships as Indigenous 'social protection' and 'human security', examine global policy imperatives pertaining to social protection in IPCC 2022, focus on the critical issue of land before looking at a case study in the Solomon Islands. We complete this chapter by highlighting the importance of the youthful, mobile and gendered population profile of Pacific communities – a complex context for understanding future challenges and opportunities for human security and social protection.

10.2 Towards Indigenous Pacific understandings of human security and social protection

The notion of 'human security' stretches back to a UNDP report in 1994 (UNDP, 1994), and was significantly boosted in 2003 with the report of the UN Commission on Human Security where people, not states, were firmly at the centre of security debates.

Its contemporary relevance remains because the severe cross-boundary impacts of COVID-19 and the compounding effects of rapid climate change (Newman, 2022). In general, it is well accepted that human security refers to threats which directly impact people's sense of safety, comfort, risk, wellbeing, and identity (Krickel-Choi, 2022). Over the last decade, state-centred security concerns have grown with the escalation of threats to people whose relationship to 'The State' has been violently contested because of their difference in terms of, for instance, ethnic background, religious conviction, sexual preference, racial appearance, or gender. Non-material ontological threats such as the direct and indirect impacts of climate change and devastation of the global COVID-19 pandemic have also drawn attention back to more holistic embodied understandings of human security.

'Social protection' is a related concept that broadly refers to mechanisms, processes, policies and programmes used to address the situation of those who are in a state of insecurity due to poverty, vulnerability and inequities (Tenzing, 2020). Social protection interventions predominantly aim for systemic change, although the nature and scope of change is diverse, including for instance; transformational, anticipatory, adaptational, mitigating, and neo-liberal. Few account for the multidimensional impacts of climate change (Kundo et al., 2024). Even fewer incorporate the unique insights offered by Indigenous approaches. Indigenous Pacific perspectives on human security and social protection emphasize holistic understandings of relationality and dynamic notions of power. These perspectives prioritise safe livelihoods through interconnected and community-focused approaches. Scholars from small island developing states have demonstrated Indigenous ways of understanding human security by drawing attention to the importance of kin networks (Ratuva, 2014) and the value of integrating knowledge across scales including the local (Jerez Columbié & Morrissey, 2023). This revives possibilities for non-transactional and generational processes of economic, social, cultural and environmental transformation.

In Pacific worldviews, threats and mechanisms for protecting people are mediated by Indigenous concepts such as ola le lei which, in the low-lying country of Tuvalu, refers to a range of processes of preparedness (Panapa et al., 2021). Such vernacular notions of human security are grounded in the realities of Pacific lives and livelihoods which include many pressing issues such as coastal erosion, land degradation, protein shortages, poor health and education services, and gender inequality. These issues are intertwined in dynamic and often paradoxical ways. For instance, Pacific communities continue to demonstrate innovation and resilience in food systems, yet food insecurity also exists, especially in urban settings, and high levels of food imports contribute to poor health. Similarly, exciting expressions of cultural identity are evidenced in a range of cultural and religious events, yet women and children are also disproportionally subject to domestic violence. Understanding the dynamic of Indigenous Pacific ways of ensuring 'safe livelihoods' and 'social protection' as the compounding impacts of climate crises unfold, demonstrates the complex challenges and opportunities that need policy attention.

10.3 Indigenous adaptive social protection mechanisms

Participatory processes and recognition of the traditional kinship systems that exist in communities are key elements in designing adaptive social protection frameworks to convert and build resilience of communities to manage and mitigate climate-related risks in the Pacific Islands. Some of these processes have co-existed for generations in Indigenous communities, transforming social protection into adaptive modes of action.

In Indigenous cultures the wellbeing of a community, children and women included, are central to community survival and happiness. Over generations, unspoken social contracts ensure that community members with shared ancestry lookout for each other. However, colonisation and Christianity has suppressed, in some cases totally removed some voices although it is well understood that impactful social protection frameworks require participatory processes including community consultations to elevate the voices of women, and traditional knowledge holders (Howard, 2023; Lane & McNaught, 2009). Kinship systems are deeply embedded within the local cultures, and both challenge and cushion families in times of economic and social risk (Ratuva, 2014). A key aspect of adaptive social protection is to invest in households and kinships in a participatory way (see Figure 10.1). Resilience building is a key aspect of adaptive social protection and investments must be at the household level to prepare them for, cope with, and adapt to shocks (Bowen et al., 2020).

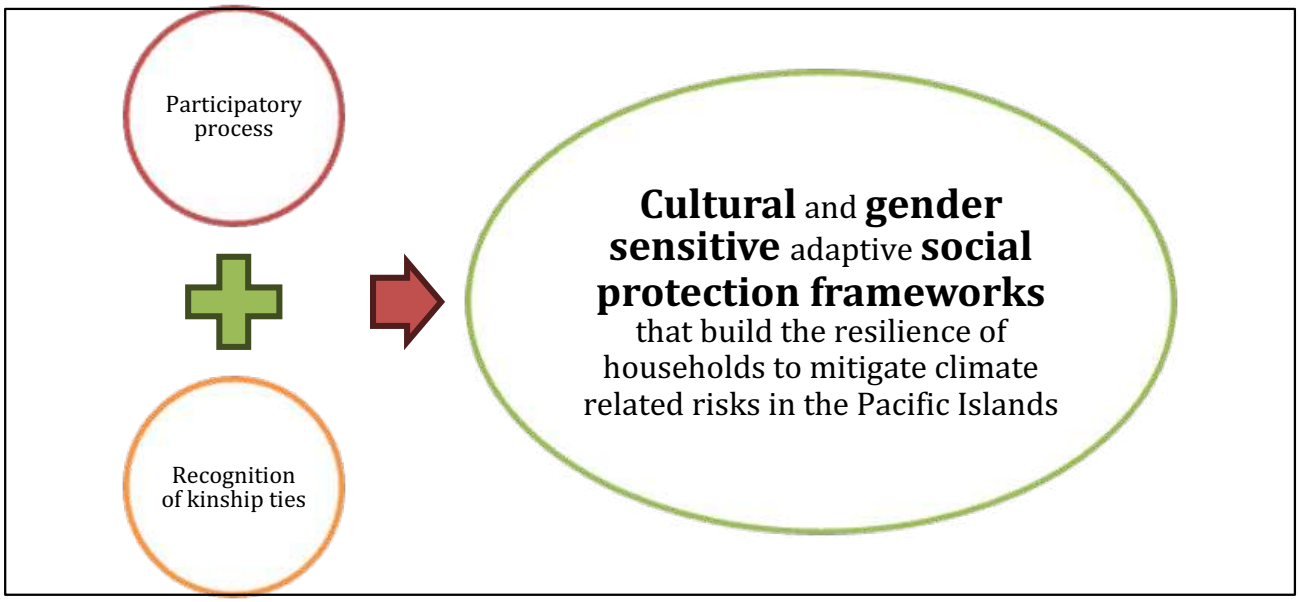


Figure 10.1: Indigenous sequential steps to achieve a cultural and gender sensitive adaptive social protection framework for the Pacific Islands.

Formal discourse on social protection centres around transfers of cash or in-kind support to people or communities to address risks, vulnerabilities, inequality or poverty. The narrative must also value Indigenous culture, so that people can draw from their own Indigenous cultures, sometimes fused with contemporary experiences to adapt to their evolving social environment (Ratuva, 2010). This evolution could include responding to various shocks, such as climate induced disasters, economic crises, pandemics and conflict and social protection (Ratuva, 2014).

Social protection in the context of safeguarding Pacific people's lives and livelihoods amidst climate crises focuses on resilience building, livelihood diversification, cash transfers, and integrating local knowledge. One way in which this was operationalised was through vertical expansion of existing social protection programs. For instance, after Tropical Cyclone Winston hit Fiji in 2016, the government used existing cash transfer programs to be temporarily increased to meet the additional needs of existing beneficiaries. This included providing extra cash payments alongside housing vouchers for home reconstruction (UNESCO, 2023). Social protection programs in the Pacific can be modified in various ways to become more disaster-responsive, such as by providing incentives and assistance to retrofit houses against cyclones or delivering public works programs to rebuild mangrove forests (UNESCO, 2023). Another way is in the form of 'Second Home Program' in Vanuatu, which secures land rights for communities that need to relocate due to climate change impacts, ensuring communities are not excluded or left without livelihoods when displaced. It is an adaptive social protection initiative that supports the country's climate change adaptation strategy (Jensen, 2019).

Existing social protections must be value-added to be adaptive so that, for instance, international interventions protecting coastlines for communities last longer than project funding. To convert this into adaptive social protection, wide participatory consultation process is needed. Taking into consideration the range of gendered social relationship could identify immediate needs such as education, employment, and livelihoods, rather than just short-term climate adaptation. Adaptive social protection safeguards Pacific people's livelihoods, manages climate-related risks and migration, and promotes sustainable, equitable development in the face of climate change (Ramsay et al., 2023; UNDESA, 2023; Mcloed et al., 2019). Pacific people have a long history of being first responders to climate risks such as sea level rise, temporary and permanent migration, and have knowledge and kinship ties that can support governments to manage climate-related migration as a strategy to enhance resilience, ensuring migration remains a choice rather than a necessity.

Participatory processes will provide a strong gender engagement to address the specific vulnerabilities and needs of women in the Pacific. Women in the Pacific are disproportionately impacted by climate change, yet their voices and agency are often overlooked in policy and decision-making (Howard, 2023; Lane & McNaught, 2009). Adaptive social protection programs must address gender dynamics that reinforce existing power imbalances that marginalise Pacific women and set strategies recognising women's critical role in building community resilience (SPC, 2013).

Gender responsive social protection can help address intersecting vulnerabilities faced by women, such as mobility constraints, gender-based violence, and unequal access to education, health, and livelihoods (Howard, 2023; Mcleod et al., 2018). This is crucial for enabling women's adaptive capacity.

The linkages between climate change and gender-based violence are rarely addressed in the mainstream climate discourse yet were noted as a priority in a workshop in Palau and reinforced with data from Vanuatu and Samoa (Mcleod et al., 2018). Vanuatu data was collected during a post disaster needs assessment for Tropical Cyclone Pam which hit the country in 2015, whilst Samoa's data was a case study collected by the International Federation of Red Cross and Red Crescent Societies from Samoa in 2016. These data highlight the potential for climate change to exacerbate gender-based violence so it is therefore necessary to ensure that policies designed to protect women are reinforced and can be effectively implemented (Mcleod et al., 2018). Indigenous mechanisms of participatory processes and recognition of kinship ties are essential for designing adaptive social protection frameworks to build the resilience of Pacific Islands communities to climate change impacts in an equitable and sustainable manner.

The following section discusses the 2022 Intergovernmental Panel on Climate Change report on climate change and its impact on human security, and secure livelihoods to highlight the imperatives to include Indigenous ways of understanding social protection. We then focus on issues of land disputes before examining a case of negotiating land tenure arrangements in the Solomon Islands highlighting the intricate negotiations that shape them.

10.4 IPCC on climate change, social protection and human security

The idea that social protection, as cultural, institutional, financial activities and institutions, that can reduce loss, and build resilience to support communities facing significant climate shocks and risk, has gradually emerged in the language of Intergovernmental Panel on Climate Change reports. In the 2022 Impacts, Adaptation and Assessment Report, it's defined in two ways, in the context of development aid and climate policy. It is used to refer to

> ...public and private initiatives that provide income or consumption transfers to the poor, protect the vulnerable against livelihood risks and enhance the social status and rights of the marginalised, with the overall objective of reducing the economic and social vulnerability of poor, vulnerable and marginalised groups (IPCC, 2022 p. 2923, citing Devereux & Sabates-Wheeler, 2004).

It is also used to describe

> ...all public and private initiatives that provide access to services, such as health, education or housing, or income and consumption transfers to people (IPCC, 2022, p. 2923).

While the focus of the report is on the way that social protection reduces risks and enhances the status and rights of marginalised, and vulnerable groups, there is increasing recognition in the Assessment Round Six that all forms of protection support community resilience, even where it does not appear to be directly related to climate (IPCC, 2022 T.S.E.24).

This gradual broadening of the concept of social protection is a slow but significant process of acknowledging the importance of relationships and collective rights. Previous IPCC reports have placed greater emphasis on the concept of human security in the context of climate change defining this as

> ...a condition that exists when the vital core of human lives is protected, and when people have the freedom and capacity to live with dignity (Adger et al., 2014).

In this context the 'vital core of human lives' refers to the 'universal and culturally specific, material and non-material elements necessary for people to act on behalf of their interests (Adger et al., 2014, p. 755). Others note that while there are diverse linkages between climate change and risks of conflict, and other national security concerns, much of this research has been overly 'deterministic' and fails to recognise the complexity of climate and security 'nexus' and more insight is needed particularly from social sciences and Indigenous knowledge perspectives (Ratuva, 2019).

In the 2022 IPCC Impacts, Adaptation, and Vulnerability report, human security is used specifically in relation to secure food, water and livelihoods. Small island communities are discussed and assessed as 'resilient' where they have 'strong social safety nets and high levels of observed 'social capital' (Mycoo & Wairiu et al., 2022). The Small Islands chapter also notes that there is currently limited information on the effectiveness of community adaptation practices or what

> ...constitutes successful adaptation, and resilience and what the limits to adaptation are' (Mycoo & Wairiu et al., 2022, pp. 5-6).

Relevant to this current stock take review, is also the assessment in the Small Islands chapter of the 2022 IPCC report that we need much greater research and insight into what 'drivers' serve to weaken local and Indigenous resilience (see Mycoo & Wairiu et al., 2022). That report also highlights the need for more research to understand how 'socio-political contexts' influence 'community adaptation and enable action towards climate resilient development pathways,' that is development that integrates a mix of mitigation and adaptation actions to promote sustainable development for all (Schipper et al., 2018). The attention paid to the socio-political contexts is welcome because of the importance of negotiating power relations in the Pacific.

Concern has been expressed more widely, however, that the narratives of human security, adaptation and wellbeing found in much research in the Pacific are frequently deficit focused and apocalyptic. Without denying the significant risks in the context of the speed of action required to limit global warming, claims that it is 'too late' to secure human well-being in the Pacific or that societal collapse is 'inevitable,' must be challenged. Not only do such narratives feed the bleakness of tipping-point rhetoric but they obscure on-going extractivism in global power relations and hide significant innovative social support systems and traditional practices 'that demonstrate high level of dynamism and institutional support in the community's response to risks (Singh et al., 2022; Hayward et al., 2020).

While serious impacts of sea-level rise may already be unavoidable, and ongoing global mitigation efforts may be essential to avoid further catastrophic impacts, the claims that it already too late to act obscures the significant ongoing adaptation efforts already initiated in the Pacific, particularly those led by women and youth. These are informed by distinctive community values such as in Samoa, for instance; vai nui or fonofale (interconnected well-living). With over 1400 distinct languages in the Pacific, recognition of local expressions of such concepts are emerging. But these are values that have sustained many societies through traumatic histories and legacies of colonisation, racism, and violence, and are still positioned to support communities suffering now, and when facing future risks (Hayward et al., 2020).

10.4.1 'Enablers' of effective climate adaptation in small islands

The 2022 IPCC chapter on small islands identified a series of 'enablers' which can help advance effective climate adaptation, sustainable development, and wellbeing. these include effective 'governance and legal reforms; improving justice, equity and gender inclusive policy practices; building human resource capacity; increased finance and risk transfer mechanisms; education and awareness programmes; increased access to climate information; and more adequately downscaled climate data' that can be used by communities to understand climate trends and impacts. The chapter also highlighted the value of 'embedding' and 'integrating' Indigenous knowledge and local knowledge and cultural resources into decision-making about adaptation and community preparedness (Mycoo & Wairiu et al., 2022, pp. 5-6).

However, the report also identified the need for much greater understanding of local social and political contexts of climate decision making, including local population dynamics such as migration, and population momentum because of historically high fertility. The 2022 IPCC chapter on small islands further argues that many current institutional and legal systems are inadequately prepared for managing large-scale settlement relocation and other responses to climate risks (Mycoo & Wairiu et al., 2022).

Other barriers to effective climate adaptation action include 'inadequate up-to-date and locally relevant information, limited availability of finance and technology, lack of integration of Indigenous and local knowledge in adaptation strategies, and domestic violence which can act to chill women's participation' (Mycoo & Wairiu et al., 2022). An additional key challenge for small islands which was identified in the 2022 report, is to scale up and coordinate adaptation actions, many of which were assessed to be 'too often incremental and do not match the scale of extreme or compounding events. Some of the systemic and sectoral scale adaptation action include new and emerging national adaptation plans and disaster risk reduction plans particularly the plans developed in Vanuatu' (Roy et al., 2018 p. 471; Mycoo & Wairiu et al., 2022).

10.5 Mobility and land: At the heart of social protection

It is historically known that Pacific Islanders are a mobile people, transversing the vastness of the ocean, between different islands and beyond territories seeking opportunities for trade, intermarriage, expansion of kinship relations, additional land, and resources, and often time for fun. They viewed their sea of islands as interconnected pathways offering opportunities for encounter and adventure. In his well celebrated essay 'Our Sea of Islands' the late Epeli Hau'ofa described the ocean as a theatre for migration and transnational pathways connecting Pacific Islanders to their home islands and beyond without any hindrances (Hau'ofa, 2008). This vast ocean was defined as home to the Pacific people and connects all their islands.

The colonisation of the Pacific Islands brought about significant changes that also resulted in the forced relocation and displacement of Pacific Islands communities and people as colonial powers pursued their political and economic interests in the islands. Examples include the displacement of Bikini people in Marshall Islands due to US nuclear testing (Kiste, 1977; Niedenthal, 1997), the forced relocation of Mururoa and Fangataufa people in French Polynesia because of French nuclear testing and the extensive radioactivity on their islands. The Banabans were forced to relocate to Rabi Island in Fiji in the 1940s (Teaiwa, 2015), and groups of Gilbertese families were also forced to move from the Gilbert Islands to Phoenix Islands in the 1930s, and then to Solomon Islands in the 1950s and 1960s. One of this chapters author's grandparents were part of the relocation in the 1960s (Tabe, 2011).

Migration is considered an adaptation strategy to climate change, yet many Pacific Islands see it as the very last resort (Campbell, 2014). However, debates about whether a community should stay or move due to climate change raises fears about the loss of land, culture, and identity. These concerns reflect similar challenges faced by communities that have been historically displaced from their home islands. Cultural identity is deeply connected to land and is very important for Pacific peoples. However, for diaspora communities, the question of identity becomes critical when the land of residence or settlement is not their ancestral land (Rynkiewich, 2012).

Although colonisation drove the displacement and forced movements of many Pacific Island communities, it also paved new corridors and pathways that enhanced movements of Pacific Islanders creating diaspora communities in metropolitan countries like New Zealand, Australia, United Kingdom, France, and the United States, some under agreements and compacts with colonial countries (Rynkiewich, 2012). New Zealand hosts the biggest Polynesian diaspora under the Free Association Agreement, with the US hosting the largest Micronesian diaspora communities through the Compact of the Free Association (COFA). While many of these diaspora communities continue to maintain relations with people and families at home through reciprocity of remittances and cultural goods, they also face many challenges as they try to integrate into new societies and navigate new cultural and environmental settings.

However, there is also an emerging challenge to dominant expectations in climate adaptation literature, that Pacific diaspora communities can endlessly contribute to the social protection of kin in ancestral homelands, particularly through transnational transfer of finances, information and ideas, and social capital (Silchenko & Murray, 2022). New research highlights the nuanced impact of climate change on diaspora and suggests much more attention needs to be paid to the 'feelings' and 'expectations of responsibility', of diaspora communities in the context of, 'their own obligations to 'aiga' and experiences of multi-level impacts of climate change). Leo Tupuana'i argues after Tiatia-Seath et al., (2020), that dominant assumptions that diaspora can be sources of transactional or instrumental social protection underestimate the profound impact of climate change on the wellbeing of the diaspora and on Pacific peoples' 'identity' as connections to 'a sense of place and belonging.

Climate change is also profoundly undermining the human security of Pacific Island communities and people and is likely to worsen based on current global trajectories. The Boe Declaration Action Plan recognises that climate change is an existential threat and underlines the need to better anticipate, understand, and contextualise the impacts of climate change on human security and its relationship with human mobility in the Pacific.

Studies have projected that as effects of climate change become more evident (through tropical cyclones, droughts, precipitation, flooding, sea-level rise, and increase in temperatures, as impacts become more evident in the islands), more people from the Pacific Islands will move from coastal to further inland, from rural to urban centres, and beyond their islands, or become displaced from their homes (Adger, 2014; Bedford et al., 2023).

Land was an important form of human security for the diaspora I-Kiribati people in Solomon Islands, but they lost all their lands when they were forced to relocate to Solomon Islands. Now they live on land plots that were allocated to them when they first arrived on Wagina, and this cannot be inherited by their children or passed on to their grandchildren. While there was a need to preserve their cultural identity as I-Kiribati people, the need for integration into the larger Melanesian society was even more critical. Intermarriage was an important approach for integration and access to land especially for the future generations. In this case, identity had to be negotiated in relation to place of residence and homes of origin (Tabe, 2016).

Identifying as Solomon Islanders and as I-Kiribati present different strengths and drawbacks. Being Solomon Islanders means that they have become part of the larger Melanesian society and have access to similar education and employment opportunities offered to citizens of the country, however, prioritisation can be a drawback to being awarded these opportunities. The Gilbertese culture is still widely observed and most of the people speak the language, but the integration of other cultures through intermarriages has also diminished much of the culture among the younger I-Kiribati people (Tabe, 2011).

Gilbertese do not have marine or land tenure, so stewardship and conservation are often a challenge. However, land can be purchased within urban areas that are not held under customary ownership. Although the implications of the forced relocation to Solomon Islands presents both strengths and drawbacks at different levels for the Gilbertese people, having multiple identities has allowed descendants like me to be able to navigate between these identities where relevant in different spaces.

Acknowledging being I-Kiribati also revitalised connections with Kiribati - the land of origin and thereby presents some form of assurance that the government of Kiribati would render support to its relocated people when the need arises.

Land ownership, especially customary land, holds immense significance and must be safeguarded as a form of social protection. Most land is in local Indigenous ownership, there is still considerable state-owned land that needs to be acknowledged. Small-scale relocation to other land is feasible, but each household or community move invokes the importance of recognising and honouring ancestral connections, genealogy, and local customs. This is the lived experience of many Pacific people, but climate change is increasing the scale and frequency of both small-scale and larger-scale moves. Indigenous systems and processes for land management and the settlement of new lands become important as Pacific peoples look to safeguard their futures. While nuances exist in land issues, clarity regarding land ownership facilitates smoother transitions and garners support from the community, affirming the accessibility and utilisation of ancestral lands for sustainable livelihoods.

Climate change has an impact on land disputes arising from reduced size of arable land, relocation, competition over resources and escalation of pre-existing land use and ownership disputes and differences. This section looks at state-based and community-based conflict resolution mechanisms as forms of social protection to address these impacts and disputes.

Land is an important and essential asset that provides food and freshwater resources and multiple ecosystem services and biodiversity for human livelihoods and well-being. Climate change impacts and increase in frequency of extreme events has negatively impacted terrestrial biodiversity and food security and ecosystems and contributed to land degradation and desertification in many countries across the globe. Increasing ocean temperatures, frequent and intense tropical cyclones, flash flooding and extreme droughts are impacting food production systems and water security in the Pacific Islands and causing climate-induced migration and conflicts over use and distribution of resources (McLeod et al., 2019). Land in many Pacific Islands is primarily owned and governed by land-owning groups and customary tenure, but governance systems and practices of land use and distribution are not uniform across the region (Higgins et al., 2021).

Land degradation and depletion exacerbated by climate change is straining social protection mechanisms and livelihoods as it strains many of the customary governance systems and increases the risk of community conflicts over land use and distribution and access to resources. Managing conflicts that arise from management and distribution of land and resources is central to community governance structures and leadership in the region, some more complex and structurally hierarchical than others. Indigenous conflict resolution and peacebuilding practice includes community dialogue and reconciliation processes administered through traditional and community governance and leadership systems (Higgins et al., 2021). Climate change is also increasing the severity of natural disasters resulting in scarcity and loss of land and resources, infrastructure, assets, and even human lives. This compounds pressure on the government and local authorities and services.

10.6 Generations and identity: Youthful, mobile and gendered

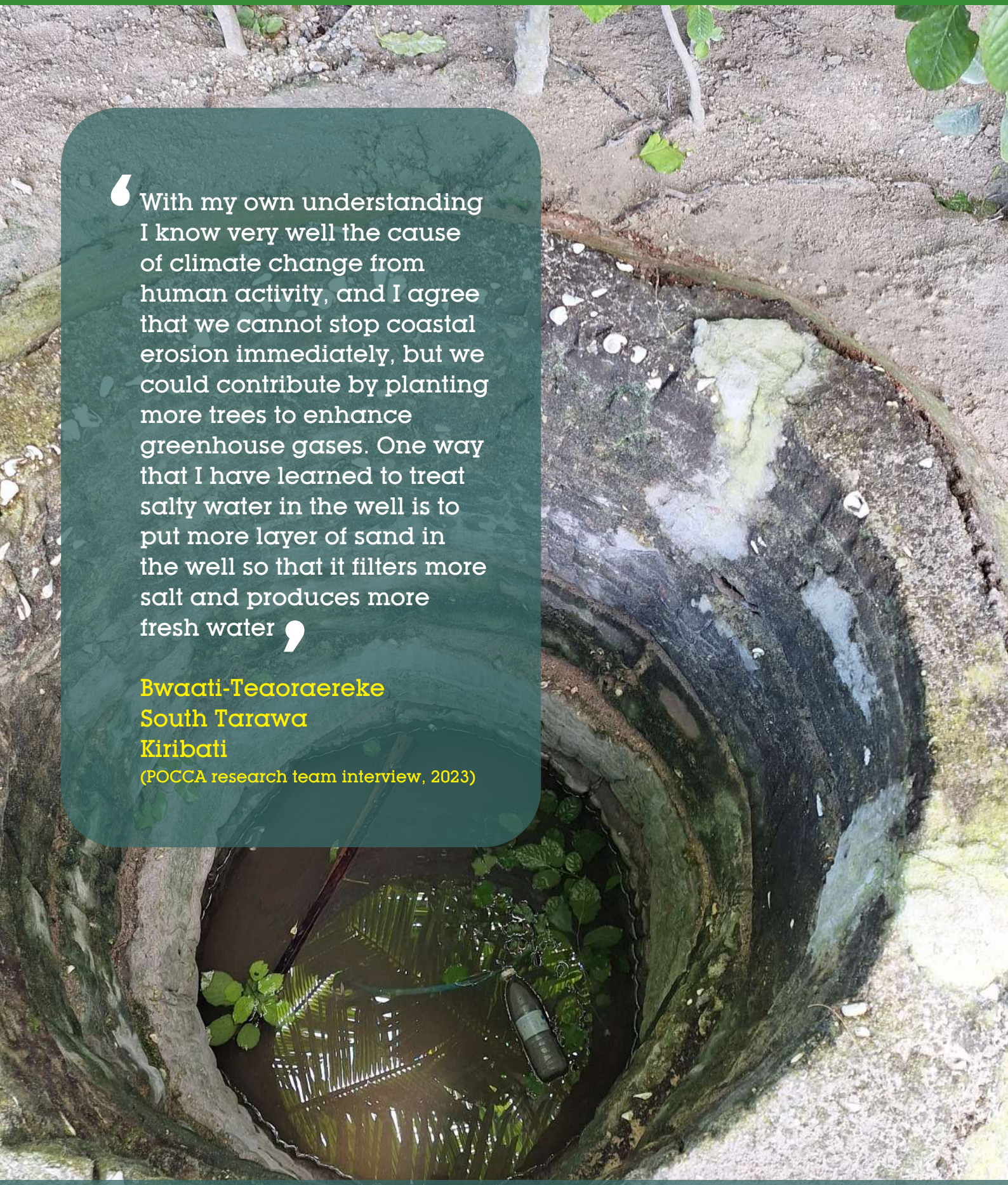
I like to listen to the sounds of the waves unfolding onto the limestone rocks near my grandparents' house at night and waking up to the sight of the ocean in the morning. The ocean is foundational to my identity because my grandfather said that we are people of the sea. I grew up in a coastal village called Arariki on the island of Wagina, before moving to Honiara, the capital of Solomon Islands to attend high school, and then to Fiji for University. I never thought that identity was going to be such a challenge when I left home.

I have always known that I am Gilbertese (or I-Kiribati, the term used now) but as I moved away from Wagina, my identity became unclear as I learned to embody new forms of identities and navigate the cultural diversity of the Pacific Islands. I am a Solomon Islander, I-Kiribati and a Tuvaluan. My layers of identities were outcomes of cultural intermarriages, historical relocations, and displacement of my grandparents from the Gilbert Islands to Phoenix Islands and eventually to Solomon Islands. We have become a Gilbertese/I-Kiribati diaspora in the Solomon Islands (Tammy Tabe, 2024)

10.6.1 Youthful

With the region's median population aged under 23, the Pacific Islands have an abundance of young people, particularly in the Western Pacific. This offers challenges and opportunities which need to be incorporated into climate adaptation and social protection planning.

Concerns have been expressed that high numbers of young people strain government resources in education, health, employment opportunities, and economic development, particularly in growing urban communities in the Pacific (Wilson, 2020). The frustrated aspirations of young Pacific communities have a potential to intensify social, economic and political stress (Wilson, 2020). However, in recent years, there has also been a growing recognition that there are huge benefits to increasing educational and employment opportunities for youth and in a younger workforce. Benefiting from these opportunities requires policies and strategies to establish structures that fully integrate youth perceptions and provide spaces for young people to contribute towards decision making, and strengthen youth participation in economic, social, and political processes in ways that strengthen cultural knowledge and community relationships (ESCAP, 2013; Cammock et al., 2021; McMeeking & Timoteo et al., 2024). Regional organisations such as the Pacific Community (SPC) are working with youth organisations throughout the region to build capacity and to help them forge partnerships with government and non-governmental organisations to address the increased challenges of education, youth unemployment, and opportunities for sustainable development (SPC, 2023).



> "With my own understanding I know very well the cause of climate change from human activity, and I agree that we cannot stop coastal erosion immediately, but we could contribute by planting more trees to enhance greenhouse gases. One way that I have learned to treat salty water in the well is to put more layer of sand in the well so that it filters more salt and produces more fresh water"

Bwaati-Teaoraereke
South Tarawa
Kiribati
(POCCA research team interview, 2023)

Contaminated water source in South Tarawa, Kiribati due to salt water intrusion and poor waste management (Photo: POCCA team, 2023).

In many PICTs, young people have been included and integrated in forums and projects that allow them to exchange their experiences, advocate and participate actively in the advancement of social, and economic development, and in championing climate change adaptation initiatives (UNICEF, 2020). There are emerging opportunities for intergenerational conversations and cultural strengths-based approaches to learning about how communities have coped with adversity and developed social protection and livelihoods in the past, which can support young people's confidence to make decisions in a changing climate and aid in reconnecting the relationships which are vital to supporting effective climate adaptation (McMeeking & Timoteo et al., 2024).

10.6.2 Mobile

Rapid changes in internal urban rural demographic trends, urbanisation, and population concentration including internal migration, displacement, and relocation impact on climate exposure will affect livelihoods. Inter-island migration has long been a coping mechanism for Pacific Islanders when faced with droughts, conflicts, or land shortages. With escalating impacts of climate change and sea-level rise, migration will continue to be a coping mechanism for Pacific Islands communities, particularly those living in low-lying atolls and coastal areas. However, rapid urbanisation in the Pacific Islands has brought about benefits such as access to improved social and health services, infrastructure, access to more education and employment opportunities than those in the rural areas. Due to the concentration of development of infrastructure in urban areas, there is a disparity in the economic and infrastructural development in rural areas where communities still highly depend on the informal and subsistence economy (Kuruppu, 2016). Rapid urbanisation in the Pacific has given rise to rural-urban migration leading to an increase of many informal settlements and given rise to socio-economic and environmental issues. Many of the informal settlements are in flood-prone areas and along coastal urban boundaries that are exposed to climate-related impacts such as sea-level rise and coastal erosion. Natural hazards such as tropical cyclones and flooding are primary challenges for informal settlements, and they are usually the ones mostly affected during natural disasters (Gero et al., 2017).

10.6.3 Gendered

Women provide the bulk of care work which is a vital component of sustainable livelihoods in Indigenous Pacific communities. Ensuring that women have a voice in decision-making, is also critical for communities and kin groups in the context of the climate crisis. Yet violent patriarchal practices in both formal and informal institutions result in high levels of gender-based violence and contribute to low rates of women's political representation. The problematic relationships that underpin these behaviours are complex and are compounded by the impacts of climate change like climate mobility. Meanwhile women continue to secure their livelihoods and that of their families and communities through diverse economic practices which enable them to maintain flexible sustainable livelihoods providing critical social protection for new generations. Empowered women will enable community-based economies to be scaled up, sustainable livelihoods to flourish, and robust social protection processes maintained.

10.7 Concluding thoughts

As climate crises unfold, this chapter has identified emerging examples of Indigenous-led decision making to address the complex interactions that arise for Pacific peoples and communities working to ensure safe livelihoods and social protection. However, to scale up and sustain these processes requires both capacity building for Indigenous leadership and adequate financial investment in Indigenous-led adaptation. At present, funding investment in social protection and livelihoods remains limited and 'highly fragmented' and the funding that is available often has high transaction costs and risks undermining rather than supporting the relationships that are foundational to social protection and safe livelihoods (GFDRR, 2014; Fouad et al., 2021).



> “We also share resources with our relatives from the different islands. Whether we need food, building materials, even fertile soil we share especially after cyclones and during droughts. Our ancestors and parents operate that way, we continue to follow the tradition. Our relationship between the islands is very important”
>
> **Community participant**
> **Cook Islands**
> (POCCA research team interview, 2023)

Dead trees along North Tarawa due to rising sea level and limited rainfall (Photo: POCCA team, 2023).

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Chapter 11

COVID-19, Community Health and Mitigating Climate Crisis

Authors
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Prolonged droughts are becoming more common in the Pacific Islands. Along Island Ring Road in Nauru (pictured), dead and dried trees dominate the landscape, a result of the severe 2021–2023 drought (Photo: POCCA team, 2023).

Abstract

Climate change significantly impacts the health of Pacific peoples. These impacts now need to be understood in the aftermath of a global COVID-19 pandemic. To best understand the connection between the climate crisis, COVID-19 and health, a holistic view of health encompassing the physical, mental, spiritual, and social factors that influence health outcomes, is needed. Knowledge of the impact of climate change on health continues to develop, however, positive health adaptation strategies can also be found within Pacific Indigenous knowledge and health models. Connecting understandings gained from the COVID-19 health response, Pacific Indigenous knowledge and practices, alongside other scientific knowledge will provide Pacific people with the best opportunity to successfully mitigate climate and pandemic repercussions.



> “For the people of Palau, their taro cultivation is a means of ensuring the elimination of unhealthy consumption from fast food chains and the retraining of our minds especially for our young ones. Working on the mesei is manually hard labour and a form of getting back the active lifestyle”
>
> Community participant
> Ngaard
> Palau
> (POCCA research team interview, 2023)

Traditional taro farming techniques in Ngaread, Palau (pictured) showcase the sustainable agricultural practices passed down through generations, emphasizing resilience and adaptation to the local environment (Photo: POCCA team, 2023).

11.1 Introduction

Climate change impacts population health in three related ways as seen in Figure 11.1 below:

- Direct impacts, which relate primarily to changes in the frequency of extreme weather including heat, drought, and heavy rain
- Effects mediated through natural systems, for example, disease vectors, water-borne diseases, and air pollution
- Effects heavily mediated by human systems, for example, occupational impacts, undernutrition, and mental stress.

Climate change refers to long-term shifts in weather patterns brought about by an increase in global surface temperature, which affects human health. According to the IPCC Climate Change 2023 Synthesis Report (AR6), in the time period 2011-2020, the average global temperature was about 1.1 degree Centigrade above the average global temperature during 1850-1900 (IPCC, 2023). The increase in this temperature was higher over land surfaces than over oceans; and, the temperature increase was attributed to increased accumulation of 'greenhouse gases' brought about by human activities (IPCC, 2023, p.1). The resulting heat affects population health via several different pathways (see Figure 11.1). Increase in heat content as indicated by persistent rise in temperature results in heat stress and related illnesses (Freychet et al., 2022); climate change is associated with droughts and related crop failure (Janni et al., 2024). In turn, this results in population-wide malnutrition due to crop failure during drought. Besides, some climate change effects are indirectly mediated through changes in the natural systems. For example, with increased temperature and increased rainfall, vector population such as that of the mosquitoes tend to increase; this in turn results in increased risk of mosquito-borne infectious diseases such as dengue and malaria (Anoopkumar & Aneesh, 2021). Further, climate change is associated with worsening air pollution; increased humidity and this results in higher risk of air pollution related health effects, such as heart disease, asthma, and respiratory diseases (Vandyck et al., 2022) and water borne diseases (Fenta, 2019).

Climate change has social implications. The climate crisis is likely to create new social problems and add to pre-existent social problems. Acknowledging that the climate crisis has an impact on physical and mental health (Havea et al., 2017), prevailing societal inequities further exacerbate these impacts as disadvantaged people are at higher risk of adverse effects that result from climate change. In particular, health impacts stemming from the climate crisis will disproportionately impact communities with extant social inequities created by poverty, housing, unemployment, family violence, limited access to services and supports, and food and water insecurity (Alston, 2015; Bowen & Friel, 2015; Mezey, 2020). Populations who experience disability, older persons, women, children, rural communities, migrants and refugees linguistically diverse communities,

are likely to be more susceptible to the impacts of climate change (Bowen & Friel, 2015).

Gender impacts are one example of the extensive social implications of the climate crisis. Women and girls are likely to be disproportionately impacted in multiple ways by climate change because of existing gender inequalities (Aipira et al., 2017; Turquet et al., 2023). For example, women make up the majority of the worlds' poor, are more dependent on natural resources that are threatened by climate change and have fewer financial resources to prepare for climate change (Aipira et al., 2017; Arora-Jonsson, 2011). In Vanuatu, for example, women's marginalised positions result in low representation educationally, politically and in employment. Women are primarily engaged in small business and agriculture and men may consider any income women make as only to be used by men (Alston et al., 2023). Climate change has had a negative impact on agriculture, thereby impacting women's livelihoods - the result is that women are even further disadvantaged as their already marginalised position in Vanuatu is worsened when climate events impact their earning capacity.

Climate change also impacts reproductive rights of women in the Pacific, particularly post climate related events. Literature suggests that in the Pacific, women already experience limited decision-making in terms of fertility, contraception, and birthing procedures (Burry et al., 2022; Fiti-Sinclair, 2002), and access to abortion services (Guttmacher Institute, 2020). It is reported that the countries of Oceania (excluding Australia and New Zealand) have limited capability for measuring progress in relation to the Sustainable Development Goals (SDG) focused on gender and the environment thereby signalling that this data gap needs addressing (United Nations Women, 2023).

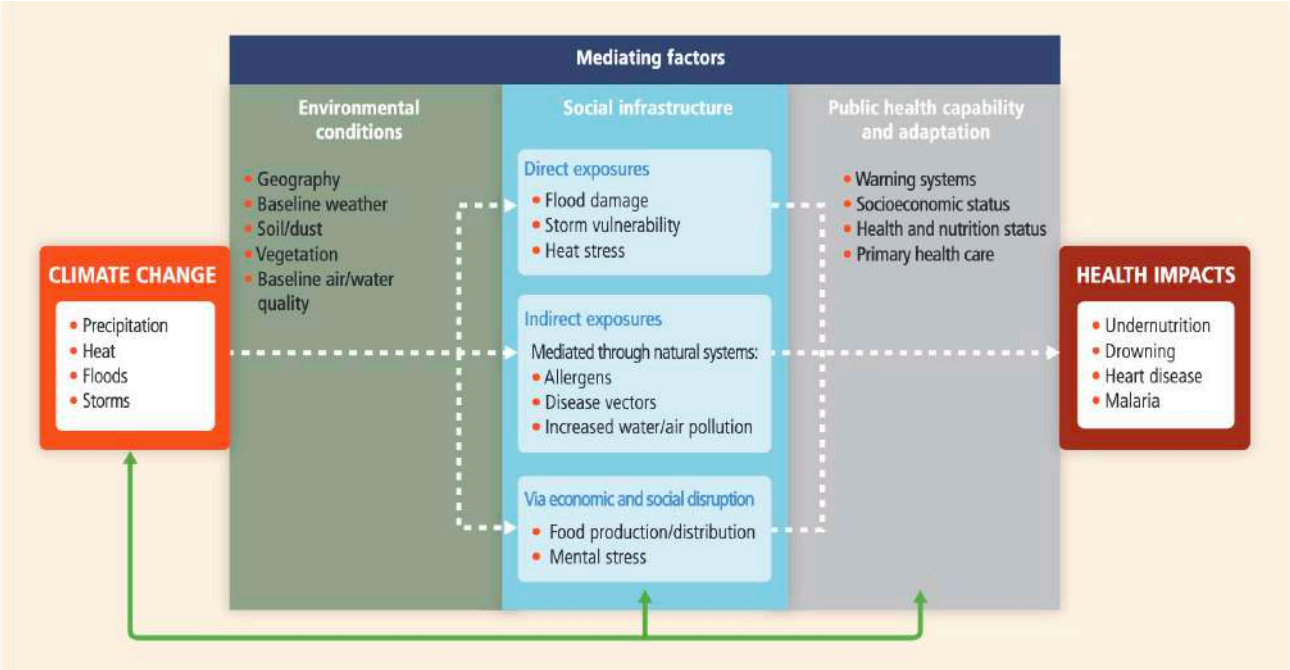


Figure 11.1: Conceptual diagram showing three primary exposure pathways by which climate change affects health. From AR5 Climate Change Report (2014), The Intergovernmental Panel on Climate Change (IPCC) p.716 (https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap11_FINAL.pdf) and direction of lines demonstrate the relationships.

The chapter is framed on the premise that extreme changes in weather will directly impact Pacific people's health, which will be mediated by natural systems and human systems, and as a result existing social inequalities in the Pacific will be amplified. We suggest that Pacific Indigenous health models and practices should be at the forefront of responses to health issues perpetuated by the climate crisis.

The chapter first examines how the deterioration of the environment perpetuates poor health conditions. Next, we explore several themes relevant to the Pacific, including primary, secondary and tertiary impacts of the climate crisis on health. We then draw attention to the reciprocal relationship between climate change, COVID-19 and health. The findings section of the chapter addresses community responses to emerging health problems with a focus on Pacific Indigenous models of health and practice. Within this discussion we point to the experience of the COVID-19 pandemic and utilise this understanding to suggest actions that can be taken now to respond to the climate health crisis in the future. The chapter concludes with a discussion on the implications for health and social policy.

11.2 Relationship between environmental degradation and poor health

Humans and animals who are exposed for prolonged periods of time to various forms of environmental toxins such as pollutants in the air, contamination in drinking water, and consumption of food grown in contaminated soil are at high risk of diseases and illnesses, ranging from various physical and mental illnesses, and in particular, different types of malignant diseases (Fuller, 2022). Notably, all human activities, including agricultural and livestock rearing practices, food consumption, recreation, travel, industrial activities, and transportation that involve burning of fossil fuels lead to the emission of carbon dioxide, methane, compounds of nitrogen, and different fluorides that escape and accumulate in the stratosphere. These gases trap heat escaping the earth surface, resulting in a condition similar to heating of the air inside a garden greenhouse. This phenomenon is referred to as 'greenhouse effect' and as this is worldwide, the warming of the air and the surface of the earth is referred to as 'global warming.' American geophysicist, Wallace Brocker, termed this phenomenon of carbon dioxide driven change in the climate as 'climate change' in 1975 (Broecker, 1975). Such warming effect of the earth's atmosphere, surface, and oceans result in environmental changes such as melting of the ice-caps of glaciers, increased release of water vapour from the warming of the ocean surface, changes in the characteristics of the flow of wind around the earth, and increase in the volume of the ocean water. In turn these phenomena affect the salinity of the ocean water and make the ocean water increasingly acidic, contributing to increase in the earth's temperature.

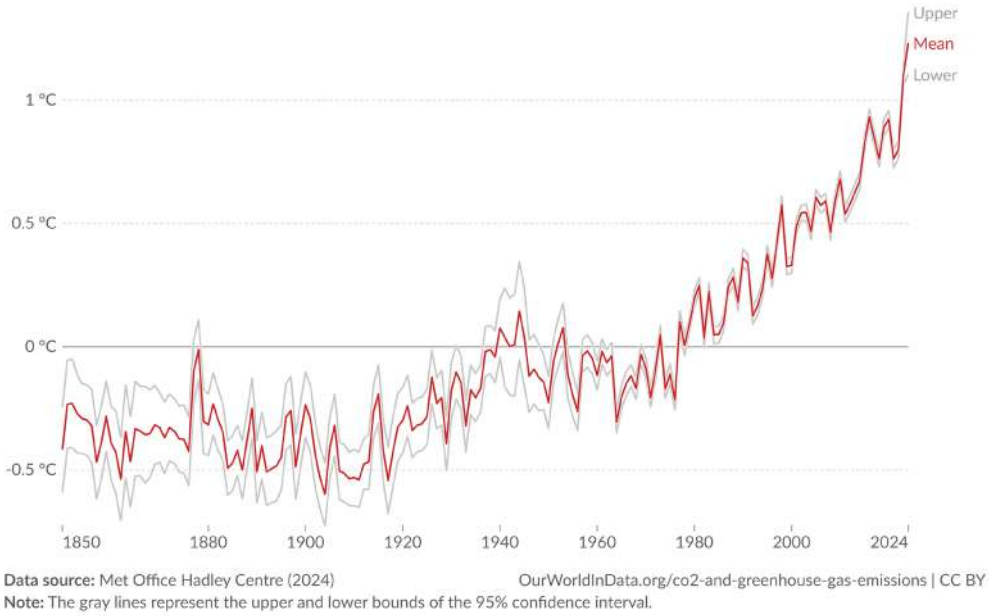


Figure 11.2: Progressively increased temperature of the world since 1850. If the average temperature of the earth's surface between 1961-1990 is 0 degrees, then this graph shows that before 1940, earth was largely cooler, but since the 1980s, the earth has progressively become warmer, to the extent that by 2019, earth's temperature was about one degree centigrade warmer than the average of the all years between 1961-1990.

These changes have been particularly pronounced since the beginning of the industrial era and have accelerated during the time of the Second World War (Figure 11.2). All of these changes collectively impact directly and indirectly the health and well-being of humans and non-human species equally disastrously. Humans, animals, plants, oceans, lands, the air, indeed the health of the planet is in crisis (Horton et al., 2014).

Global warming occurs on a planetary level and all regions of the world are affected; but people experience the impacts and effects depending on their geographical locations and their economic ability to withstand such impacts. For example, as global warming leads to altered geologic forces that exacerbate hurricanes, storms and wind patterns, island states and people who live close to oceans suffer disproportionately from damages caused due to hurricanes and storms that tend to gather force on landfall due to warm ocean air currents. These effects are particularly significant for the people in small Pacific Island nations, where rise in sea levels, increased humidity, rainfall, and acidification of ocean water have led to significant changes in livelihoods, high risks of displacement, and resultant health losses. Lachlan McIver et al., (2016, p.1707) analysed and contrasted the vulnerabilities of Pacific Island countries to the health impacts of climate change and adaptation strategies and concluded that 'Pacific Island countries are among the most vulnerable societies in the world to the health impacts of a changing climate'.

This highlights the particular importance of studying mitigation and adaptation in the context of Pacific Island countries.

Using comparative risk estimates of runaway public health impacts for Oceania and Pacific Island countries, Campbell-Lendrum and Woodruff (2006) have projected that by 2050:

- Increase in deaths attributed to heat will significantly outweigh decrease in deaths from cold and will be double the baseline risk of overall deaths

- There will be a substantial expansion of malaria and dengue

- Approximately a 10% (5-18%) increase will ensue in the annual hospitalisations due to diarrhoeal diseases.

Burden of diseases in any country or for any group of people represents population health impact, and is measured by estimation of disability adjusted life years (DALYs) for that population. One DALY represents loss of a year of life due to death and disability. DALY can be estimated for all causes of diseases and deaths or they can be estimated for a single cause, or a number of causes that result in disability or death. The higher the DALY, the worse the status of population health. In 2004, the WHO calculated that health effects attributed to climate change accounted for about 12.4 DALYs per 100, 000 population. This figure was lower than the global average of 84 DALYs per 100, 000 population from all causes of disease and deaths. The burden of disease and disability attributed to climate change was highest for low-and-middle income countries in Africa and lowest for high income countries. Countries in the Western Pacific region had lower burden of diseases and deaths attributable to climate change than the global average (Gavurova et al., 2021). As can be seen in Figure 11.3, if the DALYs are measured in logarithmic scale and if these measurements are compared across different countries in different income levels, we observe that those individuals in the High-income countries (HIC) show the lowest DALY.

The highest DALYs are observed in the African Low Middle Income Countries. This indicates that the burden of death and disabilities are very high in those countries that are middle to low in income levels.

In summary, anthropogenic climate change, brought about by the cascading effects of increased global temperature due to industrial activity and burning of fossil fuel leads to increased temperature, high humidity, altered patterns of rainfall, changes in oceanic currents, melting of permafrost, and loss of biodiversity (Lawrence et al., 2020).

These changes significantly affect human health (Coates & Norton, 2021). These changes lead to a rise in ocean levels, ocean water becoming increasingly acidic, resulting in loss of coral reefs and sources of nutrition to oceanic wildlife. Further, with an increased volume of water in the oceans due to the melting of glaciers, geological forces resulted in increased frequencies of hurricanes and tropical storms. As a result, small island countries with limited resources have suffered due to such geological changes, often leading to mass displacement. The resulting health effects of such changes are now well documented and have resulted in the increased frequency of heat-wave related health effects in the more temperate countries (Haines & Patz, 2004), increased prevalence and incidence of parasitic diseases (Short et al., 2017), and food poisoning due to consumption of mussels and seafood that have grown in warmer oceanic waters (Marques, 2010).

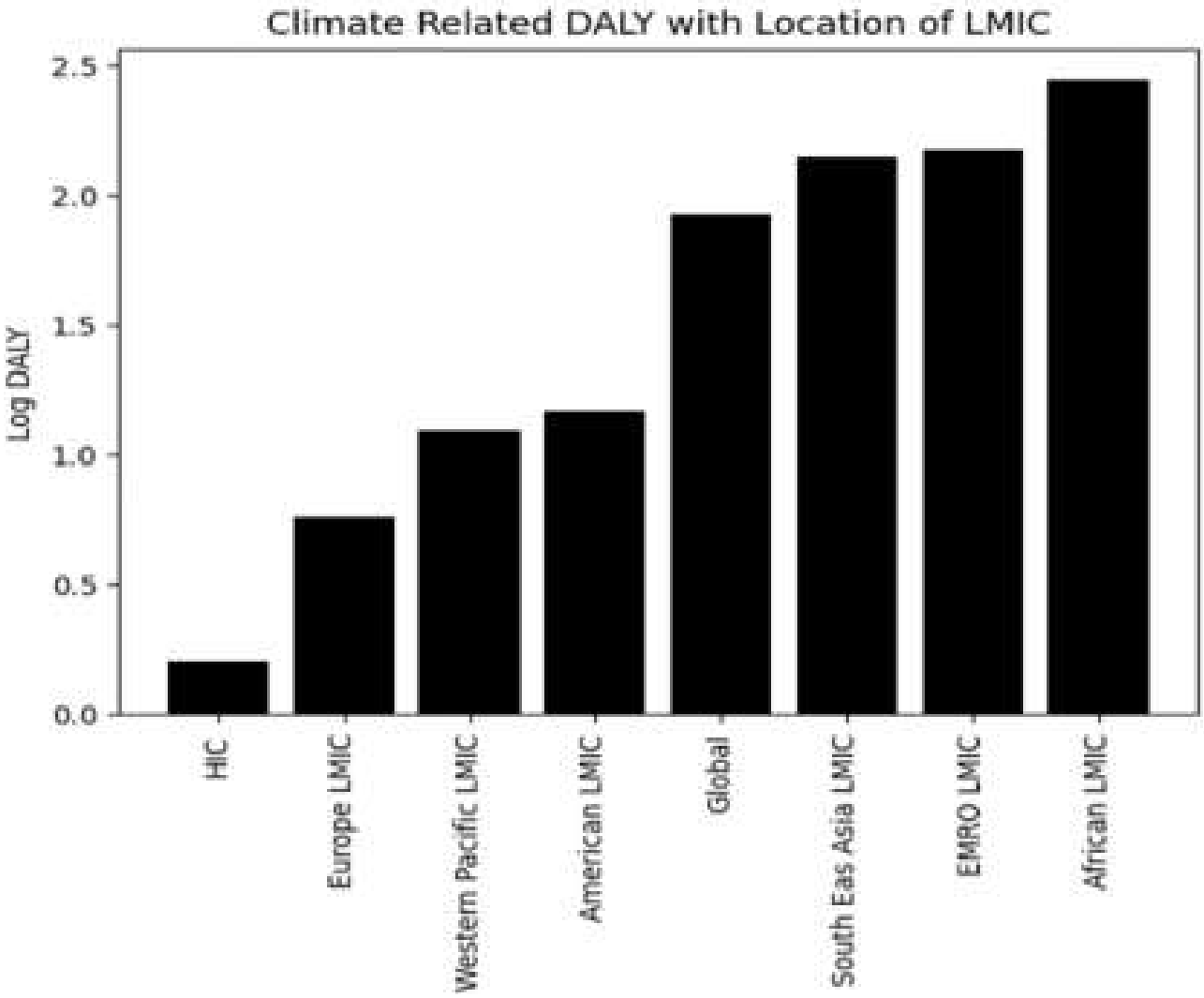


***Figure 11.3**: Tally of Climate Change related log transformed DALYs (disability adjusted life years) and geographical locations of the world for low- and middle-income countries (HIC = High Income Countries, LMIC = Low- and middle-income countries)*

11.3 Themes

In this section we address the direct and indirect impacts of the climate crisis on health. Direct impacts are the result of extreme weather events such as storms, heatwaves and floods. Indirect impacts on health occur because of alterations in the environment and include changes in access to water and food, impacts on mental health and wellbeing, and on health equity. Finally, this section brings together climate and pandemic issues and provides an analysis of how climate change has influenced COVID-19 and in turn how COVID-19 has impacted climate induced health conditions

11.3.1 Impacts of the climate crisis on health conditions

Direct and indirect pathways of climate disasters potentially increase risks of injuries, diseases and even deaths (Banwell et al., 2018). There are intertwining effects of climate change on health, with extensive repercussions that warrant a holistic approach to neutralise its impact on human health.

Case example of climate effect

In order to explore the impacts of the climate crisis on health conditions we introduce Mere (pseudonym), a 48-year-old Indigenous woman who has been living with diabetes and associated health conditions since 2015. At the time of interview, Mere was living with her family in a village, which is thirty minutes away from the town centre. Mere was attending the diabetes and hypertension clinic at a nearby health centre. She shared personal experiences of hardship to try and live healthily, and highlighted the lack of support they received after a natural disaster in Fiji. Mere died in 2020 from the complications of diabetes. This is part of her story.

> Last year, we received seeds from the Agriculture Ministry, but shortly after, we started experiencing terrible weather conditions, which damaged all our vegetables and crops. The Ministry of Agriculture staff did not supply us with more seeds…no one came to assess the damage to our farms. The cost of fresh vegetables in supermarkets are expensive. It is difficult for an amputated person to get to the market to buy them, so we have no choice but to opt for the unhealthy and cheaper food items (Mere, personal interview, 2018).

People living with a chronic medical condition often need assistance to support their need for a healthy lifestyle. For health-care plans to succeed, their affordability must be assessed and carefully planned, and consideration must be given to their impact on organisational objectives (Ravono, 2021). The impact of climate change on farms and gardens threatens healthcare objectives, therefore, careful interventions must be planned to mitigate such threats. Figure 11.4 shows the rock that fell after a series of seismic events experienced by villagers at Dranivau village in Ra, Fiji, 2023. The triple burden of climate change effects sources of herbal medicines, food and livelihood. People now live-in fear of further disastrous events.



Figure 11.4: *Rock fall at Dranivau village, Ra Fiji. The rock foundation had been weakened by drought and heavy rain over the years and was easily dislodged by a recent earthquake (Provided by authors).*

11.3.2 Climate crisis and community health

As noted in the introduction, several factors contribute to the climate crisis. Figure 11.5 is a diagrammatic representation of the connections between climate crisis and community health. In this section we outline the primary, secondary and tertiary impacts of the climate crisis on health.

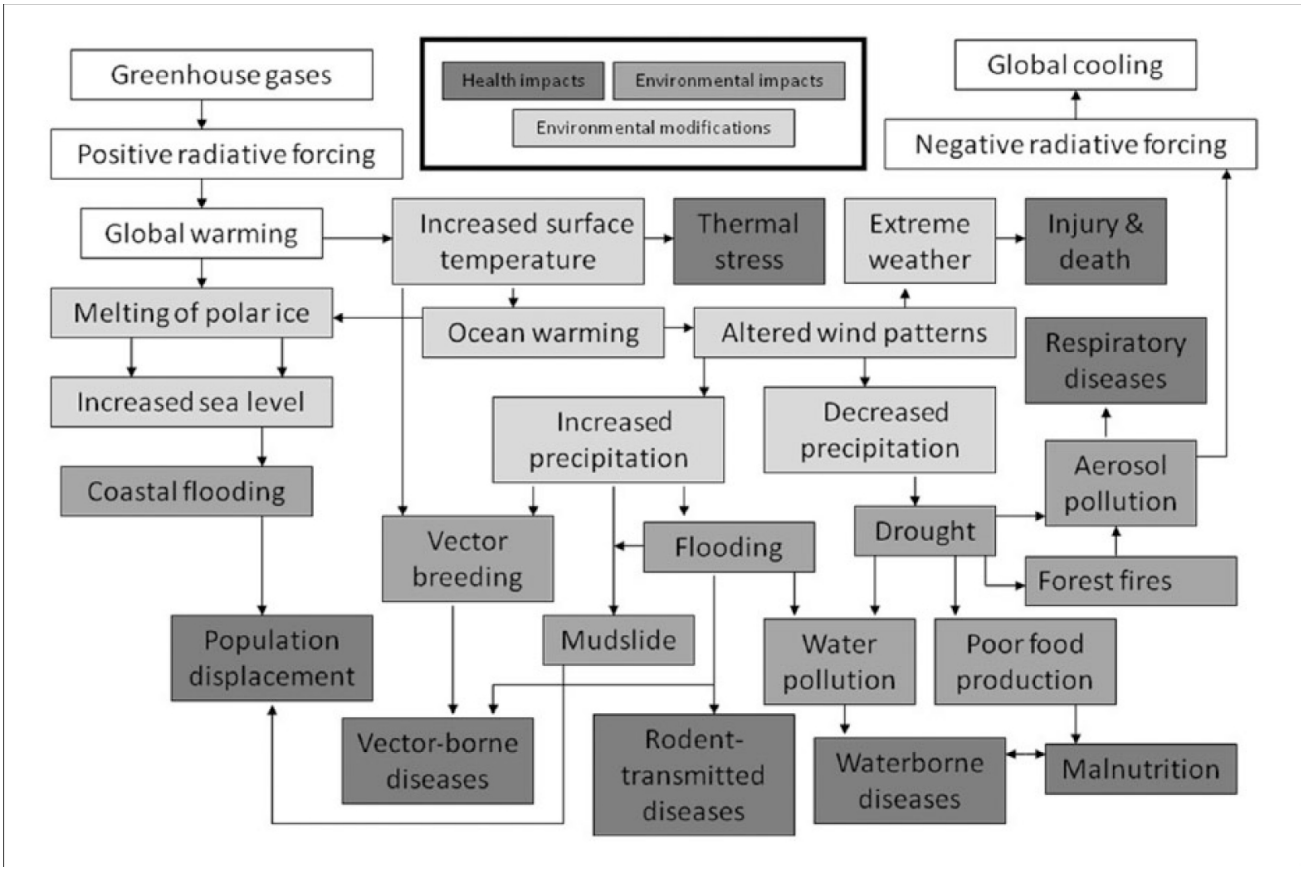


Figure 11.5: Health effects of global climate change. From 'Climate Change, Extreme Weather Events, and Human Health Implications in the Asia Pacific Region' by J.H. Hashim and Z. Hashim, 2016, Asia Pacific Journal of Public Health, 28(2), (https://doi.org/10.1177/1010539515599030)

11.3.3 Primary impact of climate crisis

Extreme weather events

Globally, 75% of natural disaster mortality are trauma related. Climate change induced alterations in traditional wind patterns creates severe weather changes we are witnessing today (Hashim & Hashim, 2016). Other primary impacts of the climate crisis include flood, drought, heavy rain, snowfall, heat wave and cold wave. The magnitude of these factors is exacerbated with severity, duration, and public complacency leading to unpreparedness (Hashim & Hashim, 2016; McIver et al., 2016).

Esala Vakamacawai conducted community talanoa on Galoa Island in Kadavu, where he identified some primary impacts of the Climate crisis on the Island (DevNet, 2024). Villagers of Galoa built a seawall around the school and village about six decades ago to prevent soil erosion and high tides. However, due to the climate crisis, seawater is overflowing onto the school compound, teachers' quarters and sometimes the classrooms (Figure 11.6). The committee of Galoa Village School shared their concerns and worries about the impact of the climate crisis. The school committee is planning to relocate the school to higher grounds and they are seeking the government's assistance. Parents are also worried that the school will be closed, forcing them to send their children away to boarding schools in Suva. Separating children from their parents at an early age to attend boarding school creates unnecessary stress, anxiety, and intergenerational trauma. (Crowshoe et al., 2018).

The school principal is concerned about the impact of the climate crisis on the availability of healthy food for school lunches. He believes that prolonged draught and soil erosion is a factor contributing to undernutrition. Children are bringing unhealthy lunches and snacks to school, comprising mostly noodles with no nutritional value, that has replaced the traditional meal of vegetables, cassava, yam and taro.

Children are most susceptible to the health impact of the climate crisis (Sheffield & Landrigan, 2011). Prolonged exposure to changing weather, rising temperature, humidity, water-electrolyte imbalance, rising sea level and rapid wind change affect children the most. Children are still developing and growing, demanding a significant physiological response that exposes them to a higher concentration of ground-level ozone, pesticide-contaminated water, and less nutritious fruit and vegetables (Sheffield & Landrigan, 2011; Pacheco, 2020). In addition, the intergovernmental panel on climate change suggests that children have an underdeveloped heat protection mechanism, making them vulnerable to the impact of global warming. In developing countries, 93% of children remain unprotected from fine particulate matter that currently exceeds the World Health Organisation recommendation (Pacheco, 2020).



Figure 11.6: *Climate crisis causing seawater to overflow onto the Galoa Village School compound (Provided by authors).*

11.3.4 Secondary impact of climate crisis

Microplastics and climate crisis

Climate change and global warming adversely affect ocean health and ecosystems by enabling growth and wide spread of microplastics in oceans and soil and enabling heat trapping. According to Haque and Fan (2023), climate change, and its resultant global warming drives soil and ocean microplastic formation and formation of associated biofilms. Microplastics are plastic substances less than five millimetres in diameter and are formed either as a result of industrial processes or they are byproducts of plastics (referred to as macroplastics or substances that are more than five millimeters in diameter as spheres). When these plastics are dumped or accumulated in soil or in the oceans or water bodies, the macroplastics are degraded into microplastics as a result of mechanical breakdown, microbial activities, or weathering as the major mechanism. This breakdown of macroplastics is facilitated by climate change that results in warmer terrestrial temperature including warming of ocean water, and acidification of the oceans. The resulting heat and acid in the ocean water further help break down microplastics. Climate change and resultant rising ocean surface temperature further exacerbates intensity of hurricanes (Andrews & Smirnoff, 2020) and affects ocean currents, thus helping to disseminate microplastics over wider distances.

In turn, the accumulation of microplastics in oceans leads to the death of fish, seabirds, and benthic organisms (organisms that live closer to the sea beds and deeper surfaces) and coral bleaching and death of coral reefs. Microplastics affect the dunes in the oceans, darkening their colours and reducing the albedo effects (reflection of light); in turn, these further raise ocean temperatures and lead to the growth of biofilms and bacteria and eutrophication of large parts of the oceans. All these factors are directly associated with reduction in the viable population of fish and marine life forms and their effects are likely to be adversely experienced in Pacific Ocean nations (Haque & Fan, 2023).

Communicable diseases

Malaria

Climate change creates a favourable breeding ground for anopheles' mosquitoes, increasing the risk of malaria. This can create a significant health problem to pregnant women and their foetuses, resulting in small-for-gestational age during neonatal screening and low birth weight at delivery (Pacheco, 2020). In the Pacific, vector-borne diseases spread by mosquitoes such as malaria are more prevalent following heavy rain in Papua New Guinea, Solomon Islands and Vanuatu. Despite its impact on pregnancy in the Pacific and the 125 million pregnant women at risk of the disease globally, governments have failed to acknowledge that malaria in pregnancy is a problem and lack policies to protect them (Pacheco, 2020; Rijken et al., 2012). Furthermore, the needs of pregnant women in the malaria-endemic Pacific region are neglected, because the WHO generalises recommendations on malaria management based on African research cohorts (Rijken et al., 2012).

Vector-borne diseases

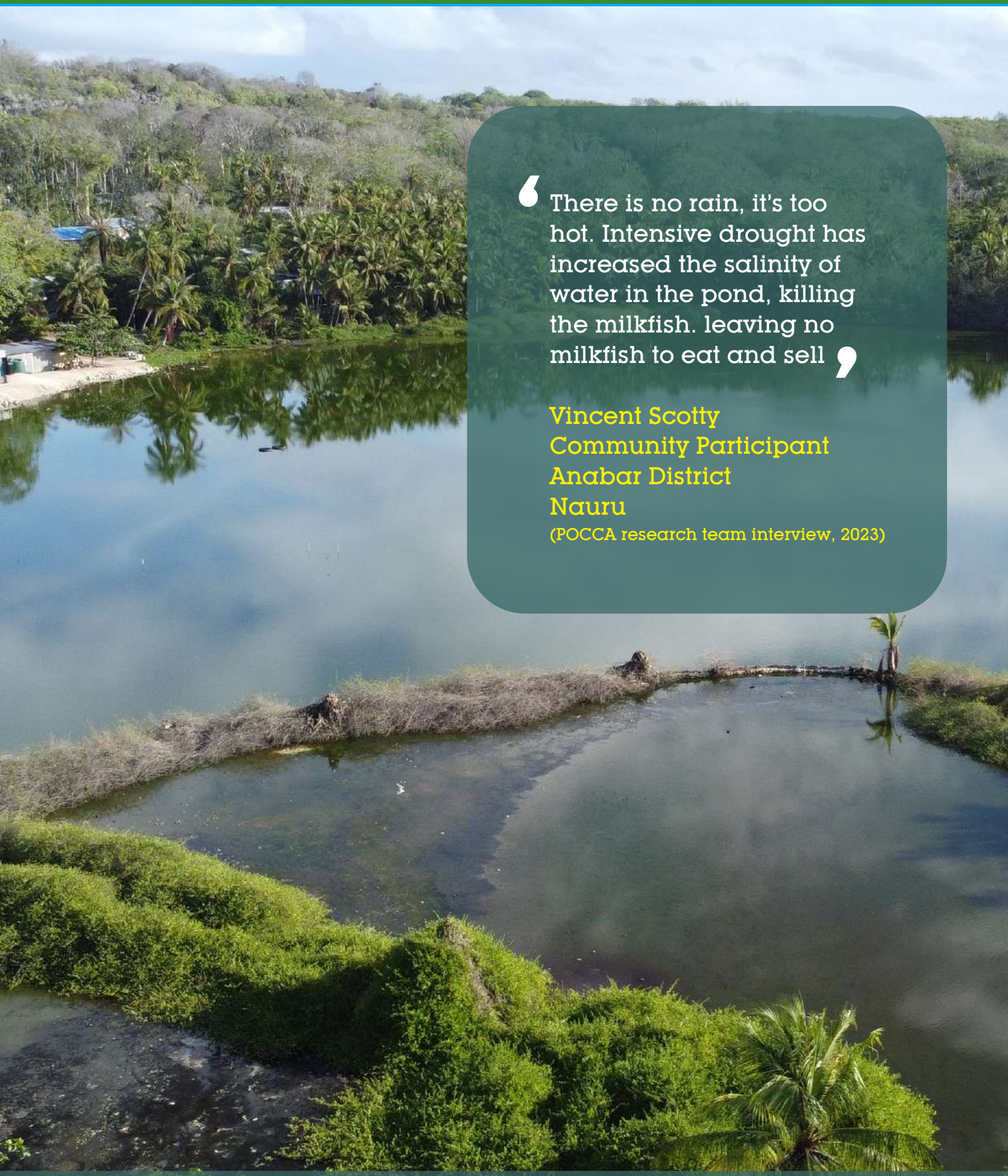
Wet conditions with flooding events during climate disasters cause outbreaks of vector-borne diseases such as dengue fever (Coates et al., 2021; McIver et al., 2012). High temperatures, humidity, and rainfall affect communities who are placed with the extra burden of implementing vector control measures. One such measure includes influencing communities to destroy breeding places post climate-disaster. Apart from dengue fever, zika virus and chikungunya are said to have been caused by changing climate conditions, evident in most Pacific Island countries; Cook Islands, Fiji, Kiribati, Marshall Islands, Micronesia (Federated States), Nauru, Niue, Palau, Samoa, Solomon Islands, Tonga, and Tuvalu (World Health Organization, 2015).

Water-borne diseases

Diarrhoea, typhoid and typhoid fever are likely water-borne diseases after a climate change disaster. In Fiji, diarrhoea remains a significant challenge due to morbidity rates, loss of work, malnutrition, and deaths. Diarrhoeal transmission is highly responsive to climatic conditions such as flooding. Typhoid fever and Leptospirosis are endemic in many Pacific Islands countries, including Fiji, Kiribati, Marshall Islands, Micronesia (Federated States), Nauru, Niue, Palau, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. While they can both be water-borne diseases, Leptospirosis is a zoonotic disease carried by animals and transmitted through infected urine and body fluids (World Health Organization, 2015). Leptospirosis significantly affects young male farmers, particularly when they come into contact with infected rodents or the urine of infected animals. This exposure occurs when humans and animals are in closer proximity Increasing cases of Leptospirosis have been reported throughout the Pacific, especially following drought and flooding. In some cases, late presentation for treatment in hospitals can be fatal (Fiji Ministry of Health and Medical Services, 2020; World Health Organization, 2015).

Typhoid fever

Salmonella (S-typhi) outbreaks disturb community livelihoods. While many countries in the Pacific Islands suffer from Typhoid, Samoa is affected significantly due to prolonged drought and unsanitary conditions, creating an environment ideal for disease faecal-oral mode of transmission. Samoa is one of the five countries with the highest disease rates in the world, ≥100 cases per 100,000 population per year. In addition to this, drug-resistant Salmonella Typhi strains have been isolated in these endemic countries, making treatment difficult and consequently resulting in rising mortality rates. To mitigate the health burden of Typhoid, the Samoa government, with the help of the WHO and CDC, introduced the Typhoid conjugate vaccine into the routine immunisation programs in 2018. This incentive was only implemented in the top five Typhoid endemic countries: Pakistan, Liberia, Zimbabwe, Samoa, and Nepal (Centers for Disease Control and Prevention, 2023).



> “There is no rain, it’s too hot. Intensive drought has increased the salinity of water in the pond, killing the milkfish. leaving no milkfish to eat and sell”
>
> Vincent Scotty
> Community Participant
> Anabar District
> Nauru
> (POCCA research team interview, 2023)

Bauda Lagoon in Nauru (pictured), once used for traditional milkfish culture, is now severely affected by pollution, invasive species, and climate change-induced saltwater contamination, making it no longer a sustainable source of nutrition (Photo: POCCA team, 2023).

Non-communicable disease

Biological and ecological systems, which are integral to the life and health of humans and other species are threatened by cascading global climate change disasters (Kjellstrom et al., 2010). Figure 11.7 presents this relationship in diagrammatic form. Excessive heat exhibited during changing climatic conditions indirectly contributes to the high incidence of non-communicable diseases (NCDs). In the process of a heat stroke, most people are less likely to engage in physical activities, which give rise to obesity. Obesity is a risk factor for NCDs such as diabetes, cardio-vascular disorders and cancers (Lawrance et al., 2021).

There are many contributing factors to health problems in the elderly, including NCDs. The most significant contributor to health problems in the 21st century is climate change, especially air pollution. A quarter of these pollutants arise from the traffic of Fine Particulate Matter, 15% from industrial emissions, and 20% from domestic fuel burning. It is estimated that air pollution increases the risk of non-communicable disease (NCD) five-fold, impacting senior citizens the most. In addition, the mortality rate of indoor air pollution is four million deaths per year, and 3 million of these deaths are the result of NCD (Campbell & Ustün, 2019).

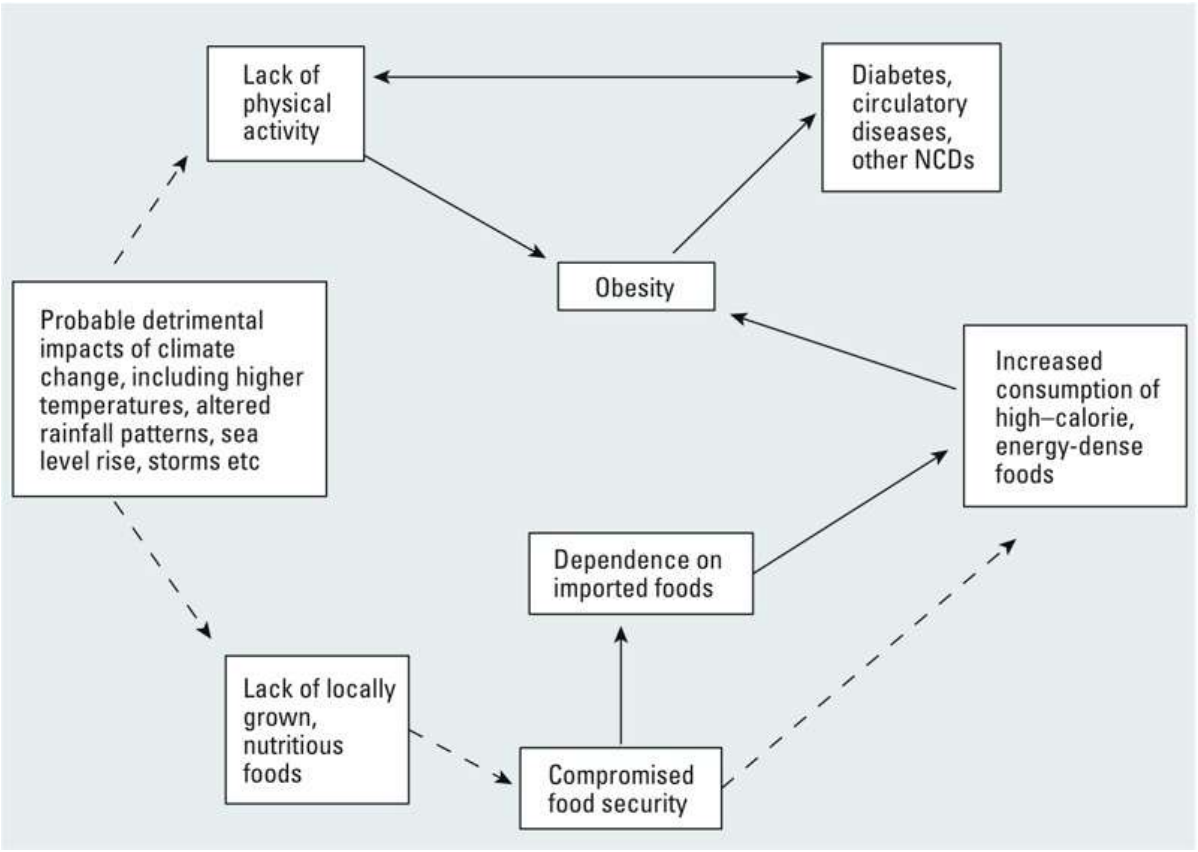


Figure 11.7: The pathways between climate change and NCDs. From Health Impacts of Climate Change in Pacific Island Countries: A Regional Assessment of Vulnerabilities and Adaptation Priorities by L. McIver et al, 2016 Environmental Health Perspectives 124 (11), p.1712 (http://dx.doi.org/10.1289/ehp.1509756)

The sharp rise in the prevalence of non-communicable disease (NCD) in the Pacific intertwines with the narrative of the secondary impact of climate crisis (Foliaki & Pearce, 2003; Dearie et al., 2019; McIver et al., 2016), especially in coastal and waterfront villages affected by flooding, rising sea levels and soil erosion. Consequently, compromised food security forces people to adopt an unhealthy lifestyle and choose processed food (Dearie et al., 2019). Compromised food security and obesity are the most significant modifiable risk factors for NCD, mainly Type 2 Diabetes, Hypertension and Cardiovascular Disease (Morgan, 2015).

Type 2 diabetes

Multiple factors, including food security issues, contribute to the high prevalence of diabetes in the Pacific. In Fiji, mortality related to NCD is the highest globally, and the rate of major lower limb amputation secondary to diabetes happens is one in every eight hours (Morgan, 2015; Nacei, 2022). An assessment of diabetes risk using the American Diabetes Association (ADA) tool on Galoa Island shows that many adults in the village are living with obesity and also have a high risk of diabetes. As noted earlier, Talanoa (carried out by Esala Vakamacawai, see Figure 11.8), with the villagers, highlighted that changing diet secondary to the climate crisis is one of the factors causing a transition of diet from fresh to processed food. In the region, the results are similar, and the trend will continue to deteriorate due to the high prevalence of obesity among Pacific people (Morgan, 2015).



Figure 11.8: *Talanoa re Anthropometric measurements of prediabetes on Galoa island using the ADA prediabetes assessment tool (Provided by authors).*

Gender and Type 2 diabetes

In a Fijian community, Itaukei women are more susceptible to diabetes and have a higher prevalence of the disease when compared to Fijian women of Indian ethnicity and Fijian men (Morell et al., 2016). The role of gender in a traditional Fijian setting imposes a domestic shackle on the iTaukei women, forcing the adoption of roles in cooking and attending to the children while the men go out to the farm to gather food, firewood and plant crops (Dearie et al., 2019; Morell et al., 2016). Gender roles in a Fijian community promote a sedentary lifestyle, indirectly increasing the risk of diabetes (Dearie et al., 2019).

Hypertension

The impact of the climate crisis indirectly cornered Pacific Islanders into choosing processed food from supermarket shelves over healthy domestic food (McIver et al, 2016). In the Pacific Islands Countries and Territories (PICTs), the prevalence of hypertension in the community is 20%. As discussed above, high salt intake in addition to obesity are the primary predisposing factors to hypertension (Kessaram, 2015). Governments should enforce environment friendly policies, and health promoting strategies to reduce the risk of climate crisis and hypertension (Morgan, 2015; Kessaram, 2015). Instead, neoliberal health ideas shift the responsibility of mitigating food security and obesity to the people.

Nutrition

The disastrous effect of the climate crisis is significantly impacting fresh local produce in coastal areas compared to villages inland. Remote islands are experiencing the impact of rising sea levels and prolonged dry weather on health, especially Type 2 Diabetes. Esala Vakamacawai, a PhD candidate at the University of Canterbury, has been comparing the clinical risk of prediabetes between a remote island (Galoa) in the province of Kadavu and two villages in the interior of Fiji's main Island (Narukunibua and Navuniyasitu) in the province of Namosi, using New Zealand's Prediabetes risk test. In his preliminary findings, Indigenous Fijians in Galoa Island have a significantly higher risk of Type 2 Diabetes when compared to those who live inland. Also, a Talanoa on Galoa Island revealed that an unhealthy diet and a sedentary lifestyle are the causes of the high risk of diabetes. The climate crisis is significantly impacting the health status of the small Pacific Island communities, as evidenced in Galoa.

Tertiary impact of climate crisis

Despite contributing least to the causes of climatic challenges, people in low-income and disadvantaged countries and communities are the first to experience health issues and typically cannot protect themselves and their families (WHO, 2021). Low-income populations, people living with disabilities and existing medical conditions, and older people who have fewer resources and savings to rebuild may depend more on under-resourced governments (Rosenberg et al., 2022).

Health risks to the climate crisis exist on a continuum. Many physiological changes happen during pregnancy, and mothers are the most vulnerable to the impact of the climate crisis in their third trimester. The physiological changes induced by the climate crisis on babies and pregnant women create a cascade of events starting before conception, prenatal (throughout pregnancy), and postnatal (after delivery) (Pacheco, 2020). Pregnant women are at risk of dehydration, micronutrient deficiencies and infections. Climate change disasters increase

these risks, which further develop into complications like eclampsia, preterm and low-weight births over risks of water-borne and vector-borne diseases. Also, newborns and babies are vulnerable to changing climatic conditions. Shocks and stresses on their caregivers further exacerbate their vulnerability. Chronic exposure to fine particulate air pollutants exposes children to irreversible brain pathologies leading to Alzheimer's, Parkinson's disease, and psychological dysfunction.

Sexual Health

There are a number of sexual health concerns within an emergency setting. In events of a natural disaster like cyclones or floods, which are likely to become more intense, certain accommodation venues are likely to be organised for people that need to be evacuated away from their settings. Such a setup has raised a number of sexual health concerns. For example, unsafe sexual activities among adolescents in evacuation centres have been anecdotally reported by medical practitioners (Fiji Ministry of Health and Medical Services, 2020). Such occurrences have led to the high incidence of teenage pregnancies. Reproductive health then becomes a concern where deficiencies of iron, resulting in anaemia, are prevalent due to the lack of key micronutrients in their diet.

Physical injuries are likely to occur amidst climate-change disasters. In extreme weather conditions, accessibility to healthcare services is limited, which prevents early diagnosis and treatment. These unfortunate events contribute to increased health costs. Untreated infections leave people to accept unfavourable medical decisions (as in amputation due to septicaemia) or, succumb to their illnesses and infections from injuries. In this way, quality of life is affected, and people's livelihood is destroyed.

Socioeconomic status is directly proportional to community health (Whittemore et al., 2004). The economic burden of the climate crisis is evident with damaged housing during severe cyclones, and health problems caused by lack of clean water and vector borne disease. In the Pacific, limited ability of outreach clinics and health education programs to accommodate communities in remote areas doubles NCD risks (Foliaki & Pearce, 2003).

Mental Health

Extreme weather conditions as described above cause disasters and adversely affect people's livelihood. The interplay between emotional wellbeing, which is an important human health condition, and climate change has been overlooked (Lawrance et al., 2021). Climate change has been shown to create a range of threats to health, but the interactions between, and common causes for, climate change and mental health issues have been largely neglected.

> There has been insufficient research, attention and conversations on this important issue which together have led to a lack of necessary and urgent action (Lawrance et al., 2021 p. 3).

Disaster-affected individuals' experience of trauma and mental health issues vary and may intensify pre-existing inequities and vulnerabilities (Rosenberg et al., 2022). Trauma affects a person's ability to function mentally, physically, socially, emotionally or spiritually (Padhy et al., 2015; Rosenberg et al., 2022). The effects of the changing climatic conditions in any community directly and indirectly affects human pathologies that are both physical and mental (Cianconi et al., 2020, Lawrance et al., 2021). In events where lives, homes and ancestral lands are lost, peoples' livelihoods are affected, causing stress and anxiety. In some cases, permanent dislocation are responses to life-threatening situations. As such, these changes disrupt traditional ways of living, which creates psychological stress, anxiety and depression (Lawrance et al., 2021).

The mental health effects of climate change are multifaceted and predominantly cause post-traumatic stress disorder, adjustment disorder and depression (Hrabok et al., 2020; Padhy et al., 2015). Additionally, environmental neuroscience research has identified that natural disasters impact the neurobiological structures and thus the neural processes of the brain. As a result, the overall health of the brain, and therefore behaviour and wellbeing, are affected (Beaglehole et al., 2018; Doell et al., 2023). Post climate disasters are likely to trigger stress among traumatised persons. Faced with the loss of home, food sources, environment, social structures and loved ones, traumatised persons must deal with their feelings of depression, anxiety, and hopelessness while working on their individual, family and community's recovery. As an example of post climate trauma, the people of Mulitaka in the central Enga province in Papua New Guinea (PNG) on May 24, 2024, heard loud cracks in the early hours of the morning before the rocks fell; those who heard the cracks were able to escape. Close to 200 people were sleeping and were buried alive in PNG.

Returning to homes is not feasible for island communities, who are often displaced or forced into migration post-disaster, and they must depend on local and traditional knowledge in adjusting to change (Kelman & Khan, 2013). In the process, traumatised individuals are stressed and experience extreme mental health issues. For example, in Papua New Guinea and Fiji, if customary land tenure is not considered at a very early stage in the relocation process, culture is lost (Gharbaoui & Blocher, 2018).

Research has demonstrated that specific risk factors such as gender, socioeconomic status and education, and pre-existing mental health conditions are associated with increased susceptibility to mental health conditions following natural disasters (Hrabok et al., 2020). Traumatised persons are at a greater risk of developing acute stress reaction and adjustment disorder, and other stress-exacerbated disorders. Adaptation to climate related disasters need careful and interdisciplinary approach to enhance preparedness for worsened outcomes.

Also, in a disastrous event, individuals have different response outcomes. Post-traumatic stress disorder is not the only stress-causing injuries, illnesses, and deaths. In emergency settings, evacuation centres have been reported as prime locations for gender-based violence (World Bank, 2017). At most times, evacuation centres become the first temporary living space that accommodate vulnerable people (Kako et al., 2020). For Indigenous Fijian women, their privacy and safety become an issue of concern because they are still expected to continue to observe cultural relationships and protocols within a confined space. Stress caused by climate change is likely to increase the incidence of gender-based violence leading to physical injuries, which need medical attention.

There is now a growing number of related literatures on the impact of disasters on mental health (Cianconi et al., 2020; Silove et al., 2006). People respond differently to traumatic stress, which is a normative response to life threats. Unfortunately, some persons continue to experience posttraumatic stress disorder, which calls for psychological interventions.

When the need for psychological interventions is overlooked, the affected person may experience psychosomatic disorders and will need medical interventions. At such points in life, survival, and adaptation to the effects of natural disaster is threatened.

People feel entrapped in their own burden that can then manifest into mental illnesses such as psychosis, epilepsy and severe mood disorders. Despite the growing awareness of the significant and pressing challenges of climate change on health, there is insufficient action to mitigate their impacts (Lawrance et al., 2021). This leaves the vulnerable populations like people with previous psychiatric conditions, low income or poor social network, and Indigenous and native communities with increased chances of developing psychopathologies (Cianconi et al., 2020).

Climate related disasters are often associated with stress-related psychiatric disorders (Padhy et al., 2015). Individuals who have been exposed to life threatening situations are likely to experience distress, have impaired quality of life and suffer post-traumatic stress disorder (PTSD) (Padhy et al., 2015). Having flashbacks of the event, increased arousal, and avoidance of cues to the memory of the event are some symptoms of PTSD. People who need to relocate their homes are prone to acculturation stress and hopelessness, which may increase suicidal tendencies amongst farmers. The vulnerable population are those that fall under the lower socioeconomic category, and they often experience high levels of distress and helplessness. As the impact of climate change seems to be increasing over time, it is likely that a greater proportion of the population would be impacted by the mental health consequences of climate change-related disasters.

Literature suggests that vicarious distress may be experienced by Indigenous populations who empathise with family and others in their social network who are distressed about climate change (Middleton et al., 2020). This means that people do not have to have ongoing or acute direct exposure to climate change to experience mental distress. Therefore, when considering the mental health impacts of climate change, we need to acknowledge that there are likely to be intergenerational repercussions. This is particularly the case for the children and youth of Pacific nations who will continue to be impacted across their life course with the consequences of climate change, as will their children. There is an opportunity, therefore, for further research on the connection between mental health, climate change and intergenerational impacts in the Pacific.

11.4 Impact of climate change on COVID-19 and impact of COVID-19 on climate induced health

11.4.1 Climate change and COVID-19 pandemic

Biodiversity loss and an increased contact between humans and animals leading to high risk of transmission of infectious disease agents between animals and humans are common to both COVID-19 pandemic and infectious disease related health effects of climate change. COVID-19 is a zoonosis, a type of disease that first occurs in animals and then spills over to humans. In the case of COVID-19, it is believed that the agent of COVID-19, SARS-COV-2 virus, a coronavirus, jumped from animal reservoirs such as bats and pangolins to humans because loss of habitat and loss of biodiversity led to increased contact between animals and humans (Morens, 2020). Similarly, in the case of climate change brought about by global warming, as humans cleared forests and grasslands to establish industry and agriculture, increase in industrial activities and increase in the output of greenhouse gases have led, in turn, to increased heat content in the different layers of the atmosphere. This too led to loss of biodiversity and increased risk of contacts between humans and animals, generating not only heat related health effects, but also other infections. Besides, rise in temperature allows viruses and other infectious agents to grow, leading to infectious disease epidemics (Habibullah et al., 2021). Yet others, for example, Heyd (2020), have argued that the emergence of COVID-19 is a faster 'version' of the unfolding of the health effects of climate change, taking weeks and months instead of decades and centuries; both share a common theme that they take time to develop, initially slowly, and then with rapid, runaway change. In the case of covid, the rate of growth were slow to begin with and then it became a worldwide crisis and ended up as a pandemic; in the case of climate change and global warming, the rate of rise in global temperature was slow to begin with and then the rate of rise in the temperature and heat content was steep (as shown in Figure 11.1 previously). Both COVID-19 and climate change are labelled as 'transboundary' issues, where the source of the problem may have been elsewhere but the after-effects are experienced by people across the world transcending geographical barriers across the countries.

The COVID-19 pandemic and responses to the pandemic, with country-wide lockdowns where people were asked to stay indoors with closure of factories and workplaces and more people were working from their homes, resulted in lower levels of greenhouse gas emissions. As a result, due to restricted mobility, an overall 17% reduction in emissions was noted (Le Quere et al., 2020). At the same time, the COVID-19 pandemic has pushed nearly 750 million additional people to poverty which is a risk factor for further infectious diseases and climate-averse behaviours such as burning of biomass fuels for cooking, and further loss of biodiversity. Hence the inter-relationship between COVID-19 and climate change deserve a close inspection for both learning about the consequences and lessons that can be derived. Lessons learned from managing COVID-19 that can be translated in the mitigation of climate change particularly relate to the mobilisation of community and behaviour change solutions that are apparently counterintuitive from the perspective of finances, yet they can address an emergent problem of existential crises: after

all, both COVID-19 and health effects of climate change push a section of the society at higher risk of death and disabilities that are best mitigated by behavioural responses.

PICTs are not isolated from the rest of the world and COVID-19 and have shown a similar trend in the pattern of the COVID-19 pandemic, in that after an initial period of relative low incidence, COVID-19 continued to rise significantly in the second half of 2022 (Figure 11.9).

COVID-19 is the consequence of climate change. The unprecedented impact of the COVID-19 outbreak has acutely overshadowed public thinking regarding climate crisis impacts. The novel coronavirus pandemic astoundingly raced around the world and caused 1.8 million deaths while the slow effects of climate change are unnoticed but exhibit more violent outcomes (Cooper & Nagel, 2021). Phillips et al. (2020), stated that the increasing and intensifying climate hazards are likely to intersect with the COVID-19 epidemic and public health responses. Compound risks of COVID-19 and climate change was evident in Fiji when a category 5 tropical cyclone occurred during the onset of the outbreak. The World Meteorological Organization (WMO) (2020) reported that Vanuatu, the Solomon Islands and Tonga also faced challenges to recovery under states of emergency while preventing introduction of the virus.

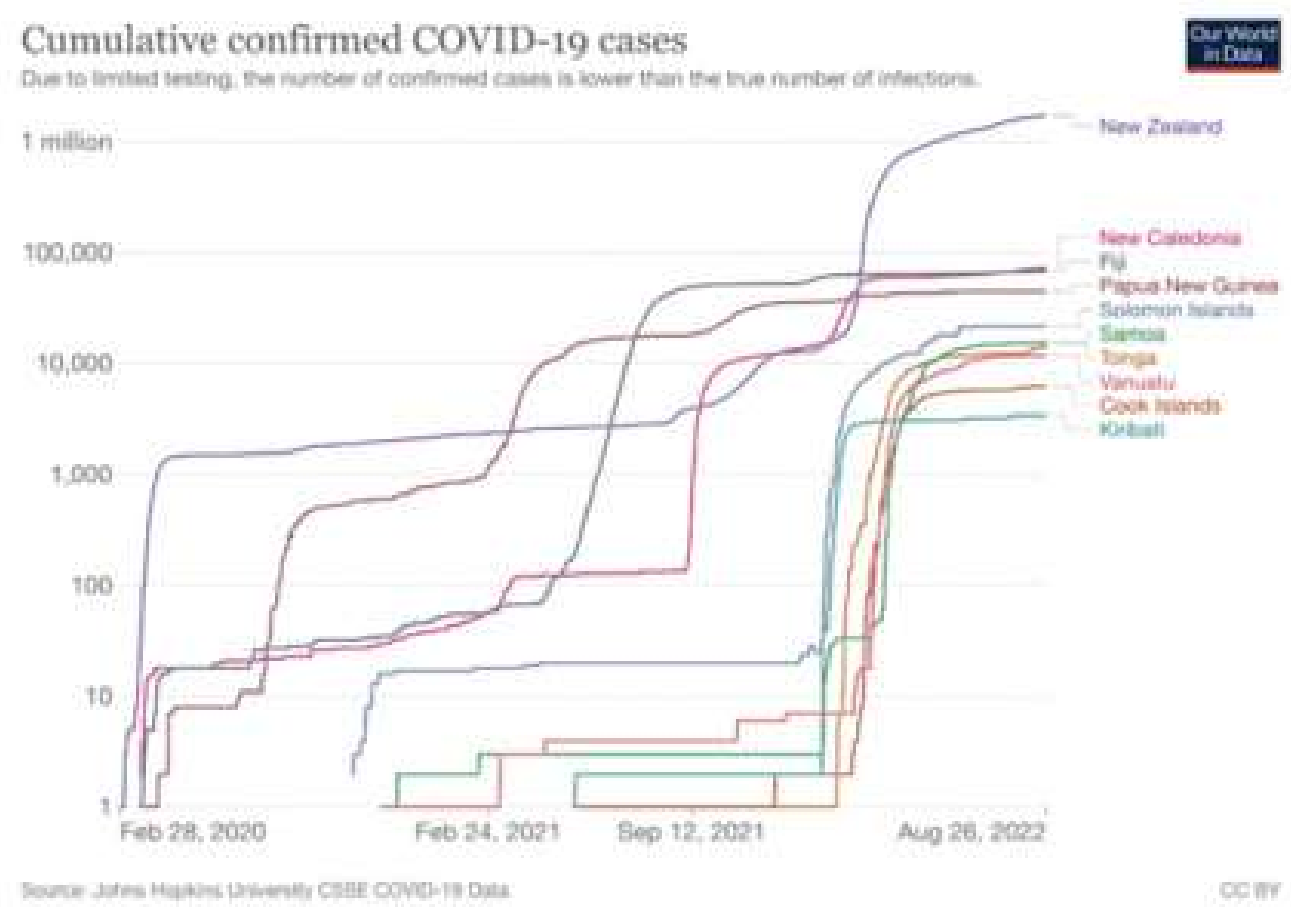


Figure 11.9: Pattern of COVID-19 infection rates in the Pacific Island countries; note that after a relatively low rate across these countries, there is a sharp rise after September 2021, largely driven by new variants of COVID19, and also brought about by increased international travel following an initial bout of restricted air travel.

Climate change impacts on health have drawn a lot of attention. As can be seen from previous sections in this chapter, climate disasters affect people's well-being, cause physical injuries and deaths and result in many losses, including homes, income, and livelihood. Global climate change is likely to be associated with malnutrition, water-borne infections, vector borne diseases, injuries, and deaths (Padhy et al., 2015). Climate change directly and indirectly, acutely, and chronically affects people's physical and psychological health. Acute effects such as the environment through extreme storms, and chronic impacts such as increasing droughts stresses human beings, which contribute to morbidity and mortality rates (Manning & Clayton, 2018). Additionally, changing climatic conditions causes uncertainties and contributes to psychosomatic and somatopsychic disorders. Climate-sensitive diseases are expected to cause an additional 250 000 deaths per year between 2030 and 2050 (WHO, 2017). Such predictions call for climate-specific initiatives to protect the planet and people. The Sustainable Development Goals (SDGs) 13.1 and 13.3 on climate action have warranted the WHO to develop health targets and strategies to promote resilience and mitigate climate change (WHO, 2017).

For people living with chronic medical conditions, as stated earlier, their ability to cope with these changes may become overwhelmed, resulting in short-term or long-term stress and anxiety, which contribute to unhealthy health behaviours such as substance abuse, or in some cases, suicidal thoughts. Other effects include failure to achieve the quality of life that could have been attained without climate change. Excess heat waves from global warming give rise to fires and increase people's risk of developing temperature-related health conditions, which could aggravate many pre-existing diseases. Global warming also provides an ideal environment for certain pathogens to thrive (Rossiello & Szema, 2019). People who fall victim to such global warming-related catastrophes experience extreme stress from their losses, which causes a variety of physical and emotional harm. Such changes in climatic conditions give rise to poor air quality, increase in diseases carried by pests, food insecurity and disruptions in clean water supply (Manning & Clayton, 2018).

COVID-19 further compels healthcare systems to cope, while health professionals are already responding to the health harms caused by the unfolding climate crisis. There is pressure on the resources and developing countries with weak health infrastructure cannot cope without assistance to prepare and respond to the COVID-19 crisis. People living with existing medical conditions suffer more as the COVID-19 virus further compromises their immune system. Travel lockdowns and restrictions exposed both positive and negative consequences. While there were also socioeconomic impacts due to loss of employment, individuals who rely on tourism were able to return to their villages to engage in farming. While involvement in physical activities removed their sedentary lifestyles, farmers were affected by the perilous effects of climate change.

11.5 Some observations relating to the climate-COVID nexus

In this section we present our key findings in relation to COVID-19, community health and mitigating the climate crisis. Factors that mitigate climate change may be environmental, socio-political, and health systems resilient in nature (see Figure 11.10). The findings presented here include mitigations specific to community health, pacific Indigenous responses (including specific Pacific health models), and Indigenous social capacity.

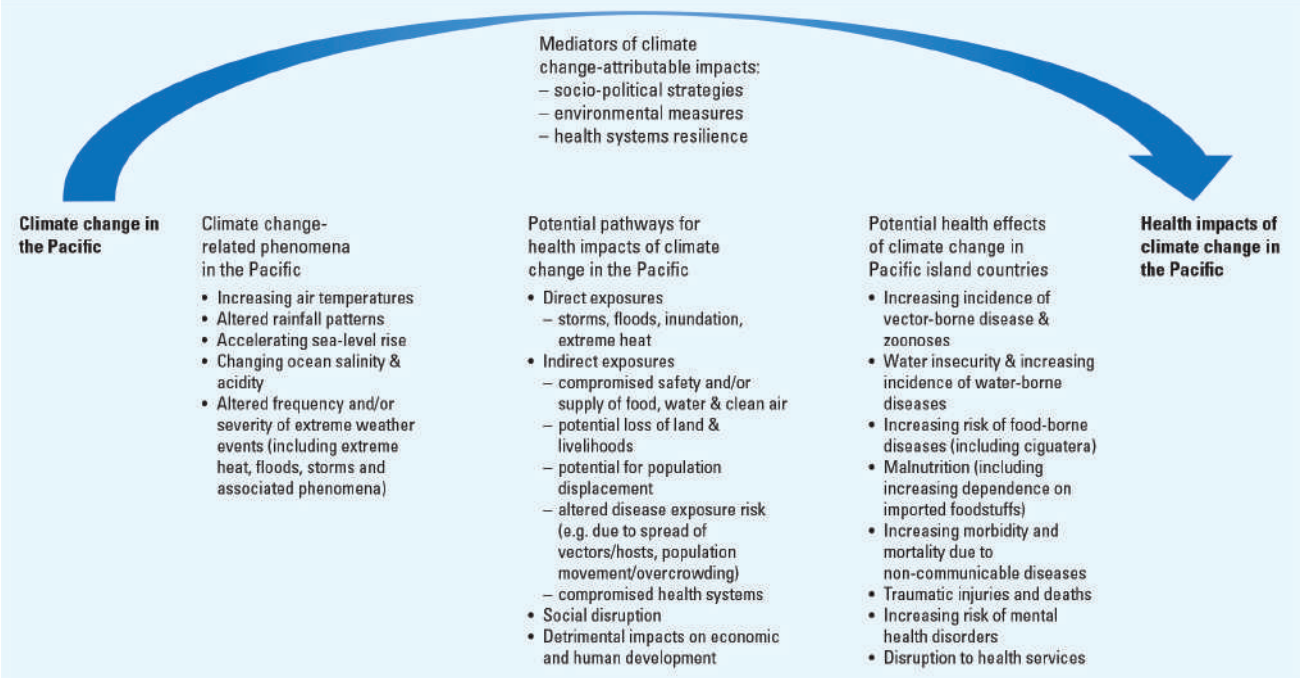


Figure 11.10: *Climate change and health impact pathways relevant to Pacific Island countries. From Health Impacts of Climate Change in Pacific Island Countries: A Regional Assessment of Vulnerabilities and Adaptation Priorities by L. McIver et al, 2016 Environmental Health Perspectives 124 (11), p.1708 (http://dx.doi.org/10.1289/ehp.1509756)*

11.5.1 Mitigation for climate crisis impacts on community health

Combining current and Indigenous knowledge is crucial in mitigating the impact of the climate crisis in the Pacific region. The Type 2 diabetes risk of Indigenous Fijians in the interior of Viti Levu (Fiji's largest island) is significantly less when compared with those who live in Fiji's urban area. Data from Esala Vakamacawai's research shows the low risk of diabetes in villagers living in Narukunibua and Navuniyasitu, two villages in the interior of Viti Levu. Narukunibua village runs a group activity called Vicavuki, empowering everyone to own a garden and participate in gardening daily except on the weekends.



Figure 11.11: *Talanoa with Narukunibua and Navuniyasitu villagers, in Namosi, Fiji (Provided by authors).*

Subconsciously, these villagers actively engage in high and moderate-intensity physical activity weekly, aligning with WHO recommendations. Vicavuki, a traditional group motivation activity, allows everyone to participate and exercise subconsciously, reducing their risk of diabetes. Also, owning a vegetable garden provides daily fresh, homegrown food for nutritious, healthy meals. Adopting these cultural values in urban settings can mitigate the risk of NCD.

Whilst growing up in the village, Indigenous knowledge plays a significant role as a determinant of health (Miyamoto et al., 2021). While Western medicine agrees that illness results from a vulnerable immune system, some traditional Pacific communities would explain it in socio-cultural and spiritual terms. (Sopoaga et al., 2010). Consider the case where village elders recommend herbal medicine to remedy specific illnesses and identify signs in mother nature to predict the weather. In Fiji, mango juice can relieve children struggling to sleep, bees and hornets' nests in the grass are seen as a sign of a hurricane, and forest insects flying into the house can predict heavy rain and flooding. In addition, the impact of a heatwave can be neutralised by traditional thatched Fijian bure (house). Science alone is not the answer to the climate crisis, and there is a need to recognise traditional knowledge in adapting and mitigating change (Johnston, 2015).

Collectivism is a Pacific way of living that can mitigate the impact of the climate crisis. Following the aftermath of category five Cyclone Winston in 2016, one of the authors was part of an emergency health team deployed to Levuka in Fiji to assist affected communities. It was bittersweet to see people without a roof over their head, drinking kava under an improvised tarpaulin roof, singing and laughing. There was the realisation that even when they do not have housing and clothes, they seem to be at peace. In climate crisis mitigation, we need to rethink our approach and come up with collective approaches to shoulder heavy burdens through family, friends and community involvement (Podsiadlowski & Fox, 2011). In this case, prioritisation of collectivism over individualistic ideas is important.

Mitigation for indoor pollution can be achieved through replacing heat generated wood burners with proper housing insulation, petrol-run generators for clean energy sources such as solar and wind turbines, and motorised vehicles with electric ones. In addition, walking and cycling can substitute short car runs, a move that will reduce air pollution and improve physical activity, reducing NCD risk. The WHO believes that 30% of adults who are not achieving the recommended physical activity level will benefit from the substitution of driving with walking.

Other mitigating concepts include replanting ecological barriers such as mangrove and riverside vegetation (see Figure 11.12) which can cushion the impact of flooding and rising sea level (Davis, 2022). In addition to protective intentions, mangrove can address healthy food security because it becomes a niche for fish, crabs, birds and many other species important for domestic food (Bell et al., 2018).



Figure 11.12: *Mangrove planting to mitigate the climate crisie in Fiji (Bolataki, 2017)*

Case study: Climate crisis and its impact on Galoa, a remote island in Fiji



Figure 11.13: *Galoa Island, Kadavu in Fiji. Source: Google Earth*

KN is a 56-year-old iTaukei male who lives on Galoa island in Kadavu. He is a newly diagnosed diabetic with bilateral below knee amputation due to complications of Type 2 Diabetes. KN said that he noticed a lot of changes on Galoa Island in the past 50 years due to the impact of the climate crisis and life is getting difficult for him on his island paradise. Processed food is now regarded as the golden standard when compared to healthy vegetables and fresh fish found freely on the island.

KN thinks that he became diabetic due to a change in diet and lack of exercise through farming. In addition to a changing lifestyle, the climate crisis made things worse for KN. Our freshwater source is dry, and we have to pipe drinking water from Wailevu village, on Kadavu's mainland. Our vegetable garden, root crop and yaqona *(Piper methysticum)* wither during the dry season. Villagers who can afford to buy water sprinklers install them in their gardens to keep their crops watered and viable until the next rainfall. We need to replant native vegetation.

KN said that foreign vegetables and root crops struggle to thrive on Galoa Island, but native ones are unaffected during the dry weather. KN believes that they must revert to their traditional lifestyle of native crops to maintain a constant supply of healthy food sources.

11.5.2 Community responses to emerging health problems

Climate crisis adaptation is a complex and dynamic process that encompasses individual, family and community responses. However, adaptation cannot be viewed as operating independently of broader contextual socio-ecological systems and intersecting systems of oppression and privilege. The climate system is one aspect of the broader system that influences health outcomes.

Institutional practices, social systems and cultural customs will influence responses to climate change and its associated health impacts. Understanding local Pacific knowledge systems is crucial in the designing of people-centred, culturally nuanced responses. Examples of Pacific specific responses to health impacts can be found in relation to the COVID-19 pandemic and in particular the vaccination programme in New Zealand where Pacific health and allied workers employed their knowledge of Pacific cultures and Pacific models of health to engage Pacific communities in the vaccine programme (Ratuva et al., 2021). However, the Covid response in many PICTs, including New Zealand, exposed gaps in funding systems that were slow to resource Pacific communities and agencies to deliver Covid focused health services. While Pacific nations, because of their geography could more easily enforce border restrictions to limit the transmission of Covid from other places, under-resourced Pacific nations reliant on local solutions faced challenges in countering the social and health impacts of the pandemic (Vakaoti, 2021).

Unlike the pandemic, where PICTs could close their borders to reduce disease transmission, the Pacific will be at the 'frontline of climate change' (Williams & McDuie-Ra, 2018, p. 39). Nevertheless, lessons can be learned from the innovative and diverse Pacific responses to the pandemic and applied to responding to the emerging health problems that the climate crisis brings.

11.5.3 Pacific Indigenous responses - specific Pacific models of health

We recognise that the pandemic and the climate crisis are not experienced equally. It may seem that already marginalised communities have the least capacity to alleviate the likely consequences of pandemics and climate change on community health. However, it can be argued that responses to the pandemic and to climate events thus far emphasise the positive outcomes that occur when Pacific Indigenous knowledge is combined with contemporary knowledge. Taking this into consideration, responses to the health impacts created by the climate crisis should use Pacific models of health and wellbeing to frame responses. Most Pacific health models identify common values and beliefs that affect health-seeking behaviours of the Pacific people (Ravono, 2021) and inform Indigenous assessment and intervention For example, the Tuvaluan Ola Lei Framework and the Fijian iTaukei Vanua Health models both identify concepts of caring, which is fostered in relationship and partnership. These models highlight the supporting structures, including customs and traditions that protect individuals from opposing forces that cause ill-health or death.

Pacific people share a genealogical-based identity through their land, origins and family connections, maintain paternal and maternal relationships and share responsibilities of caring for one another (Manuela & Sibley, 2015; Tiatia, 2008). Unfortunately, health service delivery to Pacific communities lacks the appropriate cultural context inclusion, therefore, Pacific people experience health inequalities (Ravono, 2021).

The Ola Lei components have four main qualities, and they are peacefulness and harmonious relationships, happiness and contentment in life, the absence of illnesses, and longevity (Panapa, 2014). The Ola Lei adopts a more Pacific community-based approach like readiness, traditional skills and knowledge, spirituality, and richness and relates to how people receive community support. Also, in, Mason Durie's Te Whare Tapa Wha model presents the four cornerstones of health as a model for understanding Māori health and helps identify the complex nature of both wellness and illness (Rochford & Signal, 2009). As mentioned above, people resort to traditional knowledge to survive and maintain their livelihood.

The Samoan fonofale model, whose three components interrelate the dimensions of the environment, time and context, impacts a Samoans person's health and wellbeing (Pulotu-Endemann, 2001). Also, the Tokelau Te Vaka Atafaga health assessment model has six essential health concepts that represent the spiritual or belief systems, the mind and the physical body, which cannot be separated from the mind (Kupa, 2009). The Tongan Fonua model pays particular attention to Tongan hierarchy and represents the relationship between humanity and the environment (Cammock et al., 2014). Similar to the Fijian vanua, Samoan fanua, Māori whenua and the Cook Islands' enua, fonua refers to the complex interconnectedness and ongoing relationships between the entire physical and social environment and humanity.

The Cook Islands' Tivaevae culturally responsive model is a multicoloured patterned cloth, which is stitched to reflect the environment (Futter-Puati & Maua-Hodges, 2019). Similar to the other Pacific health models, the Tivaevae model signifies the patterns of stitching together Pacific cultural values that define who they are. These Pacific models reaffirm the structures that surround and serve to protect the individual from opposing forces that cause illness, or death (Ravono, 2021). Natural disasters disturb the harmonious relationship Pacific people share with their environment; therefore, their livelihood is affected.

11.5.4 Indigenous social capacity

We indicated earlier some traditional adaptation strategies used by Pacific communities. In Fiji, for example, the concept of solesolevaki, which is an event of communally working together (Vunibola & Scheyvens, 2019) to return to a near-normal state in communities. Also, post climate change disaster, traditional food preservation is used to ensure nourishment is sustained until outside help arrives. For example, burying of food such as root crops as an alternative preservation method. There are other alternative food preservation methods to prevent food from spoiling.

We now move to discuss the adaptive capacity of Pacific communities and traditional knowledge systems. All systems hit their limits somewhere, so a fundamental question to address is; what does this look like for health systems in the Pacific? Pacific peoples develop identities based on culture, environment, land, relationships and cosmology and these also relate to their wellbeing (Ravono, 2021). Thus, any disturbances to their environment are likely to have impact on their wellbeing and health. Traditional health practices, values and knowledge have been the key that help maintain wellbeing in communities during disastrous events.

One hundred and seventy of the 194 WHO member states have reported the use of traditional medicine, which is the first approach by Indigenous people to treat many diseases (WHO, 2022). Traditional health knowledge is highly influenced by cultural and historical origins, based on theories, beliefs and experiences Indigenous to different cultures. From an Indigenous perspective, health and wellbeing are viewed holistically, and Indigenous people have pluralistic solutions to any health problems that also consider the physical, mental, social, spiritual and ecological dimensions of health (Janska, 2008).

Although many Pacific communities may have limited resources, traditional practices of reciprocity continue through the exchange of food and basic items to help sustain other members of the community. Treatment using traditional knowledge is individualised to their social circumstances, and this not only address the symptoms but also restore the state of equilibrium within oneself and the environment (Ravono, 2021).

As noted earlier in the chapter, flooding is one climate crisis impact that places extra pressure on health. It is important to investigate the potential coping strategies of the community during a flood and to ask at what point after a crisis do people start implementing such practices. In Fiji, some traditional health practices include boiling drinking water, caring (veivukei), and sharing traditional health knowledge for those that need assistance. Also, in events of an outbreak, community leaders and chiefs work with the Health Ministry to impose controls on movements through curfews hence, limiting the spread of infections. Although communities are limited in many ways, traditional practices of reciprocity continue through the exchange of food and basic items to help sustain other members of the community. These values are part of being an iTaukei in Fiji (Ravono, 2021). In instances where injuries are prevalent, herbal therapies are used and applied. Such traditional healing beliefs form a combination of ethnic medicine plus Western medical care.

A systematic review by Bowen et al (2023) found a range of health effects of climate change and responses by the PICTs as summarised in Table 11.15:

Country	Climate change exposures	Climate change exposures	Responses
Fiji	Storm surges	Storm surges	EWS for leptospirosis, typhoid and dengue
	Cyclones		Mosquito surveillance
	Landslides		Relocation of villages
	Landslides		
	Coastal erosion		
	Water scarcity		
	Seal level rise		
	Groundwater salination		
PNG	Rising sea levels	Vector borne diseases	Strengthening awareness
Solomon Islands	Cyclones	Capacity	Prioritised respiratory and vector borne diseases, water borne diseases, food security, traumatic injuries
	Coastal erosion	Psychosocial	
	Groundwater salination	Respiratory illnesses	
	Drought	Zoonoses	
	Flooding	Vector borne disease	
	Temperature rise	Malnutrition and food security	
	Sea level rise	Zoonoses	
	Coral bleaching	Zoonoses	
	Ocean acidification	Zoonoses	
Samoa	Extreme weather events	Water security and safety	Community health education on WASH
	Rising temperature	Waterborne diseases	Hazardous waste management
	Ocean acidification	Food security and safety	Vector control
	Coral bleaching	Malnutrition	Breast feeding
	Rising sea level	Food borne diseases	Psychosocial support
	PNG	Vector borne diseases	Disease surveillance
			Research linking health and climate change

Table 11.15: *Pacific Island countries – health effects and responses*

11.6 Concluding brief and social policy implications

Pacific experiences of climate change, the pandemic and its health impacts alongside Pacific Indigenous knowledge should be at the core of addressing climate change. While the pandemic distracted efforts to negate climate change and its impact on health there is a need to recognise the connection between the two. There is now an opportunity to focus our attention on taking action to forefront Pacific Indigenous knowledge and response systems, alongside other knowledge, and to start to prepare now for what will be needed to combat the health impacts of climate change for Pacific people.

Indigenous health knowledge can be used as a framing tool for adapting to climate change effects on health (or climate crisis induced health complications). In this regard, Pacific communities should be considered at the forefront of assisting its members since they share culture, values and beliefs. Outside helper's under-rate the ability of affected communities to draw on their own resources (Silove et al., 2006). Therefore, any outside assistance should be carefully designed to avoid cultural insensitivity, intrusion or disempowerment of local leadership systems. In this next section we discuss the health and social policy actions needed to address the impact of climate change on the health of Pacific people.

11.6.1 Policies need to merge local Indigenous and scientific knowledge

Mitigation and adaptation to the climate crisis are acceptable and appropriate objectives to reduce the impact of the climate crisis. Remote island countries in the Pacific are the most susceptible to the effects of the climate crisis. The failure in the current management of the climate crisis is the inability to merge local knowledge and scientific knowledge successfully. It is believed that scientific approaches alone are not adequate to reduce the climate crisis. A combination of present-day technology and Indigenous knowledge is vital in impacting climate change. Ignoring resilient Indigenous knowledge that has existed for many generations is a mistake and can mislead the people. This is evident in the middle of tropical cyclones when the electrical blackout paralysed digital technologies. People reverted to basic Indigenous knowledge for survival. Yet, there is limited relevant literature available, pointing to the need for research on Indigenous practices to be promoted and funded.

The Intergovernmental Panel on Climate Change (IPCC) predicts that the climate crisis will worsen, leading to extreme drought and tropical hurricanes (IPCC, 2023). A case in point, Fiji's health sector has recently been devastated by severe weather. Heavy rain and drought lead to stagnated water pools, an ideal breeding ground for the spread of vector-borne diseases such as leptospirosis and dengue fever. In the first quarter of 2022, Fiji diagnosed 1784 cases of leptospirosis with 36 mortalities, and the youngest victim was a 15-year-old boy (Krishant, 2022). In Samoa in 2023 and 2024, increased cases of Dengue virus were reported with the majority of cases being under 10 years and over 60 years (Government of Samoa, Ministry of Health, 2024). Globally, more than 66 million children face health problems due to extreme weather, and it is estimated that this will worsen and affect 175 million children.

11.6.2 Policies need to address population preparedness

As stated above, the eventual divestment of the Pacific COVID-19 vaccination programme to Pacific organisations in New Zealand yielded positive impacts, however, the targeted ethnic specific Pacific response was delayed. Additionally, the impacts of the COVID-19 health response overwhelmed health systems around the world, leading to pressured health systems that temporarily closed some health delivery services while a response to the pandemic was prioritised. The pressure on health systems globally resulted in delays in the provision of health services, and health and allied health workforces that suffered the effects of burnout and exhaustion (Chang et al., 2021).

Planning for climate crisis health impacts in the Pacific means addressing ahead of time the health system and workforce challenges that will ensue. Consideration needs to be given now as to how to build and maintain an at-the-ready health workforce in the Pacific. This means investing in future health workforce education now by encouraging and funding Pacific people into health careers. Similarly, population preparedness includes supporting Indigenous Pacific health practices noted previously in this chapter, thereby improving the ability of communities to work together to adapt to climate crisis events. Disasters are becoming progressively devastating and require extensive planning, reconstruction, and recovery efforts to rebuild better. Therefore, while developing recovery plans, it is also vital to contemplate and address community trauma and mental health when engaging with disaster-affected communities.

Awareness raising education is another component of population preparedness. Employing culturally responsive methods of communicating about the likely health impacts of climate change will enhance the likelihood that government adaptation strategies will be implemented by communities (Harris 2014). Recent literature suggests that perceptions of the climate crisis in Samoa influence the strategies used by villages to adapt, and furthermore perceptions and adaptation are influenced by traditional village gender roles (Cassinat et al., 2022). Therefore, communication strategies need to take into account the local cultural context and engage Pacific participatory cultural approaches (Kuir-Ayius & Marena, 2019) for responding to climate induced health issues. Successful climate mitigation policies should integrate education about climate change and its impacts on health across all levels of education in the Pacific.

Governments need to be engaged in developing responses with local communities; responses that are cognisant of the intersectional and holistic impact of climate change on health. In essence, health responses should recognise that health is also impacted by social inequities so that social impacts, for example, housing, poverty, alongside wellbeing issues such as disability or violence, are addressed in conjunction with directly dealing with physical and mental health issues. Versey (2021) suggests that such an approach necessitates asking questions such as; Who is most at risk in the climate crisis? Who is more likely to be impacted by climate events? Who is likely to experience long-term challenges as a result of the climate crisis? The answers to these questions can guide planning for nuanced responses to diverse sectors of the Pacific population, such as women, children, men, people who experience disability, poverty and so forth.

11.6.3 Policies need to encourage a multi-sectoral approach

To enable a successful adaptation to climatic change impacts on health, a multi-sectoral approach is required. Such an approach can be multi-level in nature to include psychosocial interventions that include the person, family and the whole community. Psychosocial recovery efforts should ensure that specialist mental health services are freely available. There needs to be consistent available services and without barriers (language in particular), and their availability must be made known to communities. Such services may not be limited to lifelines that offer an ear to people in crises.

Approaches may include reconstruction programs that promote psychosocial, economic and cultural recovery. We have already indicated that there is a need to train primary care personnel to be vigilant to symptoms of disabling and hidden cases of traumatic conditions to enable the provision of appropriate interventions. Coordination between governments, communities, and individuals to enhance preparedness and access to services in such events is necessary. Coordination is needed at every level of government to prevent potential conflicts of strategy across agencies, and each country should have in place disaster-ready detailed plans that are tailored to the unique vulnerabilities and the affected Indigenous Pacific population.

Responses to Pacific communities need to be culturally nuanced and incorporate biopsychosocial models of practice such as targeting resources to prevention, intervention and postvention. For example, adoption of public health measures related to smoke inhalation and heat exposure that are likely to increase in future with runaway climate change aftereffects.

11.6.4 Policies need to support holistic climate crisis-health mitigations

For mitigation plans to be successful, they should be holistic in a way that addresses the interconnected challenges to people and the environment and, to create a more sustainable and resilient future. These include developing climate resilient healthcare systems to withstand the impacts of climate change (Abbass et al., 2022). Some examples include developing early warning systems for disease outbreaks, heatwaves and ensuring healthcare access for the vulnerable populations. To provide adequate and effective services, healthcare facilities must be built to withstand extreme weather events.

Holistic urban planning plays a significant role in health and climate change as they involve promoting walkability and cycling infrastructure, prioritising public transportation, and creating green spaces. As such, emission is reduced, physical activity is enhanced and air quality is improved, which all enhances wellbeing. The shift to renewable energy sources like hydropower at Bukuya project in Fiji, solar and wind to reduce greenhouse gas emissions mitigates climate change and improves air quality, thereby reducing respiratory and cardiovascular diseases associated with air pollution (Nowak, 2019).

The health of farmers can be protected from pesticide exposure through the adoption of agroecological practices in farming. Such practices reduce the use of synthetic inputs and focus on biodiversity conservation, water management and soil health (McLennon et al., 2021). Food security is enhanced, deforestation is reduced and carbon sequestration is promoted with this approach (Anwar et al., 2021). The protection and restoration of natural ecosystems have multiple benefits as they sequester carbon, regulate water cycles and are a habitat for biodiversity (Clarkson et al., 2013). These ecosystems have totemic relations and also enhance mental wellbeing of the Indigenous population.

To holistically mitigate climate change, education plays a significant role in addressing its health implications. Behavioural changes follow the promotion of environmental literacy to communities, families and individuals to act on emission reduction, health promotion activities, and healthy lifestyles. Using a participatory approach in a decision-making process among community members and engaging them in climate change and health initiative programs fosters ownership, social cohesion, and ensures their needs and perspectives are considered (Chu, et al., 2016). Implementing green infrastructure helps manage stormwater, reduce heat effects and improve air quality (from the Cook Island experience). As such, there is reduced risk of flooding, and lesser health-related illnesses. Therefore, these interventions positively impact the environment and public health. Waste management practices such as composting, and recycling reduces emissions and pollution. This is what constitutes a circular economy, which minimises resource consumption, promotes reuse and recycling, which reduces the health impacts of waste disposal (Kurniawan et al., 2022).

11.6.5 Policies need to address climate financing of health adaptation and mitigation

Climate financing supports health adaptation and mitigation efforts in climate change and involves the allocation of financial resources to fund projects, programs, and initiatives aimed at addressing the health impacts of climate change (Lee et al., 2022). Climate financing assists healthcare systems by building resilience and preparing communities to cope with illnesses related to extreme weather events (Khan et al., 2022). Through climate financing, resilience is enhanced, emissions are reduced and the vulnerable communities are prioritised.



> ‘Before, used to have a lot of food alternatives, but now we don’t. We eat the same diet every day, and then you get sick from it. The current generation prefers imported goods over traditional island cuisine’

Serei Joseph
Community participant
Epau village
Efate
Vanuatu
(POCCA research team interview, 2023)

Pork is a source of protein for the people of Epau Village in Vanuatu but now the series of cyclones have threatened this traditional source of food and wealth (Photo: POCCA team, 2023).

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Chapter 12

Climate Crisis and Food Security in Pacific Island Countries and Territories

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Sugarcane farmers in Labasa, Fiji often experience loss of crops due to extreme weather patterns such as droughts, cyclones and flooding (Photo: POCCA team, 2023).

Abstract

Climate change has contributed to increase in the rates of transition in food systems and nutrition from traditional diets to more ultra-processed foods in Pacific Island Countries and Territories (PICTs). Increasing frequency and intensity of climatic extreme events and loss of land due to rising sea levels make the recovery of local food systems very slow. This has led to permanent and irreversible lack of food availability, accessibility, and stability, as well as increasing food insecurity, poor diets and high incidence of non-communicable diseases (NCDs). How could we understand and address climate change impacts on food security and reduce non-communicable diseases in PICTs? First, we explore the common perception of foods, food security, food sovereignty and consequences of the change of food sources and eating habits. Second, we describe the status of food system and food security in PICTs. Given the interconnectedness of local, national, regional and global food systems as means for food availability, accessibility, stability and utilisation in Pacific Island communities, we describe the diversity of food systems in PICTs at rural, urban and atoll communities. Third, we describe the impacts of climate change, shifting the rural, urban food systems to a more atoll-based food systems decreasing the reliance on local production, and increasing the consumption of foods from ultra-processed, expensive imported foods. We also share, using local case studies, few examples of how Pacific Island communities build their resilience to climate change and increase food and nutritional security and ensure environmental sustainability. We conclude the chapter with policy recommendations and key research gaps.

> ‘In regards to food security, climate change has really impacted our food crops such as bananas and pandanus. In order to address food security issues in our communities the local government and central government need to secure fundings to help each community set up small scale farms and plant climate resilient crops’
>
> Chris Makiphie
> Laura village
> Marshall Islands
> 2023
> (POCCA research team interview, 2023)



Home garden in Laura Community, Marshall Islands, showing home gardening as an adaptational strategy to climate change (Photo: POCCA team, 2023).

12.1 Introduction

Pacific Island Countries and Territories (PICTs) are heterogeneous. The region comprises 28 countries, which are often divided into the sub-regions of Micronesia, Melanesia and Polynesia. The 28 PICTs contain 20,000 islands and atolls that are scattered across the Pacific Ocean, which covers 46% of Earth's water surface (Goldberg, 2018). In 2020, these islands and atolls are home to about 12 million people (Pacific security, 2024). The larger Melanesian countries of Papua New Guinea (PNG), Fiji, New Caledonia, Solomon Islands and Vanuatu represent 90% of the total Pacific Islands' population and 85% of the total land area. The region also includes some of the smallest, widely scattered and lowest elevation countries in the world. For example, the land area of Tuvalu is only 26 km^2 and the highest point of Tuvalu is 5 meters above sea level (Sisifa et al., 2016; Wairiu et al., 2012). Heterogeneity exists both among and within countries. The high islands have rivers, streams and groundwater, which rely on rainfall for recharge. Many small islands and atolls rely exclusively on rainwater and shallow groundwater in lenses sometimes sitting above saline water (UNESCAP, 2007) to supply water for drinking, cooking, washing and other socio-economic functions (Taylor et al., 2016).

Historically, food sources were mainly from agriculture, fisheries, wild sources such as forests, rivers etc (Iese et al., 2018). Agriculture historically played a central role in Pacific Island communities. It provided food, fibre, and other materials that maintained socio-cultural connectedness, pride and identity. In post-independence times, agriculture is also a critical sector for employment, export revenue, household income and livelihoods (McGregor et al., 2016). Agricultural systems in the Pacific Islands are highly dependent on favourable climatic conditions for successful yields. Some key crops such as yams and breadfruits are seasonal and other crops such as taro and fruit trees rely on abundant rainfall for high yields. About 70% of the agriculture systems in the Pacific Islands are rain-fed (FAO, 2010) and about 90% of farmers are smallholder subsistence to semi-commercial farmers. The remaining 10% are commercial farmers, who contribute to export revenue and provide employment for Pacific peoples (Iese et al., 2020; Sisifa et al., 2016). Due to the high exposure and sensitivity of Pacific agriculture systems to climatic variables, agricultural components such as crop yields are highly affected by climatic extreme events and changes in seasonality. Extreme events such as droughts, floods, tropical cyclones, and storm surges damage crops, kill livestock and cause loss of agricultural productivity (Sisifa et al., 2016). Pests and diseases and human pressures such as increasing population, and unsustainable use of pesticides contribute to long-term losses in agricultural production in PICTs (Sisifa et al., 2016). On top of these pressures, climate change is affecting the growth and phenology of crops, causing sea levels to rise, and exacerbating the impacts of extreme events and pests and diseases on land availability, soil fertility, crop yields, livestock supply and agriculture equipment (Wairiu et al., 2012).

The impacts of climate change on agricultural production further declines yield, local food production and increase reliance on imported, ultra processed foods – leading to the increase of non- communicable diseases. How could we understand and address climate change impacts on food security and reduce non-communicable diseases in PICTs? We attempt to answer this key question in our chapter based on review of existing literature, community field research as well as more than 100 years of our collective living experiences growing up and thriving in our own communities (spread across high islands, low lying islands and atolls). We are also sharing more than 100 years of collective research experiences in different components of food system, food and nutritional security in PICTs.

The focus of our chapter is based on three key approaches. First, we explore the common perception of foods, food security, food sovereignty and consequences of the change of food sources and eating habits. Second, we describe the status of food system and food security in PICTs including the diversity of food systems in rural, urban and atoll communities. The interconnectedness of local, national, regional and global food systems impact on food availability, accessibility, stability and utilisation in Pacific Island communities. Third, we describe the impacts of climate change in shifting the rural, urban food systems and the decreasing reliance on local production, while increasing the consumption of foods from ultra processed, expensive imported foods. We also share, using local case studies, a few examples of how Pacific Island communities build their resilience to climate change, and increase food and nutritional security and ensure environmental sustainability. We conclude the chapter with policy recommendations.

12.2 Defining the context of the food-culture-health-resilience, food sovereignty

To understand the impacts of climate change on food system, food and nutritional security in PICTs, it is important to focus on the culture of foods. PICTs are quite culturally diverse, and food plays a central role in communal culture. Food is more than what one consumes. In most Pacific communities, food is also viewed as a means of demonstrating love, generosity, care, godliness, the environment, power and strength. It represents cultural relationships, language, and norms. It is a source of health and cultural wealth, medicine, social interaction, traditional currency, and a means to gain status. Food is often given as a gift and a refusal is considered an insult to the host or giver. While the subsistence values of foods are still significant in PICTs, it is also being commercialised as a source of cash. Commercial agricultural and fisheries are geared towards income, although subsistence agriculture and fisheries for home consumption is still prevalent. Thus, we could argue that although most of the households (farmers and fishers) are labelled as subsistence producers they are mostly semi commercial, selling some or most of their produce for money (Iese et al., 2020). Households are selling crops, fish, vegetables and use the money to purchase cheap and ultra processed foods such as two-minute noodles, high sugar beverages, and fast food. A discernible trend is the transition of food sources, from a traditional food system to imported ultra-processed foods (Iese et al., 2021; Guell et al., 2024). Many projects are increasing local food production to increase the access of households to local foods especially after COVID-19 and high cost of living (Iese et al., 2021) The next section describes the diversity of food systems in PICTs and consequences on food and nutritional security.

12.2.1 Food security and shifting of food systems: I am not hungry therefore I am food secured

Food security can be defined as the physical, social and economic ability to access sufficient, safe and nutritious food for an active and healthy life (Guell et al., 2024). This definition is broad enough to encompass the physical, cultural and nutritional aspects of food security. But in some PICTs, food security is mostly associated with just the idea of physical satisfaction in relation to eating. Based on many conversations we have had with communities, including young and old people (both women and men), food security is often associated with the notion of 'state of hunger'. People feel that they are 'food secured' if the 'stomach is full' and no one is hungry in their community. Even if the diet that satisfied the 'state of hunger' is only cassava and tea, they are happy as no one is suffering from hunger.

This perception of food security can be highly problematic because focusing only on immediate physical satisfaction of a full stomach can overshadow the important issues of nutritional and healthy diet.

For instance, as described below and captured by Guell et al. (2024), the rate of incidence of non-communicable diseases, and percentages of deaths attributed to food related diseases are two or three times the global rates. Therefore, the perception of food security in PICTs, discussed above can conceal 'hidden hunger'. Over-consumption of few food groups – mainly high sugar and protein groups, and very low dietary diversity may not be healthy (Iese et al., 2021). Nutritional transition from locally produced foods to ultra processed diets started during the colonial times, and continued to increase post-independence. Climate change has increased the rates of this transition, and it has become a challenge trying to reverse the process – especially in atolls and urban areas.

12.2.2 Food sovereignty – transition from independence to dependency and high reliance to processed, imported foods

Food sovereignty exists when people have the right to produce and control their food and nutrition, have control over how food is grown and define their own food and agriculture systems, and are able to grow food without having to rely on aid in any form (Guell et al., 2021). It also exists when people produce food by building on local, traditional knowledge, in consultation with scientific knowledge using participatory methods and respecting ecological diversity. Finally, food sovereignty also includes the promotion of equal society, one in which women and men and different members of a community have a say in decision-making over food (Guell et al., 2024). The principles of food sovereignty are strongly rooted in Pacific Islands agricultural practices and the adaptive capacity of traditional practices and institutions, and this was particularly evident during the COVID-19 pandemic. However, this unique legacy of knowledge has also been affected by centuries of colonialism, followed by incorporation of neoliberal agricultural policies, on the corporate food regime and on unequal terms of trade, into the modern, industrialised global food system (Guell et al., 2024).

Food sovereignty is closely associated with the Indigenous and traditional food system in which both advocate the right to healthy and culturally appropriate foods that are produced through ecologically sound and sustainable methods. Producers, distributors and consumers of these healthy and culturally appropriate foods are to be placed at the heart of the sustainable food systems and policies rather than the demands of markets and corporations (Patel, 2009; Sampson & Wills, 2013).

In the Pacific region, food sovereignty is increasingly being overshadowed by commercialisation of local food, imported foodstuff and weakening of Indigenous and traditional food system. This is evident in the impact of transition from traditional subsistence agriculture to more cash crop farming (Lako, 2001; Lako & Nguyen, 2001). These may have contributed to the decline in the local food production coupled with the increase in the importation of ultra-processed foods that are unable to provide healthy and sustainable dietary needs for the population (Lako, 2017).

12.3 Status of food systems in PICTs – shifting realities of food insecurities

Agriculture and fisheries are major contributors to Pacific livelihoods, yet average agricultural production is declining in the region. Coastal fisheries are under increasing pressure and productivity is declining. Growing urbanisation and aging agricultural producers and fishers create long-term challenges for the food sector. Although the majority of people in rural areas across the Pacific Islands still largely depend on subsistence fishing and farming including the cultivation of crops such as yams, taro, sweet potatoes, bananas and watermelon to name a few, this is quickly changing (Figure 12.1). Historically, food systems in the PICTs were managed through culture and traditional knowledge (Campbell, 2015). Indeed, Pacific food systems involved a mixture of community-based production activities, subsistence farming, bartering and inter-island trade (Wairiu, et al., 2012). A highly plant-based diet was the norm, supplemented by protein from fish, poultry and pigs (Connell, 2015; Gnecchi-Ruscne & Paini, 2017). In some PICTs, traditional knowledge continues to guide how food systems are managed in modern agriculture, aquaculture, horticulture and fisheries (Wairiu, et al., 2012). Shocks to the Pacific food system such as extreme category 5 tropical cyclones and the Western trade explosion in the 1990s saw a significant importation of processed foods (Plahe et al., 2013; Charlton et al., 2016) which has not only contributed to a shift in diet and lifestyle of Pacific peoples (Davila & Wilkes, 2020), but has also led to the high reliance of modern-day Pacific food systems on imported foods (McGregor et al., 2009; Andrew et al., 2022).

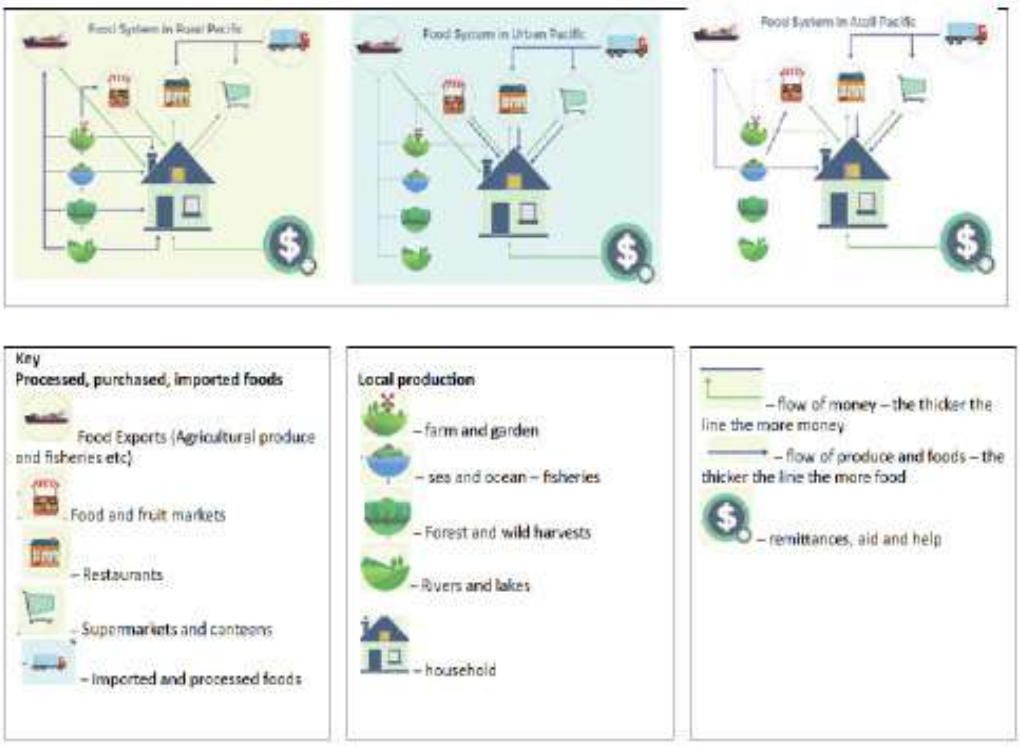


Figure 12.1: Alignment of three common food systems across the Pacific Islands. Note: the presence, thickness and direction of lines demonstrate the relationships (Provided by authors).

12.3.1 Rural food system

As mentioned, and shown in (Figure 12.1) rural and Indigenous communities have access to land, sea, farms, forests and rivers for food. The sources of food are also sources of money for most of the rural communities. There is a diversity of sources for rural areas across PICTs. In general, isolated communities with very limited access roads and boats to towns as in highlands of PNG, Solomon Islands or Vanuatu rely on about 90-100% of local food sources (wild harvests from forests, fish, bivalves and other invertebrates from the sea and rivers, birds and mammals, and own local plantations/gardens). These communities have very limited access to purchased foods. Rural communities with regular access to towns, markets and shops in Melanesian countries get about 60-80% of daily diets from local sources. Polynesian countries such as Samoa, Tonga, and rural areas in Fiji, with regular access to purchased foods, rely on about 40-60% of local sources of daily diets. These rural communities are mostly semi- commercial producers, with regular access roads and transportation to shops and markets in urban areas and cities where they sell their produce and marine products. Root crops from some of the rural households are exported. Imported foods such as rice, sugar and tinned fish are purchased and taken back to rural areas for daily consumption. Dietary diversity is normally between three to four food groups, and incidences of NCDs are rare in rural Melanesian countries but are increasing amongst rural Polynesia and Micronesian populations (Iese et al., 2021; Guell et al., 2024). There is high reliance on remittances from relatives living in urban areas and also in overseas countries. Remittances contribute to purchasing processed foods for rural communities. It is also important to note that few of the communities that were relocated due to sea level rise, such as Vunidogoloa in Vanua Levu in Fiji, had little access to urban areas and markets as they had to walk for about two hours to get to the main access roads. Their food system before the relocation was mainly from local farms, and the sea with very little reliance on ultra processed purchased foods (McMichael & Powell, 2021).

12.3.2 Urban food system

The PICTs are very diverse with regard to urbanisation. For example, Samoa, Solomon Islands and PNG have about 18%, 20% and 18% of their populations living in urban areas respectively. On the other hand, Nauru has about 100%, Kiribati and Tuvalu with 57% each, Cook Islands with 74% living in urban areas (United Nations Human Settlements Programme, 2020). Urban communities rely mainly on markets, food stalls, supermarkets and limited local supplies for food. Foods at fresh food markets are produced and transported from rural areas and outer islands. In urban cities and towns, most of the populations migrate to urban areas for better access to schools and employment opportunities and they are exposed to different food sources. There is limited land in urban areas for households to farm or do home gardens. Rivers and coastal seas are often polluted and hard to access for fishing in urban areas. Based on our expert and experiential knowledge, urban households in PNG, Fiji, Solomon Islands, Samoa, Tonga, Vanuatu have home gardens around their houses and rely on limited fruit trees in season as local sources of foods (about 10% of daily diets, as shown in Figure 12.1).

Most of their daily foods are purchased (70-90%) but from local markets (fresh food/crops/fisheries), up to 30% of daily foods are purchased from local markets, and up to 60% of daily foods are purchased from supermarkets and restaurants. Rural farmers and fishers feed urban populations in PICTs. Dietary diversity are around three to four food groups but with some of the highest ranges of NCDs – such as diabetes, obesity and anaemic in the world (Iese et al., 2021; Guell et al., 2024). These households are extremely vulnerable to food insecurity when the prices of foods increase or when disasters strike. These households rely on remittances from relatives living overseas for foods.

12.3.3 Atoll food system

In urban areas of atoll islands such as Funafuti in Tuvalu, Tarawa in Kiribati, Majuro in the Republic of the Marshall Islands, food sources have shifted from local to imported purchased food. These urban atolls are some of the most densely populated areas in the world. They host 40-60% of the total populations of respective countries (McCubbin et al., 2015). But landmass is very small, extremely low lying and not suitable for sustaining local agriculture and food production. The local populations of urban atolls rely on coastal fisheries and tuna for daily protein sources. But most of the tuna stock and fish from these atoll countries with very large exclusive economic zone are exported to Asia, Europe, USA and other countries. As a result, urban populations of atolls rely on purchased imported and processed foods (about 90%) for daily diets. From our own personal experiences, dietary diversity has about two to three food groups that are mostly made up of ultra processed, imported and very sweet food. As a result, there is very high NCD rates, mortality rates and loss of productive years of their lives due to dietary based sicknesses (Guell et al., 2024).

The constant increase in imported foods into the Pacific region, even though helped stabilise the food supply system, it apparently exposed their high import dependency and heavy reliance of readily available ultra-processed foods which encourage regular consumption and promoting dietary shifts. Approximately 80% of foods are imported into the Small Island States costing about US$5billion in 2018 as the combined value for the Pacific Islands and Caribbean communities. Most of these imported foods are nutritionally poor and highly processed (Murphy et al., 2020).

The shifts in dietary pattern away from healthy sources of traditional root crops, fresh fish and vegetables, rich in healthy proteins and carbohydrates, vitamins and minerals, to nutritionally poor ultra-processed imported foods mainly enriched with fat, salt and sugar increase high density calorie intakes. These greatly affected the food patterns of people as sources of food supply changed which subsequently altered the composition of diets (Lako, 2001; Lako & Nguyen, 2001). Available data also suggests that food energy availability with fats and oil availability have increased considerably in recent decades with increasing food imports in parallel with increasing energy density and consumption (Snowdon et al., 2013). These results in the increase incidence and prevalence of diet-related disease especially non-communicable diseases (NCDs) in adults such as obesity and diabetes and micronutrient deficiencies that is now linked to almost three in four adult deaths in the Pacific Islands.

The transition from locally produced foods for diets started to shift during contacts with European explorers and traders in the 17th and 19th Century. The rates of the shift continued to increase during the colonial administrations, Second World War and post war era. Unfortunately, when Pacific Island Countries became Independent, they became more dependent on imported ultra processed foods as governments tried to balance trade and limited revenues. Although efforts have been made to increase production of local foods through agriculture and fisheries, most of the produce are sold for cash and households purchased ultra processed and cheap imported foods. Impacts of climate change increases the rate of shifting of food systems to a more market-based and cash-based food system, and for some communities in atolls and urban areas, the shift to more market and cash-based food systems is more irreversible. As a result, there is no food security, no nutritional security and no food sovereignty in a changing climate.

Case study 1: Dietary diversity and food insecurity in Yasawa Islands, Fiji.

Yasawa group of islands in Fiji like many PICTs had experienced high burdens of non-communicable disease (NCDs), which can in large part be attributed to poor diet. This is exacerbated by an increasing reliance on food imports, often of low nutritional quality.

In addressing part of the issues, various projects were implemented, including good agricultural practices (GAP), and home and school gardening interventions in 7 villages in Yasawa. Model gardens were set up in schools to serve as seed banks for the communities.

A cross-sectional mix-method survey was conducted on adults aged 18 and over, investigating dietary intake, food insecurity (FI), food production diversity (FPD), food sources and sociodemographic data. Dietary diversity score (DDS), FPD and FI were then obtained. Household focus group discussions and stakeholder interviews were conducted as well.

Of the two hundred interviewed 52% were female with a mean age of 44.9 (15.2) years. The common sources of food were their production which is 94% and 93% of these were consumed more than once weekly. The prevalence of inadequate dietary diversity was 72% (95% CI: 65, 78), with a mean of 3.6 (1.7). The prevalence of moderate-to-severe FI was 5.5% (95% CI: 2.6, 8.5). For both DDS and FI, there were no differences by gender.

Our findings confirm that food security can be attained through home production and community sharing of food, which is primarily used for home consumption. Despite the high prevalence of food security in the Yasawa Islands, dietary quality could be improved through increasing dietary diversity, which is desirable to reduce NCDs in this setting (ICoFaN, 2023).

12.4 Climate change and shifting of food systems

Climate crisis is already undermining the food systems globally, and this has led to the increase in global hunger and is threatening many farmers and fishers' sources of food and livelihood worldwide including the Pacific Island region. The food systems of the PICTs are being put under a lot of stress. Impacts of climate change are amongst the leading stressors (McCubbin et al., 2015). Extreme weather-related disasters already have an impact on agriculture, making it more vulnerable by affecting their tolerant range with their required weather conditions. The food systems could become unstable because of these catastrophes caused by climate-related extreme events, jeopardising both local and global food security. The risk that an extreme weather event may result in a disaster varies depending on the event's severity as well as how exposed and sensitive the natural and human systems that it affects are (Lesk et al., 2016). According to Campbell (2019); Edmonds & Noy (2018); the majority of PICTs are exposed to climate threats on a regular basis. With their three main components of destruction—windspeed, rain, storm surge, and high waves—tropical cyclones with increasing intensity poses threat to nations that are closer to the equator and the cyclone belt. Most of the Pacific Islands are also exposed to flooding, sea-level rise, and cyclone, salt-water intrusion and other hazards related climate events increasing their food production lose in both long-and-short-run, thus exposing them to more threats in terms of demand, supply, and price.

The latest IPCC report anticipated that based on the current trajectories, the vulnerabilities and exposure of Pacific Islands to the frequency and the high intensity of extreme weather patterns, ocean acidification, sea level rise is unequivocal, and this has an impact on the food system (Mycoo et al., 2022). For instance, ocean acidification due to warming will cause devastating effects in the reef systems and thus affecting the food sources and livelihoods. The increase in the global trend for sea level rise will have an impact on atoll countries such as Tuvalu and this will lead to the exposure of food sources to saltwater intrusion, coastal inundation or erosion and the impact it will have in the water systems. In addition, the loss of arable land for agriculture due to coastal erosion or disappearing islands will lead to land disputes and more conflicts will arise.

In general, impacts of climate change on food security are three-fold, or leading to a triple burden to local communities (See Figure 12.2). Climatic sudden onset hazards such as cyclones, floods and droughts damage local food production leading to a decline of foods available at rural, and urban and also atoll communities. In addition, the slow-onset events such as sea level rise, saltwater intrusion, coral bleaching and ocean acidization incur irreversible loss to both land-based and ocean-based sources of foods. Given that sources of foods are also sources of income for about 90% of households, a decline of local production leads to decline of income, making food hard to access for low income and poor households. At the same time, costs of foods increase after both localised and global disasters. Households increase their reliance on food aid and remittances to help have access to foods. Unfortunately, the quality of food aid, and the food households' access and utilise are very poor.

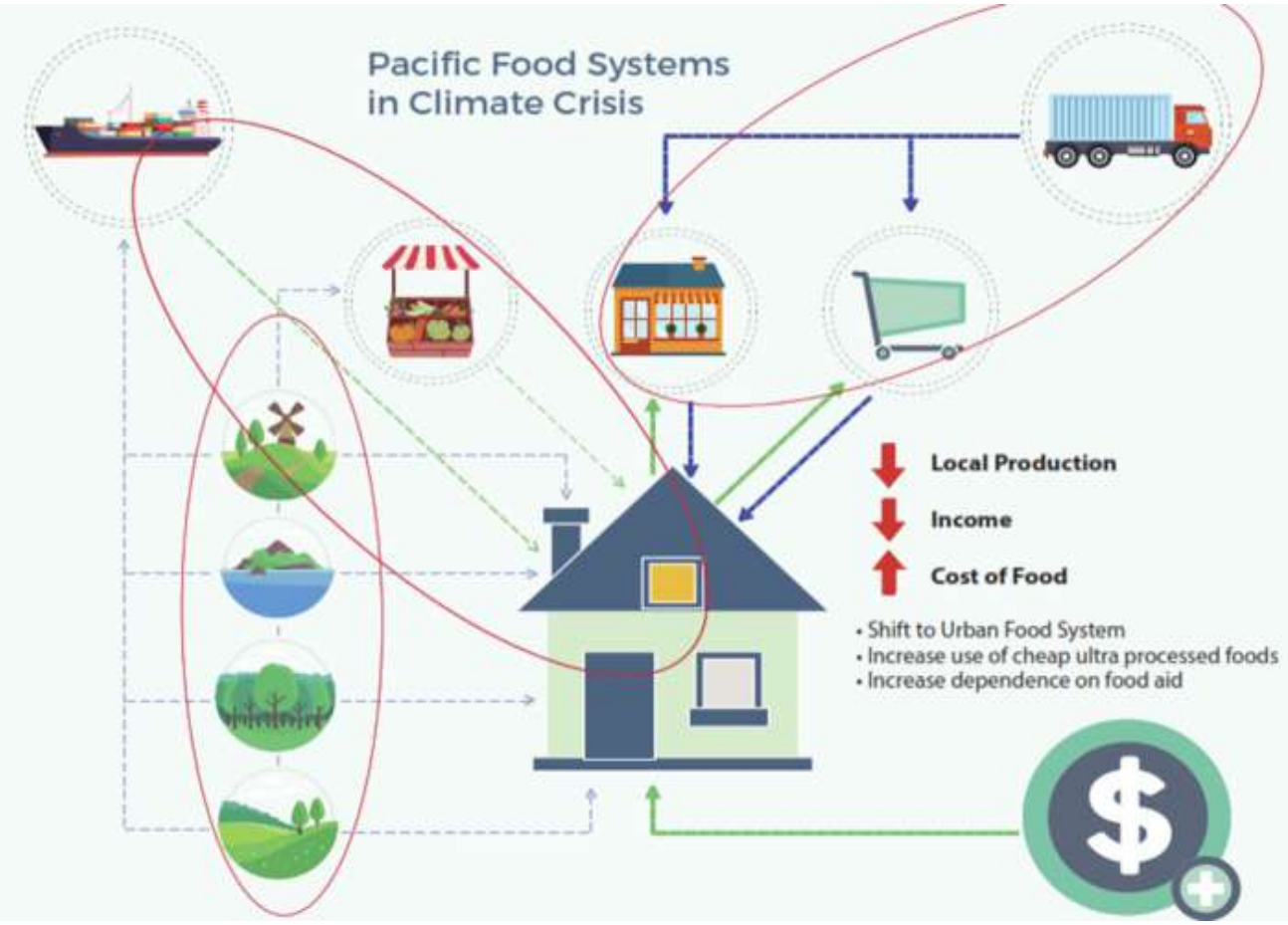


Figure 12.2: Pacific food systems in the context of climate crisis (Provided by authors).

As a result, impacts of climate change shift rural food systems to a more urban based type of food system, while urban food systems in high islands are shifted towards more atolls-based type of food systems. Atoll food systems in a changing climate are pushed to a 100% import based, increasing food insecurity and poverty at the same time.

As discussed above, the dietary transition and shifting of food systems in PICTs from traditional to contemporary food systems started during colonisations and post-independence. Climate change is pushing the food systems towards a more imported ultra-processed food system. With the increase rate of climatic hazards impacting local food production – climate change is speeding up the shifting of diets and making the shift more unsustainable and irreversible. Leading to a sharp rise of non-communicable diseases and food and nutrition insecurity.

12.4.1 Specific impacts of climate change on food production

The agricultural food system is already affected by the impact of climate variability, climate related-extreme events, and long-term climate change (Fanzo et al., 2018) in the PICTs. However, the impact experienced depends on their locations (Bowen & Ebi, 2017). For example, the impact of coastal erosion, increased groundwater contamination from saltwater intrusion, cyclones and storm surges, heat stress, and drought may individually or together significantly reduce food production for low-lying coastal regions, thus affecting human nutritional diets (Barnett, 2011). The impact on human nutrition can be influenced by several factors, such as decrease in crop yield and livestock production, fisheries, and agroforestry, which are already vulnerable to the change in temperature, rainfall, and drought. This will then influence food prices, access to high food quality, and the market resulting in the continuous high risk of malnutrition (over-and-undernutrition) because of dietary change, contributing to the difference between nutrition consumption, production values, and the recommended daily allowance for households (Dillon et al., 2019), influenced by climate change.

With human health climate change has both direct and indirect impacts as a consequence of temperature and precipitation changes and the occurrence of heatwaves, floods, and droughts. It can also cause ecological and social disruptions ranging from crop failures, shifting disease vector patterns, and population displacement, all of which contribute to health issues to some degree. Without any adaptation and mitigation, these impacts will continue to intensify over time, challenging the already fragile food system in the PICTs to meet food and nutritional security (Fanzo et al., 2018). This will then affect the food and nutritional security within the PICTs. The consequences of climate change on food security should be considered as food security is a function of food production, economic growth and employment, poverty, and public health as stated by Barnett (2020). Understanding the pathway between climate change, agriculture, and health is complex and challenging, and health depends on a variety of factors. According to Tuomisto et al., (2017), given the differences in pre-existing dietary patterns, the effect of food availability on nutrition and health is expected to differ between regions and populations. Knowledge of the intricate connections and feedback loops that occur across a wide range of systems is essential for making predictions about climate change and its impact on the agricultural production, diets and health. Given that climate change will result in more inconsistent food quality, it is important to retain and strengthen the current systems and policies that control food production, monitor food quality and safety, and address emerging nutritional and safety concerns (Lake et al., 2012).

Therefore, with the implications of climate change on agriculture contributing to the health crisis, especially on the nutritional status, affecting the consumption of nutritional diet required for the human body leading to the 'triple burden,' the intergenerational cycle of malnutrition is expected to get worse under the business-as-usual models in terms of nutrition, increasing health risk implications (Cunrui & Qiyong, 2022).



> "Sea level rise , change in wind pattern and cyclone season is happening frequently. Crops are not growing well due to the saltiness that is found in their Taro and Pulaka pits"
>
> Teone Paape
> Kavatoetoe village
> Fongafale
> Tuvalu
> (POCCA research team interview, 2023)

Taro growing in plastic containers in Papa Elise, Tuvalu to respond to the problem of sea water intrusion (Photo: POCCA team, 2023).

According to Berners-Lee et al., (2018), even if there was the potential to increase the nutritional benefit for food production to maintain a healthy lifestyle, a diversion in the process to meet other demands other than consumption would be lost thus increasing health risk and shift to more refined and processed foods.

In the Pacific, small-holder farming and subsistence scale of food production is highly vulnerable and susceptible to extreme weather conditions and natural disasters. The observed impacts of climate change on food systems and food security in PICTs is multidimensional, intergenerational and will continue to worsen over time (See Table 12.1 below).

Climatic hazards	Observed impacts on food production	Observed impacts on food transportation and storage	Observed impacts on local food prices	Observed impacts on food security pillars	Impacts on Food consumptions
Cyclone (floods, strong winds, storm surges)	Physical damages and total loss of crops, fruit trees, vegetables, death, injury or sick livestock (chickens, goats, cattle, pigs). Poor and no planting materials for coastal communities, making it hard to restart farming. Damages to corals, fishing boats and gears. Takes up to 12 months to have new gears and boats if can afford. Damaged crops regrow but with limited yields or poor eating quality and increasing food loss. Takes about 12 months or more to recover (after replanting) for crops. Livestock farms take more than 12 months or not recover at all.	Damages of roads, jetties making it hard to transport foods to and from communities to markets. No electricity, No refrigeration for storage. Roads and jetties take up to a month or more to rebuild and functional. Electricity could also take up to a month to return.	Increase for up to 3-6 months.	Decrease (local foods) availability, accessibility, stability, utilisation (cooking with poor water quality). Increase reliance and accessibility of cheap ultra processed foods Increase food aid dependency.	Decrease food groups in diets. Decrease quality of diets. Increase consumption of ultra processed foods.

Climatic hazards	Observed impacts on food production	Observed impacts on food transportation and storage	Observed impacts on local food prices	Observed impacts on food security pillars	Impacts on Food consumptions
Droughts	Physical wilting and loss of crops, fruit trees and vegetables. Total loss of livestock. Hard to cultivate soil. Loss of planting materials, which will take more than 2 years to recover. Takes up to 1 to 3 months to replant crops after droughts if it is the right season. Takes 12-18 months to recover after droughts. Livestock takes longer to recover or may not recover at all.	Limited damages to roads, jetties. Droughts have impacted levels of water at dams and reduce electricity supply in higher islands.	Increase for up to 3 months.	Decrease (local foods) availability, accessibility, stability, utilisation (cooking with poor water quality). Increase reliance and accessibility to cheap ultra processed foods. Increase food aid dependency.	Decrease (local foods) availability, accessibility, stability, utilisation (cooking with poor water quality). Increase reliance and accessibility to cheap ultra processed foods. Increase food aid dependency.
Extreme rainfall and flooding	Physical damages to crops, fruit trees and vegetables. Drowned, sick and injured livestock. Takes 1-3 months to recover for crops and fruit trees. Takes up to 6 months for livestock to recover.	Physical damages to roads and electricity are often turned off during floods. Takes a day or two to restore roads (when floods subsides) and electricity.	Limited damages to roads, jetties. Droughts have impacted levels of water at dams and reduce electricity supply in higher islands.	Decrease (local foods) availability, accessibility, stability, utilisation (cooking with poor water quality). Increase reliance and accessibility to cheap ultra processed foods. Increase food aid dependency.	Decrease food groups in diets. Decrease quality of diets. Increase consumption of ultra processed foods.

Storm surges/ salt water inundation	Physical damages and 'burnt leaves' from salt spray to coastal crops, trees, vegetables. Deaths, injuries, and loss of livestock. Salinised soil. Loss of planting materials and farmers cannot restart farming for a while. Takes 1-3 months for coastal crops and trees to recover. Takes up to 1 month of good rainfall for soil to recover. Livestock may not recover.	Physical damages to coastal roads and jetties and airport (for atoll countries – e.g., Tuvalu). Takes 1 or 2 days to recover functionality.		Decrease (local foods) availability, accessibility, stability, utilisation (cooking with poor water quality). Increase reliance and accessibility to cheap ultra processed foods.	Decrease food groups in diets. Decrease quality of diets. Increase consumption of ultra processed foods.
Increasing sea temperature coral bleaching and ocean acidification	Physical damages to corals, increase growth of algae, loss of calcium carbonate structures of corals, and invertebrates Takes years to recover or not recover at all.	NA		Decrease (local foods) availability, accessibility, stability, utilisation (cooking with poor water quality). Increase food aid dependency.	Decrease food groups in diets. Decrease quality of diets. Increase consumption of ultra processed foods.
Sea level rise/ salt water intrusion	Physical damages and total loss of crops, fruit trees and vegetables. Loss of arable land. Loss of planting materials. Never recover. Cannot recover land unless built higher or relocate.	Physical damages to roads, loss of jetties, stop flights at airports (e.g., Tuvalu). For sea level rise – may not recover unless build higher or relocate. For tidal intrusion – can recover after extreme high tide.		Decrease (local foods) availability, accessibility, stability, utilisation (cooking with poor water quality).	Decrease food groups in diets. Decrease quality of diets. Increase consumption of ultra processed foods. Relocation of farms and communities exposed them to ultra processed foods.

Table 12.1: *Details of observed impacts of climate change on food systems and food security in PICTs (Provided by authors).*

Indeed, during times of extreme natural disasters, food supply in the PICTs is significantly supplemented by imported foods (Campbell, 2020) This convenient supplementation of the Pacific diet with aid relief imported food has in some part disincentivised locals from cultivating famine foods (Guell et al., 2021). The convenience of imported foods has also led to the disengagement of Pacific peoples from exercising storage methods traditionally installed to sustain food supply through crop seasonality and low production (Connell, 2015).

Agricultural food production

Heatwaves, floods, droughts, and tropical cyclones reduce the yields of root crops and trees on Pacific Island farms. Most of the agriculture in the PICTs is rainfed (about 70%) making it more susceptible to damages during droughts. Traditional crops are also seasonal with limited genetic diversity. There is high incidence of pest and diseases affecting local crops, vegetables and trees. The population dynamics and distribution of pests and diseases are highly influenced by climate and weather. Salinisation from salt-water inundation, intrusion and salt spray and coastal erosion from storm surges and rising sea levels will reduce the amount of land that is suitable for farming, further threatening food security. Most crops cannot tolerate saline soils. The impacts of climate change on availability of food are directly related to food production in terms of crop yield, health of forests and rivers or biodiversity. Good water supply is required for crop production and affect quality supply and the utilisation of food.

Additionally, agricultural productivity of atolls in the Pacific are further compounded by the inherent poor conditions of the soil and reduced crop diversity these communities are subsequently able to grow (Guell et al., 2024). The productivity of crop farms is affected by droughts, intense rainfall, increasing temperature, soil erosion, soil fertility, deforestation, and increasing water salinity resulting from groundwater contamination with saltwater incursion (Barnett, 2020). Reduction in agricultural labour workforce is another driver of decreasing domestic food production in the Pacific, e.g., Samoan farmers have attributed this to the current seasonal workers scheme (Molimau-Samasoni et al., 2021) whereby able-bodied Samoan youth are exported as workforce to New Zealand and Australia to work as farm hands for three to nine months of the year. This is a likely scenario in other PICTs where seasonal workers schemes are in place as in Fiji and Vanuatu. The productivity of the fisheries sector is also susceptible to changing environmental conditions. The temporal and spatial abundance of fish, water salinity and temperature affect food and income sources of coastal communities in the Pacific (Barnett, 2020). Low investment, slow technological advancement, and poor understanding of recent developments in food production have also been reported to be contributors of low food production in the Pacific region (Guell et al., 2022). The low level of domestic food production in the Pacific is also undermined by postharvest losses that occur along the value chain, contributing further to food insecurity.

Marine and aquaculture resources

Heatwaves, floods, droughts, and tropical cyclones also disturb and destroy the marine ecosystem and resources. The abundance of fish and edible invertebrates in the sea are also affected by climate change. Climatic extreme events incur losses and damages to coral reefs and biodiversity. Coral bleaching from marine heatwaves cause coral mortality and make coral reefs more vulnerable to damages from storm surges. Ocean acidification resulting from the uptake of carbon dioxide by the sea is a serious threat to corals and other marine organisms such as crustaceans, which affect fish stock and other seafood.

Heatwaves and rise in sea surface temperature increase fish kill and death, affect ocean environmental health including coral bleaching degradation, destruction and death that provide habitat to growth of microalgae including harmful alga bloom (HAB) which is a risk to increase ciguatera fish poisoning (ciguatoxin) affecting food safety and trade. Degradation of coral reefs reduces the productivity of reef fish species that are able to remain on reefs and many other targets fish species migrate to higher altitude, reducing their accessibility affecting food security. Fishing gear and fishing boats are damaged or destroyed by tropical cyclones or storms, affecting food availability and household incomes are reduced (Mangubhai et al., 2021; Eriksson et al., 2017).

Food prices and transportation

Food prices in the Pacific are sensitive to the impacts of climate change on the countries that import foods. PICTs rely heavily on imported foods from both larger countries such as Australia, New Zealand, United States, Japan and other Asian countries. Disasters that reduce yields of maize, wheat, rice, fruits or other crops in those countries may cause prices of imported foods to become unaffordable for many PICTs households, hence reducing food accessibility. The reduction in yield and limited supply of food with increase in fuel and transport costs due to the impact of climate change have also increased food prices. Transportation of food both within and between countries is affected by impact of climate change. Most of the roads in the PICTs are located near coastal areas or across highlands and are prone to coastal erosion/storm surges and inland erosion or landslides during cyclones and heavy rainfall events. Jetties and wharfs may be damaged by both sudden and slow onset climate events, impacting food availability and accessibility for rural communities for extended time periods. Climate change impacts could also cause fuel prices to increase as these are imported, adding to food costs. The increase in the global fuel cost affects the local transport costs.

Food processing and preservation

Commercial food processing and packaging in the Pacific region is limited and occurs only in a few countries including Fiji, Samoa, Tonga, PNG, Solomon Is and Kiribati. Local and traditional preservation methods depend on favourable weather especially for sundried foods. Rainy conditions affect the quality and shelf life of dried foods such as fish, shellfish or root crops. However, there is limited technology to process, recycle and re-use food wastes. This together with the negligent attitude of many people in relation to sustainable farming, has increased soil degradation, which is worsened by climate change especially during extreme events and flooding (Andrew et al., 2022; SPC, 2022).

Food storage, distribution and marketing

Food storage, distribution and marketing are affected by climate change. A number of fresh fruits and vegetables including taro, breadfruit, coconut, Tahitian chestnut, plantain, green leafy vegetables as well as fish are processed and stored in either coolers or freezer accordingly and transported by airplanes for export to the buyers in different countries. Heavy rain, floods or extreme events affect harvest and distribution of crops and marine foods respectively from farm to the market, retailor, manufacturer or food industry. Given the warm humid tropical weather, perishable foods such as fish need to be handled quickly with care and with cooler or ice to avoid spoilage and damage when received at the destinations. Damaged and degraded foods either will reduce the selling price or thrown away due to higher spoilage rate and wastage.

Climate change influences food markets at both retail and wholesale. In the Pacific region, markets are patronised by commercial and subsistence producer-vendors and by non-producer vendors, who are all affected by climate change. The reduction in crop yields due to climate change increase prices of agriculture products, processing and transportation. Greater levels of climate change are reported to have greater socioeconomic impact by reducing economic gains and high temperature enhance crop prices and price volatility. Most of the foodborne diseases happen during floods and droughts. The unavailability or lack of access to many nutritional food leads to heavy consumption of one or more nutrient that lead to the fast increase of non-communicable or lifestyle diseases such as diabetes, hypertension and overweight.

Climate change poses a fundamental threat to Pacific food systems. It has negatively impacted agriculture and fisheries production and the continued sea-level rise, changes to rainfall and ocean temperatures, as well as increased incidence of extreme weather events will have significant impacts on Pacific ecosystems, water resources, agriculture and fisheries. Extreme weather events damage critical infrastructure in the food systems value chain, as well as increasing agricultural and aquatic biosecurity threats. Water security is increasingly threatened by sea level rise and projected changes in rainfall. This will impact rain and groundwater dependent food production and freshwater availability for some countries, such as atolls like Kiribati, Marshall Islands and Nauru. It will also impact the health of communities through increasingly polluted and saline water. Extreme weather events will also increase risk of flooding and food losses in countries like Papua New Guinea and Fiji. Pacific leaders in the Kainaki II Declaration noted with grave concern that global greenhouse gas emissions continue to rise, reaching record levels; and based on current trends, without urgent action, temperatures will exceed 1.5°C by as early as 2030 and reach 3°C or more by the end of this century (PIFS, 2019).

Given this context and changing environment, climate change will also have broader impacts through effects on trade flows, food markets and price stability and could introduce new risks for human health. It threatens to reverse the Pacific's progress made so far in the fight against hunger, malnutrition and non-communicable diseases. As highlighted by the latest assessment report of the Intergovernmental Panel on Climate Change (IPCC), climate change augments and intensifies risks to food security for the most vulnerable countries and populations, including small island developing states across the Pacific region (Mycoo, 2022). Four out of the eight key risks induced by climate change identified by IPCC AR5 have direct consequences for food security and these include the loss of rural livelihoods and income, the loss of marine and coastal ecosystems and livelihoods, the loss of terrestrial and inland water ecosystems and livelihoods, and food insecurity and breakdown of food systems. The availability and accessibility of nutritious food will be greatly impacted and imported foods will play a critical role in bridging production shortfalls, particularly in atoll nations.

This will consequently have substantial impacts on diets and public health outcomes and greatly expanded efforts to respond to climate change are needed immediately to safeguard the capacity of Pacific food systems and its food security (Guell et al., 2024).

Case-study 2: Farmers response to climate change impact in Solomon Islands

This case study from Solomon Islands demonstrates the impacts of climate change on food production and diets of rural communities in PICTs. The Solomon Islands is a tropical country with two distinct climates, dry season with high and consistent temperature and humidity throughout the year, with southeast trade wind, and wet season (SIG Metrological Service, 2015). The country's population mostly depends on agriculture for economic and food security. With climate change and related extreme events, farmers are now faced with a continuous challenge in stabilising their food security status. A case-study in the rural communities in North Malaita Province involving a total of n=98 farmers were interviewed in 2019 (Bird et al., 2023).

Impacts on food productions: It was reported that approximately all root and tuber crops and vegetables were affected in some degree by climate change-related conditions such as cyclones and droughts. The two most affected crops were taro *(Colocasia esculenta)* at 78.5% and sweet potato *(Ipomoea batatas)* at 77.6% followed by Lesser yam *(Dioscorea esculenta)* and pumpkin (61% and 51% respectively). The farmers also highlighted there were 15 main constraint issues, and the most: lack of equipment (tilling tools and planting materials) (21.7%), labour (fewer than two people and old age) (20.4%), followed by other constraints such as weather pattern (14%). Around 8% indicated no constraints, and the least at 1% indicated accessibility to the local market to sell their local produce. As reported by a farmer:

When it rained, sweet potatoes grew well, especially the vines, but not the yield. because the fruits have not produced at all. Same with taro because of too much rain. However, it affects most of my crops. Also, when it rains, pest numbers decrease compared to when there is no rain. So as for me, I will change the crop type to other varieties where the harvest will not be affected by too much rain. Also, move to another site (Malu'u, age 62).

Impact on farmers Household Dietary Diversity Score (HDDS) and resilience: Farmers' diets were also recorded to determine their HDDS because of their strong relationship with local food production and to assess their food sources. According to the data acquired, certain households may be at high risk of food insecurity, resulting in a failure to satisfy the necessary nutritional standards in their daily intake. This was due to the fact that some food categories are only available seasonally or as a result of calamities such as cyclones and drought causing food damage. Making it harder to access and obtain different food groups, hence influencing the way foods are consumed. Therefore, to build their capacity in food resilience against climate change, local farmers are still implementing traditional approaches to deal with or safeguard local crops. Subsequently, their traditional methods also align with the Solomon Islands Post Disaster Risk Assessment. The adaptation methods implemented by the farmers are shown in Table 12.2 to further improve their food security and food system to ensure sustainable food security.

Adaptation Practices	Rainfall (%)	Temperature (%)
Replicate same crop in different site (Shifting cultivation)	37.7	38.8
Change planting date	27.4	27.1
Change crop type	19.8	17.8
Increase garden plots	7.5	7
Implementing soil and water conservation	4.7	6.2
Use cover cropping/trees and crop residue	2.8	3.1

Table 12.2: *Adaptation strategies in food production in the Solomon Islands (Provided by authors).*

12.5 Marrying science and traditional knowledge to slow down the shift of food systems

As mentioned earlier, resilience is the ability or capacity to recover quickly from difficulties and challenges faced. It is an emerging paradigm to transition from a relief stage to a development path (Babu & Blom, 2014). In the context of a resilient food system, it is the capacity to withstand a shock, to absorb the effects of a shock, and to recover from the shock to its normal or even better state in terms of any lost food security for a sustainable system (Babu & Blom, 2014; Iyappan & Babu, 2018).

Three resilience themes have been identified to help rebuild food system resilience of the PICTs; these are livelihoods and food system shocks, adaptive capacity and coordinated focus on food and nutrition security (Guell et al., 2024). The livelihoods and food system shocks focuses on resilience of livelihoods that is determined by the underlying factors which create or inhibit buffers for future shocks. Future shocks include extreme weather events and health associated shocks, as well as ongoing stresses such as climate change and increases in non-communicable diseases. The current food systems need to be planned for these near-term and long-term shocks. The adaptive capacity of Pacific food systems on the other hand is affected by a combination of biophysical contexts, and the knowledge and social capital of different groups. Combining existing farmer and fishers' knowledge with new interventions in the food production sector can help advance context-specific adaptive capacities. Coordinated focus on food and nutrition security is the knowledge sharing of useful information updates which became frequent since the onset of the COVID-19 crisis. Further strengthening of regional governance that links health and production sectors on an ongoing basis and advances food systems approaches to policies and programs can support resilience.

As indicated above, resilience in small island communities relies on adaptive capacities that include flexibility and diversity in livelihood strategies, multilevel governance systems that are participatory, and adaptive local and Indigenous knowledge systems (Guell et al., 2024; Iese et al., 2020). In the context of PICTs, adaptive capacity from the impact of climate change can be linked to factors including community cohesion and sharing, good leadership, religious participation and strengthening the Indigenous food system. Building a climate resilient and sustainable food systems in the Pacific region will need the revival, adoption and strengthening of the Indigenous and traditional food system and merged with scientific and modern approaches. Focusing on building resilience appear to be increasingly recognised as the strategy to disaster risk reduction and climate change adaptation (Klock & Nunn, 2019).

Climate crisis in various PICTs	Local response to food security challenges	Pillars of food security addressed	References
Changing wind patterns and strength especially due to increase intensity and frequency of tropical cyclones, and astronomical tides, storm surges, contributing to sea level variability and sea level rise in various coastal and low-lying areas (Increase intensity of extreme events).	Construction of groynes and seawalls or storm walls, planting trees, mainly coconut palms or mangroves along beaches and shorelines to prevent coastal erosion. Relocation of community gardens or farms to higher grounds to reduce and avoid salt-water intrusion.	Availability Stability	(Becken, 2005) (Clarke et al., 2019) (Savage et al., 2020)
Changes in precipitation patterns is evident in the increasing frequency of heavy and extreme rainfall events and flooding (Change in amount of rainfall).	Implementation of new cropping techniques, pest control methods, and the provision of agriculture guide handbook have been successfully incorporated in community livelihoods activities.	Availability Stability	(Becken, 2005) (Clarke et al., 2019) (Becken, 2005) (Clarke et al., 2019)
	Ban of fertilizers for the declaration of organic islands, reduced use of fertilizers and continuous application of good agricultural practices, conservation areas in the neighbouring forests and the limitation of deforestation to prevent erosion.	Availability	
Long term and frequent droughts and water shortages (Increase severity of drought).	Rainwater harvesting, collection, storage and conservation of water where possible e.g. the mulching of garden waste and layering of shredded paper, cardboard or coconut shells are measures that keep the soil moist and reduce the need for irrigation.	Availability Stability	(Becken, 2005)

Climate crisis in various PICTs	Local response to food security challenges	Pillars of food security addressed	References
Long term and frequent droughts and water shortages (Increase severity of drought)	Improved irrigation technologies, as well as agronomic practices that enhance soil water retention such as minimum tillage, and increase in soil carbon and organic matter	Availability Stability	(FAO, 2015) (Clarke et al., (2019)
	Water management that reduced the need for freshwater by reuse of dirty water from washing the dishes, crops and food preparation for watering flowers and added to feed for the animals. Use of adapted varieties or breeds, with different environmental optima and/or broader environmental tolerances, including resilient crops and neglected crops. Changes in post-harvest practices, use of solar driers and improved products storage after harvest. Building of desalination plants in remote atoll islands		(FAO, 2015)
Increasing temperature with prolong heat intensity.	Implementation of backyard and school gardens, crop diversification, integrated food production systems.	Availability Accessibility Utilisation	(Clarke et al., 2019) (Savage et al., 2020) (Klock & Nunn, 2019)
	Change farm times to early morning before sunrises and late in the afternoon when heat subsides Establishment of individual demonstration plots closer and next to their homes.		
	Integration of traditional seasonal calendars and early warning systems with scientific climate data has also been done in Vanuatu, aiming to assist farmers in adjusting planting and harvesting seasons in line with changing weather patterns.		

Climate crisis in various PICTs	Local response to food security challenges	Pillars of food security addressed	References
Increasing temperature with prolong heat intensity	Improved utilization and demonstration of communities using local agricultural knowledge, along with external inputs that built demonstrations of climate resilient gardens with diverse crops and farming techniques. Food management activities including the demonstration plot and solar preservation techniques of surplus foods in preparation for climate extremes and store food for everyday use, and in times of disasters.	Availability Stability Accessibility Utilisation	(Clarke et al., (2019) (Savage et al., 2020) (Klock & Nunn, 2019)
Rising sea surface temperatures, heatwaves and ocean warming and acidification.	Development of climate change ciguatera fish poisoning early warning systems. Increase mangrove planting.	Availability Accessibility Stability Utilisation	(Vave, 2021) (Pacific R2R: Ridge to Reef, 2022) (Bell and Taylor, 2015) (Bell and Bahri, 2018) (Becken, 2005)
	Expand the freshwater ponds aquaculture for Nile tilapia, milk fish and prawns.		
	Increase the preservation of marine areas, also using cultural taboos (Tabu) to protect marine resources.		
	Increase access and heavily reliance on catching tuna in nearshore waters. The use of fish aggregating devices (FADs), to attract pelagic fish, such as tuna, to counterbalance the diminishing supply of coastal fish, have been extensively implemented in communities in Vanuatu, Fiji which prompted as an effective adaptation initiative. Farming of oysters.		

Table 12.3: *Diversity of agriculture and food system responses in Pacific Island Countries and Territories (Provided by authors).*

Various adaptation techniques that have been carried out in the various climate vulnerable communities as listed in Table 12.3. Most of these adaptations observed in Small Island Developing States (SIDS) including the PICTs appear to be reactive in nature, which according to Klöck and Nunn (2019), do not qualify as adaptation, but rather classified as coping strategies. These coping strategies reduce vulnerabilities and increase resilience in communities through awareness, cooperation and empowerment programmes, which strengthens activities related to food and water security, in times of climatic stress (Clarke et al., 2019).

Coping/adaptation approaches that enhances resilience

Table 12.3 shows the major adaptation or coping techniques that demonstrates the resilience of the Pacific regional people in ensuring the food system is sustainable in that it has capacity to provide food security over time. Some adaptation or coping techniques common in most PICTs include; construction of groynes and seawalls or storm walls, planting trees, mainly coconut palms or mangroves along beaches and shorelines to prevent coastal erosion from changing wind patterns with increasing strength and intensity. These conditions are often accompanied by tropical cyclones, astronomical tides, and storm surges, which result in sea level variability and sea level rise in various coastal and low-lying areas (Becken, 2005; Clarke et al., 2019; Savage et al., 2020). Planting of mangroves and coconut trees have been practiced in most coast lines of the low-lying Pacific Islands to help absorb strong wave energy in order to prevent the washing away of sand and soil and reduce coastal erosion, apart from their indirect contribution to food security such as ingredients for traditional medicine, habitat for prawns and fish, and suppliers for wood and fodder as well as firewood for cooking food (FAO, 2007). Although coconut trees also absorb wave energy to some extent, most are uprooted and destroyed from intensive tropical cyclones, astronomical tides and storm surges, which directly affects food sources. When coastal erosion persists, despite the constructions of groynes and tree planting, salt intrusion occurs due to sea level rise and storm surges that destroy nearby gardens and crops. This prompted relocation or shifting of gardens to higher grounds for most communities.

Mainstreaming of climate change into a range of national and sectoral policies, frameworks and plans have been observed in Vanuatu, Fiji and Samoa. This has been carried out through improved integration, collaboration and coordination with civil society, NGOs and faith-based organisations of various climate smart projects. Climate proofed public conveyance infrastructure including transport routes and coastal erosion and sea level rise have also been introduced and practiced improving food security (Guell et al., 2024).

Training in climate resilient practices such as: planting of local resilient crops, establishment of food security farms with efficient and good drainage systems, implementation of new cropping techniques, pest control methods, and the provision of agriculture guide handbooks in some PICTs have been successfully incorporated in community livelihood activities to help reduce crop damage, risks from pests and diseases that contribute to decline in crop yield and quality

from the impact of changing precipitation patterns, extreme rainfall events and flooding (FAO, 2015).

Enhancing women's individual empowerment in decision making and their contribution to natural resource management have been observed to improve community resilience and adaptations. Introduction of demonstration plots with efficient water resource management and conservation such as the mulching of garden waste and layering of shredded paper, cardboard or coconut shells to keep the soil moist and reduce the need for irrigation, reuse of dirty water from washing and food preparation in watering gardens and added to moisten feeds for the animals and the use of solar preservation techniques for seasonal and surplus crops are also implemented to increase community recognition of the need to adapt efficient farming and preservation practices and techniques in time of droughts and water shortage. These enable the community to increase crop yields and increase preserved food for daily use, and in times of disasters while also providing additional income source from the sale of preserved foods (Clarke et al., 2019).

Adapting to change in temperature with prolonged high heat intensity include water resource management, and food/agricultural management, change farm times either early morning before sunrises or late in the afternoon when heat subsides, establishment of farms closer and next to homes. Integration of traditional seasonal calendars and early warning systems with scientific climate data has also been practiced in Vanuatu with the aim to assist farmers in adjusting planting and harvesting seasons in line with changing weather patterns. Implementation of backyard and school gardens, crop diversification, integrated food production systems are observed.

Preservation of marine areas (Tabu), expansion of freshwater ponds aquaculture for Nile tilapia, milk fish and prawns, oyster farming as ocean warming, heatwaves, acidification, coral bleaching and degradation, low reef fish availability, fish kill were experienced and observed. This reduced reef fish consumption which prompted the increase in aquaculture freshwater fish, oyster and crab farming. The use of fish aggregating devices (FADs) to increase access to pelagic fish for communities without access to motorised boats (Pacific R2R: Ridge to Reef, 2022; Bell & Taylor, 2015; Bell & Bahri, 2018) and replanting of corals were observed.

One such practice that could be utilised for adaptation was reported by Vave (2021) using culturally protected water body (CPWB). Archival research and interviews with 201 individuals across Fiji's 189 districts revealed five CPWB types. Conception, meconium, and circumcision CPWBs are at risk of practice cessation, while chiefly investiture and funerary, have 15% and 42% actively practicing districts, respectively. Primarily serving a ceremonial and food provisioning service, the view that CPWBs do not contribute to biodiversity conservation can be counterproductive to conservation efforts. CPWBs as a place-based practice are eroding due to low awareness by conservation practitioners, and exclusion from community management plans.

Knowledge of CPWBs and the practical challenges of implementing them can help conservation practitioners and Indigenous peoples maintain cultural practices, while ensuring food security and conservation into the future.

It was also observed that increased demand and dependence on imported non-traditional, convenience foods in response to reduced time for production, and lack of access to land in increasingly crowded urban and isolated rural communities especially in atoll islands have bridged the production shortfalls which linked to the prevalence of non-communicable disease (NCD) crisis among the Pacific Islanders (Hughes & Lawrence, 2005; Estim´e et al., 2014; Thow et al., 2010).

The Pacific Islands food system is indeed fragile from the various factors discussed above including the geographical remoteness with limited arable land that are constantly faced with natural disaster and climate change with slow recovery. It also has limited food processing capabilities and technologies with limited food storage capacity that increase food losses across the supply chain, especially with perishable foods. High food import dependency with minimal food export earnings, which contribute to high consumption of processed food rich in fat, sugar and salt that ultimately result in the high prevalence of non-communicable diseases. Covid 19 has further aggravated the food system challenge by impacting the sources of revenue from the tourism industry, labour market and international trade (Iese et al., 2021).

Again, as shown in Table 12.3, both Indigenous or traditional and modern approaches of managing food resources determine the outcomes and sustainability of the food system. Rural communities survive through Indigenous or traditional subsistence and semi-subsistence production and the harvest of traditional crop species that are healthy and resilient to environmental change, while also encouraging multi-cropping and eco-cultural practices that enhance food sovereignty. Such approach shows the wisdom and richness in knowledge of the local community as they naturally understand the relationships between ecological or climate change, cultural practices and livelihood that contribute to the sustainability of the food system. For instance, in Samoa, Fiji, Tonga and other Pacific Island communities the locals' traditional knowledge and experience of tropical cyclone season, regulates their timing in managing the agricultural production of root crops due to their resilience to wind damage, as opposed to tree crops such as bananas and breadfruit, that are highly susceptible to wind injury and up-rooting. Additionally, local, Indigenous and traditional knowledge help them make use of high fruit availability during times of seasonality, to improve their food security. During breadfruit season, Pacific communities especially Samoans still practice the storage of mature fruit in earth pits which are later dug up, cooked and consumed when food supply is low. This Indigenous and traditional approach to food production had sustained the local food supplies, diets and livelihoods for the majority of rural families. However, over the years, a constant decline in agricultural production with increasing population have occurred due to various factors and drivers such as high rural-urban migration that limited the remaining number of people in rural areas to farm the land, affecting the food supply system.

On the other hand, the modern approach to the food system, focuses on mono-cropping, high yield of market driven products and livestock production put pressure on the environment. These result in the overuse of various forms of fertilisers and chemicals which are harmful to the land and the environment, result in an unsustainable agricultural system.

Improving yields and quality through the use and application of scientific and technological systems to boost agricultural and livestock production and food processing for longer shelf life that encourage distribution and marketing to further distances and for export. Such food system is also regarded as a major driver of climate change, particularly through inefficient use of fertilisers, livestock produced emissions, cause of habitat destruction and land use change (Springmann et al., 2018).

Merging and integrating both the positive impacts of Indigenous or traditional and modern approaches will enhance the development and building of sustainable and resilient food system that promotes food security, strengthens and supports the ecological natural systems and food sovereignty. An example of the application of traditional approaches is provided in the case study below.

Case study 3: Carving canoes for fishing in Tonga

Climate change and natural disasters have caused many disruptions to Tongan lives and COVID-19 has further complicated issues of food and nutrition for Tongans. Tonga has been for many years plagued with nutrition issues leading to increased incidences of health complications and mortality tied to Non-Communicable Diseases (NCD's). Since the imports of highly processed, less nutritious and fatty foods have increased to Tonga, many diets and lives have drastically changed. Rural communities rely on fisheries and agriculture to meet their daily needs however, the impacts of climate change and COVID-19 have posed a challenge to many individuals in Tonga. The Mainstreaming of Rural Development and Innovation, Tonga Trust (MORDI TT) has been funded and supported by the International Fund for Agriculture Development (IFAD). They work with the Ministry of Internal Affairs in Tonga to identify the community's development priorities and mobilise support to implement them. Community development plans have identified priorities in development of which is linked to the Popao (traditional canoe) carving training initiated. Representatives of Ha'apai islands led by town officers and district officers gathered at MORDI TT Headquarter for a weeklong intensive canoe carving exercise. The training focused on reinvigorating traditional knowledge of rural remote communities in carving outrigger canoes (popao) to help communities in shallow water fishing. These are ways to enable sustainable food security in the face of the destructive impacts of climate change.

12.6 Policy implications

As the chapter has demonstrated, building up sustainable food security in the face of climate change requires innovative strategies and resilience. Resilience building should encompass both short term and long-term benefits, underpinned by good governance, infrastructure, capacity building and development, not including other initiatives already proving successful in the Pacific after years of trials (Iyappan & Babu, 2018). There needs to be recognition of the work of various stakeholders to establish capacity at the individual, organisational, and system levels in order to provide a holistic approach to enabling environment. Individual capacity builds innate motivation and understanding of specific areas, while organisational capacity addresses allocation of resources, adaptation and self-renewal of changing circumstances, and interaction with other organisations to achieve good leadership and management that enable the environment for a strong system capacity. A strong system capacity is thus characterised by good governance, inclusive policy processes, transparency, democratic processes, cooperation, accessible information, coordination, and evidence-based decision making (Babu and Blom, 2014). This includes the level of participation and cooperation among public, private, and non-profit organisations in various elements of a food system.

Thus, the food system approach shown in Table 12.4 explores the possibility of devolving resources, power, leadership, institutional reform, and resources as important steps in achieving food system resilience and sustainability, which apparently demonstrates multisectoral and holistic approach.

Food system components	Resilience indicators	Examples of interventions to build resilience
Adaptation processes, planning and implementation	Integrating adaptation limits in planning of adaptations on food systems to transform the food systems	All the adaptations activities in Table 2 are incremental adaptation, that could not be sufficient to build the resilience of food sources, transportation etc to frequent and severe sudden and slow onset climatic events. Explore pathways to improve the adaptation process and system approach to understand multiple options and adaptation limits to make long term commitments, investments and transform adaptation actions.
Food Production Systems	Policy	Strong policy to enable resilient food production, access to early warning indicates to support decision making, enhancement of local crop diversity through multi-sectorial and stakeholder partnerships.
	Governance	Participatory processes through decentralisation and territorialisation enhance cooperation and coordination among various stakeholders to support farmers and fishers in healthy and resilient food production and harvesting techniques.

Food system components	Resilience indicators	Examples of interventions to build resilience
Food Production Systems	Institutions	Monitoring and evaluation, assessments of requirements, multisectoral coordination, and information and communication technology to move relief to long-term development. For example, adopting the practice of social norm such as 'solesolevaki concept' within and between institutions for food production to high and quality crops yields.
	Technology	Innovations of drought resistant crop varieties, pest, and disease resistant crop varieties, multi-cropping procedures, mixed farming strategies and natural resource management and precision farming. Use organic method of farming such as mulching and limit the use of chemicals to maintain soil fertility and the use sustainable fishing and practice marine protected areas.
	Capacity	Active learning process and evaluation of farming needs at community and commercial levels for high and quality crop yields with diversity.
Food Storage and Distribution	Policy	Appropriate storage and distribution for minimal food loss and waste and practice proper handling techniques along the food supply chain.
	Governance	Addressing storage and distribution issues through dialogue with various stakeholders and sectors.
	Institutions	Multi-disciplinary and multisectoral monitoring and evaluation, assessments, coordination, and information on storage and distribution technology to reduce food loss and waste and maintain efficiencies.
	Technology	Adapting technology for efficient and cost- effective storage and transportation system in various weather conditions.
	Capacity	Train communities and entrepreneurs to assess technologies that provide efficient and cost-effective storage and distribution.
Food Processing and Packaging	Institutions	Strong national and local institutions for monitoring and evaluation, assessments of requirements, multisectoral coordination, and information and communication for efficient and effective processing and packaging.
	Technology	Provide communities technology and tools for processing and packaging of local foods and extraction of nutraceutical potential components for marketing and export.
	Capacity	Introduction and adoption of adsorptive, adaptive and transformative capacities to achieve efficient processing and packaging for high quality foods.

Food system components	Resilience indicators	Examples of interventions to build resilience
Food Retail and Markets	Policy	Development of effective and functioning markets for locally and grown produce.
	Governance	Performing situational analysis on poor marketing and sales of local foods.
	Institutions	Develop strong partnerships among public, private, academic, and non-profit institutions to support the marketing and purchase locally produced foods for financial and institutional incentives for the community.
	Technology	Provide efficient retailing and marketing technology and tools to open new market at local, regional and international levels.
	Capacity	Capacity building on finance literacy that integrates with marketing of foods.

Table 12.4: Building of resilience food system through the food supply chain appropriate for PICTs (Provided by authors).

Any resilient food production system needs to have the technical capacity to adapt to physical and environmental changes in agriculture and fisheries. Strong research and innovation mechanism is to be built on information from the markets, trade, and institutions in order to develop specific tools, technologies, or practices that best suit the anticipated adverse effects. A good extension system should connect research innovations to the farmers' and fisheries fields to communicate the challenges and ideas of farmers and fisheries back to the research community for further investigation.

Policy intervention or support are also required for effective communication for overall enhanced resilience. In this case policy processes are to be evidence based, participatory, transparent, open, and democratic for effective policymaking. Empowering communities to create and enact contingency plans for small-scale shocks when sufficient local capacity is intact, and to call for help and implement external support for larger, community-wide shocks.

The markets, trade, and institutional indicators affects the capacity to transfer food from producers to consumers. There are other stakeholders that include government agencies; regulatory organisations; data collection systems; and the laws, regulations, and policies that govern how markets function. These entities can control how food systems are affected by adverse events, e.g. by buying excess grains or releasing food stocks. They can also detect and mitigate potential food safety related disasters such as testing for bacterial contamination and implementing food recalls, provide data to farmers and agribusinesses for day-to-day decision making. Markets, trade, and institutional stakeholders also implement the laws and programs that are developed by the policy system, and decide for the how, when, and what resilience-related policies should be developed at the macro level.

Moreover, various recovery strategies focussed on assisting market access, enhancing supply chains and agricultural production have been implemented in the PICTs in recent years. The ability of Pacific people's livelihoods is dependent on food systems been able to withstand and be resilient to climate change, is contingent on adaptations in the agricultural, fisheries, horticultural and aquaculture food systems. Various levels of support at different timescales can be considered, where short-term, intermediate term and longer-term opportunities and adaptation strategies should form a layered approach to creating a resilient food system in the Pacific.

In the immediate short-term, adaptation strategies can leverage current local initiatives around agricultural production to support food security. There is potential to develop and establish food production adaptations and technologies to counteract the shifting wet/dry season patterns, and cyclone season. Mid-term strategies can examine existing regional food system research to enable dialogue at the regional level to support regional food systems capacities. For instance, regional dialogue can include sharing of research findings from different countries and their adaptation strategies and discuss how these strategies could be used in other countries in the Pacific. Long-term strategies may include a futuring/foresighting approach to identify scenarios that may arise out of climate change impacts in the Pacific, and subsequently strategise ordered measures to achieve favourable scenarios for the Pacific food systems in spite of climate change.

12.7 Concluding remarks and research gaps

Given the increasing high vulnerability of the Pacific regional communities to shocks from climate change and Covid - 19, there is greater need for research and actions to understand, develop, manage, and utilise individual, organisational, and policy-system capacities for strengthening the resilience and adaptation or coping strategies for the food systems to achieve a sustainable system.

There are many research gaps in the Pacific region however key research gaps include economic evaluations of different capacity-building strategies, especially in identifying the most cost-effective approaches to building capacity at the individual, organisational, and system levels and to determine the economically optimal level of investment in resilience capacity building that need to be developed, validated and adopted. There is also a great need to understand the coordination capacity and interdisciplinary knowledge and technology required to address shocks and threats that affect multiple sectors. Assessment of different organisational capacity–building approaches in the Pacific region to improve allocation, management, and utilisation of resources is yet to be reviewed and strengthened. Finally, the methods and techniques for improving governance capacity that will enable decentralised decision making and to facilitate participation in policymaking by governmental and nongovernmental actors at national, subnational, and local levels are yet to be aligned and applied.

Specifically, four gaps highlighted are critical to increase the understanding on not just impacts of climate change on production systems but also food system and health.

a. More research is needed on how climate change speed up the rate of nutritional transitions compared to different historical timelines (before independence and post-independence) and map out climatic drivers that caused major shifting of food systems, diets and health.

b. As shown in our chapter, relocation of communities from coastal areas to be safe from rising sea level has exposed them to markets, urban areas and therefore shifting food systems from a traditional based food environment to a more market and cash-based food sources. As a result, there is increasing consumption of ultra processed foods, and rising of non-communicable diseases with lasting impacts on resilience of the communities. More research is needed to understand the shifting of food environments, food systems and diets before and after the relocations to understand how the relocation impacts food systems and diets and livelihoods of relocated communities. This is important to be included in planning of relocations to ensure communities are safe from sea level rise and future rise of non-communicable diseases.

c. More research is needed to understand the specific impacts of climate change on food production and nutritional composition of local root crops, fish and sources of foods.

d. Still more research is needed on 'marrying' traditional knowledge processes and approaches and modern science in developing tools to improve the resilience of local food systems.



> “We are reviving this tradition of ours and not only that, but we are also reviving many inactive mesei throughout Palau. The traditional role of the women of Palau is to cultivate, manage and harvest the taro patches, and men fish, but women are educated, we got formal employment with the government, public enterprises and other institutions and no one attends the mesei. Most of our mesei had been cultivated by our grandmothers and mothers then left inactive over time. Now we are returning to these patches, and we are helping one another as a group”

Community participant
Palau
(POCCA research team interview, 2023)

Taro patch in Palau to sustain people throughout the year, despite the extreme weather (Photo: POCCA team, 2023).

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Chapter 13

Climate Crisis, Geopolitical Vulnerability, Transnational Crime and Mitigating Responses

Authors

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Personnel from Fiji Revenue and Customs Service (with the support from HMNZS Taupo) conduct operations in the outer islands (Pictured), in a move to address increasing security challenges like transnational crime, which increasingly overlap with climate change issues (photo: Chapter Authors)

Abstract

The Pacific is facing an array of complex and, at times converging, security challenges ranging from the existential threat posed by climate change to the enduring threat of transnational crime. Increasingly, however, geopolitical competition is threatening to 'distract the region and its partners from efforts to address its existing security priorities addressing climate security, supporting human security and disrupting criminal activity' (Pacific Islands Forum, 2022). This chapter explores the relationship between climate change, a systemic risk to the Pacific, the geopolitical vulnerability of the Pacific region as a persistent threat, and transnational crime as an enduring threat. It considers the ways in which climate change intersects with and amplifies the geopolitical vulnerability of the Pacific region and transnational crime by drawing on the available literature and the observations of the authors.



> “Machine guns, fighter jets, ships are not our primary security concern. The single greatest threat to our very existence is human induced, devastating climate change. It threatens our very hopes and dreams of prosperity. Waves are crashing our doorsteps, winds are battering our homes, we are being assaulted by this enemy from many angles”
>
> Inia Seruiratu
> Former Minister of Defence
> Fiji

Coastal infrastructure like this wharf in Majuro Atoll, Marshall Islands (Pictured), are more frequently impacted by extreme weather events hindering usability (Photo: POCCA Team).

13.1 Introduction

The Pacific is facing an array of complex and, at times converging, security challenges ranging from the existential threat posed by climate change to the enduring threat of transnational crime. Increasingly, however, geopolitical competition is threatening to 'distract the region and its partners from efforts to address its existing security priorities addressing climate security, supporting human security and disrupting criminal activity' (Pacific Islands Forum, 2022). These dynamics are expected to persist due to the likelihood of geopolitical tensions increasing and major powers continuing to 'compete for influence in the region to protect and promote their own interests' (Pacific Islands Forum, 2022).

In response to the multifaceted security challenges facing the region and the increasingly 'dynamic geopolitical environment leading to an increasingly crowded and complex region', the Pacific Islands Forum Leaders endorsed the Boe Declaration on Regional Security (2018), which advanced an 'expanded concept of security' as a means of exercising sovereignty and agency over the regional security agenda. To that end, the Boe Declaration identified climate change as 'the single greatest threat the livelihoods, security and wellbeing of the peoples of the Pacific' (Pacific Islands Forum, 2018) as well as four priority security issues: human security, environmental and resource security, transnational crime, and cybersecurity. Of these security challenges, climate change is a systemic risk to the Pacific. This chapter explores the relationship between climate change and two other security challenges identified in the Boe Declaration: geopolitics and transnational crime. Specifically, this chapter examines the geopolitical vulnerability of the Pacific region as a persistent threat and transnational crime as an enduring threat. It considers the ways in which climate change intersects with and amplifies the geopolitical vulnerability of the Pacific region and transnational crime. Accordingly, this chapter explores (a) the relationship between climate change and security in the Pacific, including between disasters, political instability and conflict; (b) the relationship between transnational crime, instability and climate change; and (c) the relationship between climate change and the geopolitical vulnerability of the Pacific region. The chapter then examines the ways in which the Pacific has sought to mitigate the security challenges including through the various policy responses. The chapter then concludes with a series of policy implications and recommendations including advancing a proposed research agenda to deepen the current state of knowledge on the dynamics between climate change, geopolitical vulnerability and transnational crime.

13.2 Climate crisis, geopolitical vulnerability, transnational crime and mitigating responses

Climate change, geopolitical vulnerability, and transnational crime are complex and intersecting challenges facing the Pacific region. While climate change is recognised as systemic risk to the Pacific and transnational crime is acknowledged to be an enduring threat, the geopolitical vulnerability of the region is emerging as a persistent threat.

There is increasing evidence that climate-related events 'intensify existing vulnerabilities to non-state security threats and raise the overall level of vulnerability and risk to both human and state security' (Jasparro & Taylor, 2008). Indeed, there is a growing body of scholarship examining the relationship between climate security and conflict which examines the factors which contribute to climate change leading to societal and state insecurity and conflict (Nordas & Gleditsch, 2007; Barnett, 2009; Busby, 2019;). In mainstream discourse, however, the relationship between climate change and security has been predominantly concerned with conflict as a result of resource security (Selby et al, 2017; Gleick, 2014) and conflict as a consequence of climate-induced migration (Boas, 2015; Anton, 2018). In the Pacific, the literature has largely focussed on climate-induced migration (Barnett, 2009; Locke, 2009; Yamamoto & Estaban, 2014; Mortreux & Perumal, 2018; Tabe, 2019) and food insecurity (Barnett, 2020).

The relationship between climate and transnational crime - specifically whether climate change and climate-related events (such as disasters) can lead to an increased risk of transnational crime – is a new area of study and has been largely undocumented in the Pacific within the policy literature. The Pacific Climate Security Assessment Guide identifies five pathways by which climate change can be considered a security threat from challenges to livelihoods, land availability and usability, disaster risks and erosion of resilience, mobility trends and risks, to the undermining of regional security (United Nations Development Programme and Pacific Islands Forum, 2023). It does not, however, recognise the ways in which crime and transnational organised crime in particular is a cross-cutting issue. The Pacific Regional Security Outlook 2023-2024 in turn notes that given 'the vast maritime expanse of the Pacific, combined with stretched national capacities and limited information sharing, there is a very strong likelihood that transnational criminal networks will seek to increasingly take advantage of porous borders across the region where their activities can occur undetected or uninterrupted' (Pacific Islands Forum, 2024).

It will be critically important for future strategic outlooks to consider the implications of land uninhabited as a result of climate change being utilised by transnational criminal actors as storage sites, drop off locations or even production labs.

Notably the Pacific Islands Forum Regional Transnational Organised Crime Disruption Strategy 2024-2028 is one of the first regional statements to make the link between climate change and transnational crime explicit. The Strategy makes a direct connection between the continuous cycle of severe weather events and worsening socio economic conditions leading to the heightened vulnerability of the region to exploitation by transnational criminal actors; as well as climate induced migration flows leaving the region vulnerable to exploitation by transnational organised criminal groups and individuals, with climate migrants exposed to risks including crimes and various forms of exploitation (Pacific Islands Forum, 2024).

Climate related vulnerability will increasingly act as a multiplier or catalyst for the growth of transnational organised crime networks in several critical ways. For example, political instability and fragility caused or exacerbated by the climate crisis create permissive environments for transnational criminal networks from which to operate. Climate change will progressively exacerbate state weaknesses and failures and their associated spillover effects in already vulnerable developing states thereby expanding traditional opportunities for transnational criminal actors (Coyne, 2022). Academic literature demonstrates a link between the impact of climate change on state and society, including the breakdown of traditional structures, leading to growth of illegal actors and networks (Caus, 2021).

At the global level, transnational crime is recognised as a multi-dimensional driver of state fragility (OECD, 2015). In 2014, the United Nations (UN) Secretary-General highlighted organised crime as one of the primary factors affecting conflict and stability, obstructing economic development and legitimate commerce, and holding people, communities, and countries captive in a negative spiral of fragility and underdevelopment (United Nations General Assembly, 2014). Accordingly, the security-development nexus is acknowledged with the reduction of transnational and organised crime recognised as one of the UN Sustainable Development Goals (SDG), specifically SDG Target 16.4 (United Nations, 2015).

While there is a substantial body of literature on transnational crime as a global threat, the Pacific region has been largely under-served. The existing literature is largely concerned with the crime types, nature and extent of transnational crime in the Pacific (McCusker, 2006; McCarthy-Jones, 2018; Sousa-Santos, 2022a); law enforcement capacity and cooperation and transnational crime (Boister 2005; Watson et al., 2021); and the role of culture and community in combatting transnational crime (Sousa-Santos & Howes, 2022). The link between climate and transnational crime remains under-developed and further research is required to better understand whether the conditions of climate change and disasters provide a crime-facilitative environment.

Transnational crime has long been recognised as an enduring threat to regional security. The Pacific Islands are strategically located along both licit and illicit trading maritime highways. The region's vast and porous maritime borders, weak jurisdictions and limited enforcement capabilities are key structural challenges and enablers to transnational crime.

The Pacific Islands Forum Honiara Declaration (PIF, 1992) recognised that the potential impact of transnational crime was a matter for increasing concern to regional states and enforcement agencies and called for a more comprehensive, integrated and collaborative approach across law enforcement to counter these threats (Pacific Islands Forum, 1992). Over the past five years, there has been a growing recognition that transnational crime can generate significant insecurity, disrupt traditional and cultural mechanisms, fuel corruption, weaken key security sectors, and undermine formal and informal governance (Sousa-Santos, 2022a). One of the major features of the Pacific security environment – increasingly visible over the last five years – is the rising sophistication, range and number of transnational and local organised crime actors operating within the region (Sousa-Santos, 2022a). The Pacific Islands Forum 2050 Strategy for the Blue Pacific Continent captured this in stating that; our geography coupled with our increasing global connectivity present further risks to maintaining peaceful communities and challenges to law-enforcement, making the region vulnerable to transnational crime. (Pacific Islands Forum, 2022).

The importation, trans-shipment, precursor trafficking, peddling and usage of illicit drugs is the most prevalent transnational criminal activity in the region (Pacific Islands Forum, 2022). Illicit drugs use, and trade is estimated to be worth AU$11.3 billion in Australia and up to an estimated AU$1.86 billion per annum in New Zealand (Pacific Islands Forum, 2022). While in the past, Pacific Island Countries (PICs) have largely been linked to transnational organised crime activities as transit points for movement of illicit substances to the larger markets such as New Zealand and Australia, domestic illicit drug markets have grown across the region over the past decade (Pacific Islands Forum, 2022). This has led to increases in addiction, mental health issues, crime and violence. In Fiji 148 drug-related police cases (including arrests for cocaine and heroin) were reported in 2009; by 2018, this had risen to almost 1400 arrests, with an increase of methamphetamine seizures from two in 2009 to 113 in 2019 (Sousa-Santos, 2022a).

The deportation policies of Australia, New Zealand, and the United States are facilitating and exacerbating crime and addiction within Pacific nations and undermining the policy objectives of development partners in the region. The majority of deportees have criminal records and are removed to Fiji, Samoa, Tonga, the Federated States of Micronesia, and the Marshall Islands. Most deportees removed to the Pacific are male, between the ages of 25 and 35, on average having spent more than 12 years away from their country of citizenship, and are incarcerated for an average of four years in the host country, with a large number separated from families (Pereira, 2014). Research in Samoa and Tonga revealed that 83% of deportees had been incarcerated due to gang activities during their adolescence in the host country and 37% had been investigated or charged following deportation; of those, almost half had served prison time (Pereira, 2011). More than 3,500 Pacific nationals were deported from Australia, New Zealand, and the United States between 2004 and 2020 although the number is likely higher given the difficulties in obtaining and disaggregating data (Sousa-Santos, 2022a). Moreover, the lack of support for deportees in their home countries means vulnerable individuals turn (or return) to crime and drug smuggling (Pacific Transnational Crime Network, 2017). As a Tongan deportee from New Zealand stated, 'I've never been here before (as an adult). I don't speak the language. I grew up as a Kiwi. I don't know how to live here. I just want to go home' (Sousa-Santos, 2021).

Barriers to reintegration for deportees can be significant. Dependence on remittances, difficulty obtaining employment, the challenges of integration, and cultural alienation are all contributing factors. Furthermore, the deportee policies of Australia, New Zealand, and the United States undermine, and are in direct contradiction with, their stated foreign policy objectives of strengthening the stability and prosperity of the region. As a member of a Tongan civil society organisation argued, 'New Zealand, Australia, and America are exporting their problems to us. How does that build trust between our countries? (Sousa-Santos, 2022b).

Significantly, the COVID-19 pandemic did not appear to negatively impact drug trafficking. In 2021 then Fijian Police Force Drugs Unit officer in charge, Assistant Superintendent of Police, Anare Masitabua, stated that 'there is a rapid increase in the usage and seizure of methamphetamine and other synthetics; this shows that methamphetamine is locally manufactured' (Vakasukawaqa, 2021). Then Fijian Director of Public Prosecutions, Christopher Pryde, claimed that funds from illicit drug activities were more than US$5 million per annum and that 'local traffickers could make between US$2500 and US$5000 a day from the sale of cocaine and meth in the domestic market' (Vakasukawaqa, 2021).

In 2022 Papua New Guinea's Police Commissioner David Manning referred to Papua New Guinea as the 'safe house' and 'transit point' for the trafficking of hard drugs following the fourth drug bust within two years totalling 893 kilograms of cocaine and methamphetamines or approximately US$ 76.38 million combined (Nangoi, 2022). In late 2022 two Malaysians and two Papua New Guineans were arrested for trafficking 117 kilograms of methamphetamines via Fedex. The seizure led Papua New Guinea's Deputy Police Commissioner Donald Yamasombi to call for support, stating that 'in the next five years we could be looking at an entire generation taking this drug(s) with the drug sold openly on the streets' (Nangoi, 2023).

The social ills associated with the spillover of drugs into the Pacific are on the rise. Evidence from Tonga indicates that illicit drug-related disorders making up 40% of monthly admissions to the Tongan national hospital's psychiatric ward (Matangi Tonga, 2024). As a consequence of increased intravenous drug use, and unsafe sexual practices, Fiji is experiencing an HIV/AIDS epidemic second to the Philippines in the Asia Pacific region with 415 cases and 82 deaths in 2023 and cases doubling every year (Dreaver, 2024).

Climate change intersects with drug trafficking and organised crime more broadly in several ways. As climate change impacts livelihoods, such as subsistence agriculture and coastal fisheries, drug trafficking and the facilitation of drug trafficking can offer economic security. Furthermore, there is increasingly a convergence of crimes. Environmental crimes such as illegal logging and illegal, unregulated and unreported (IUU) fishing have a detrimental impact on the Pacific.

Fisheries crimes such as IUU have a direct economic impact on Pacific states. Fishing fees from industrial fishing fleets to get access to Pacific waters account for an average of 37% of all government revenue (ranging from 4% of government revenue for the relatively large economy of Papua New Guinea to 84% for Tokelau) (Bell et al., 2021).

The total annual volume of tuna product harvested or transhipped in the Pacific involving IUU activity during 2017-19 is estimated to be 192,186 tonnes, worth US$333 million (ex-vessel value) (Pacific Islands Forum, 2022).

Other estimates suggest that up to 7.2 million tonnes of IUU fish catch (valued at between US$4.3 billion to US$8.3 billion) disappeared from Pacific waters annually (Manaswita et al., 2019). The associated loss of employment and food insecurity that results (when considering that the fishing industry provided 23,000 jobs for PICs (based on 2018 estimates) and that 70% of the regions protein intake comes from fish) adds to the negative consequences of IUU fishing in the Pacific (Pacific Islands Forum, 2022). Moreover, as deforestation (both legal and illegal) depletes subsistence agriculture on land, local communities are increasingly reliant on coastal fisheries. There is therefore a direct correlation between the illegal trade in timber and food insecurity. Furthermore, as the impact of climate change (fish stock patterns) and IUU fishing increases to reduce coastal fisheries, there will increasing vulnerability – and food insecurity – amongst communities. This in turn increases an individual's vulnerability to exploitation and coercion.

The COVID-19 pandemic illustrates the link between vulnerability and transnational crime in the Pacific. The economic and human security impacts of COVID-19 intersected with one of the major features of the Pacific security environment – the rising sophistication, range and number of transnational and local organised crime actors operating within the region. The pandemic effectively amplified the challenges posed to Pacific states and societies by transnational crime and contributed to heightened vulnerabilities which transnational criminal organisations and local crime actors have been quick to capitalise on. As economies faltered and livelihoods were directly impacted, criminal actors sought to take advantage of the vacuum with significant implications for human security (Sousa-Santos, 2022b). Then Pacific Islands Chiefs of Police observed that COVID-19 could be facilitating local recruitment by drug traffickers in the Pacific (Radio New Zealand, 2021; Radio New Zealand, 2022) enabled by the economic disruption of the pandemic. This has also disproportionately impacted the most vulnerable including women and girls, children and the poor.

Trafficking in persons, for example, increased in the Pacific during COVID-19. The Pacific is vulnerable to trafficking in persons and evidence over the past decade indicates that the Pacific islands are a source, transit point and destination of trafficking in persons (UNODC, 2023). The market for trafficking in persons in the Pacific is dominated by three main patterns of trafficking: forced labour; sexual exploitation; and child trafficking. The pandemic led to increased domestic trafficking in persons as borders closed and economic insecurity increased (Davy & Tupou, 2022). Research undertaken by the United Nations Office of Drugs and Crime (UNODC) found an increased presence of child trafficking in the wake of the most severe economic downturn related to the COVID-19 pandemic (UNODC, 2023).

Moreover, anecdotal evidence suggests that as irregular migration has increased so has the domestic trafficking of women and girls (personal communication, December 6 2023). During the COVID-19 pandemic, the drivers and risk factors for domestic trafficking increased due to the economic impact of the pandemic.

This included an increase in trafficking and exploitation of individuals facing a loss of livelihood and seeking other, potentially risky, options, and more children have left school to work to assist their economically struggling families, thus being exposed to a higher susceptibility of being trafficked or exploited (UNODC, 2023). The drivers of trafficking in persons are in part due to the region's heavy reliance on industries with complex global supply chains, often prone to exploitive labour practices. Pacific markets are characterised by narrow economic base and high unemployment which puts vulnerable groups at risk of exploitation. The exact scope of the problem is unclear due to a lack of data and public awareness (UNODC, 2023).

In communities and states that do not have the resources to prevent and mitigate the security and societal impacts of illicit activities such as drug and human trafficking, organised crime syndicates have capitalised on the opportunities posed by the COVID-19 pandemic to further entrench themselves in the region and strengthen their position.

However, the pandemic has illustrated that trafficking worsens within societies under pressure. Climate change as an enabler or driver of trafficking in persons therefore needs to be better documented and understood. The pandemic is a prescient warning and provides valuable insights into the ways in which the climate crisis will worsen vulnerabilities and exacerbate the nexus between climate, geopolitics and transnational crime. Criminal actors profiteering from vulnerability is not new. It is, however, being compounded and facilitated by the challenges posed to the Pacific by COVID-19 and the pressures being placed on government agencies tasked with responding to both the pandemic and existing criminal activities. Agencies are already stretched by the Pacific's challenging geographic realities, its extensive and porous jurisdictional boundaries and differences in governance and heterogeneity in law enforcement capacity.

13.3 Mitigating responses

Reflecting the complex challenges and growing urgency of tackling transnational crime in the region, the Pacific Islands Forum (PIF) elevated the issue in its Boe Declaration on Regional Security (2018), which identified transnational crime as one of four paramount challenges confronting the region (Pacific Islands Forum, 2018). A range of regional mechanisms have been established to combat transnational crime, including the Boe Declaration on Regional Security Action Plan (2019), the Pacific Transnational Crime Network, the Pacific Methamphetamine Action Plan, and the Regional Transnational Crime Disruption Strategy 2024-2028 (2024). The Boe Declaration recognises transnational crime as one of four primary security threats to the region, as did earlier regional security declarations, although their limited success demonstrates the need for corresponding national policies and political will. The Boe Declaration Action Plan seeks to align regional and national-level efforts and identifies eight proposed actions to combat transnational crime in the Pacific, ranging from strengthening national capacities to increasing information sharing (Pacific Islands Forum, 2019).

Central to its success will be the strengthening of national capacities; building greater linkages between Pacific law enforcement and other relevant agencies; and building the necessary supporting systems within the health, education and social service sectors to support communities and individuals.

Many Pacific communities are on the frontlines of both climate change and transnational crime. Robust traditional power structures, such as village authorities and the church, are often 'first responders' against the drug trade. Village councils in Samoa, for example, known for supporting police conducting gun amnesties, have partnered with police to bolster anti-drug campaigning (Sousa-Santos, 2022). Then Samoan Prime Minister Tuilaepa Lupesoliai Sailele Malielegaoi noted in 2015 that in some villages, they have zero tolerance for these (drug-related) activities and have imposed stiff penalties - including banishment'.

Community resilience and Indigenous Knowledge have a critical role to play in addressing the consequences and impact of illicit activities such as drug trafficking. The drug trade in the Pacific has created shadow economies and contributed to the creation of criminal hierarchies, which undermine the balance of power between traditional authority, church, and state (Sousa-Santos, 2022a). Criminal actors and groups have created sub-cultures and power structures with their own leaders and hierarchies, rules, and regulations, effectively diffusing power away from legitimate sources of authority. This is evident in the laundering of money through local businesses, the use of import and export businesses as fronts for illicit drug trafficking, and the large amounts of money offered as gifts and donations to influential members of communities to start businesses or undertake community projects. Shadow economies create economic possibilities, broker political power, establish cultures, and create new, sometimes hybrid, forms of authority blurring the lines between formal and informal authority (personal communication, December 1, 2023). As a traditional Tongan leader stated:

> Families are angry with young people stealing family mats et cetera to sell or swap for drugs…this shames families within communities…having a child or parent on drugs impacts the family's status in the community…it's not just the individual but the family which is impacted and can lead to families pulling away from village life (Sousa-Santos, 2022).

In response to the 2024 drug seizures in Fiji, Fiji's Home Affairs Minister Pio Tikoduadua stated that drugs were threatening the fabric of society and that the drug issue is a battle that we must fight on all fronts' (ABC, 2024).

His response that we must empower our communities to be the first line of defence against threats (ABC, 2024) echoed long-standing calls from regional religious leaders including Pacific Conference of Churches General Secretary Reverend James Bhagwan for the Church to be increasingly engaged in national responses to transnational crime and the associated societal ills (Fiji Village, 2023).

> “Our forefathers used to coexist nicely with the environment. Following Vanuatu’s independence, freedom of choice and expression (democracy) resulted in the formation of many chiefly titles under the major chief, producing conflict among the people within the community and resulting in communal changes. Not only are we seeing the effects of climate change, but also man-made repercussions”
>
> Joel Matueletolu
> Chief of Sunai village
> Moso Island
> Vanuatu
> (POCCA research team interview, 2023)



Seawalls like this one in Vanuatu (pictured) often provide limited protection against coastal inundation, as they collapse under rising sea levels and intensified wave action (Photo: POCCA Team).

13.3.1 Post-disaster tension and mitigating strategies

It is widely accepted that the risk of conflict increases following disasters (Peregrine, 2019) however it is a complex interplay of social, economic, political and environmental factors. In circumstances where conflicts and disasters are protracted, the relationship is even more complex and intertwined (Peters et al., 2019).

Moreover, research suggests that the severity and intensity of a disaster may be a determining factor in the level of conflict; as well as the severity of the impact of disasters on natural resource availability increasing conflict. To date, however, the increase of conflict and political instability in post-disaster situations in the Pacific has been low. Conflict and political instability did not occur in Vanuatu following the widespread destruction caused by Cyclone Pam (2015) which led to damage and loss amounting to US$449.4 million equating to 64.1% of GDP (Government of Vanuatu, 2015), or Cyclone Harold (2020) which led to damage and losses amounting to US$617 million equating to 61% of GDP in 2020 (Government of Vanuatu , 2020). Nor did conflict or political instability emerge in Fiji following Cyclone Winston (2016) which resulted in damage and loss amounting to US$1.38 billion equating to 31% of GDP (Government of Fiji, 2016). In both cases, other societal and structural factors, such as traditional power structures, robust cultural mechanisms, collective feeling of empathy and cooperation and strong political authority, may have mitigated the potential for conflict and instability.

In contrast, the interplay between disasters and conflict in Papua New Guinea is significant. About 72% of displacement in the highlands region is as a result of disasters such as the 2018 earthquake and 28% as a result of tribal conflict and ethnic clashes. Evidence suggests a clear link between disaster induced displacement, both voluntary and forced, and conflict (International Organisation for Migration, 2021). Moreover, research on disaster induced displacement as a source of conflict suggests that conflict and governance issues arising where resettlement is in others' customary land is lower risk when relocation is voluntary and well planned (Campbell, 2010; Boege, 2011; Bryant-Tokelau, 2018; Boege & Rakova, 2019; Tabe, 2019).

13.3.2 The intersection of disaster and conflict risk

The literature suggests that the relationship between post-disaster situations and conflict can be grouped into four broad categories: (a) conflict increases following climate-related disasters because local economic conditions deprive polities of tax revenue so that they can no longer suppress conflict; (b) conflict increases following climate-related disasters because existing social inequalities lead to conflicts over differential access to resources; (c) conflict increases following climate-related disasters because migration forces population into condensed settlements ripe for conflict; and (d) conflict increases following climate-related disasters in polities where leaders tightly control access to political authority because leaders may use violence to maintain control over the resources they use to secure support from other elites (Peregrine, 2019).

In the Pacific, there has been a reluctance to securitise climate change and climate-related events in the region. The Solomon Islands National Climate Change Policy (2012-2017), for example, does not acknowledge a connection between conflict and climate change (Government of Solomon Islands, 2012) although the National Security Strategy notes existing vulnerabilities are amplified by climate change and disasters (Government of Solomon Islands, 2020). Pasisi has argued for greater recognition of the links between climate change and fragility in the Pacific including identifying 'coping capacity and natural disasters' as a critical fragility risk linking climate to insecurity and conflict (Pasisi, 2019).

Crime and violence often spike in the immediate aftermath of disasters, affecting the most vulnerable and stretching traditional response capacities (Roy, 2010). Successive hazards, with shortening recovery periods in between crises, present significant fragility risks and bear the potential for short-term conflict and longer-term deterioration of sustainable livelihoods and economic integrity (Pasisi, 2019; personal communication, November 30, 2023). Critically, disasters can lead to the emergence, growth and influence of non-state actors, including criminal organisations and armed groups, seeking to exploit the aftermath of humanitarian emergencies, and the security vacuum that can exist in a post-disaster context, to strengthen ties with communities, leverage governments and secure resources and profit (Sousa-Santos, 2021). Coyne argues that climate change will progressively exacerbate state weaknesses and failures and their associated spillover effects in already vulnerable developing states thereby expanding traditional opportunities for transnational criminal actors (Coyne, 2022).

13.3.3 Mitigating strategies

It is significant that, despite the extensive evidence, the internationally agreed framework for action on disasters, the Sendai Framework for Disaster Risk Reduction 2015-2030 (United Nations Office for Disaster Risk Reduction, 2015) does not acknowledge the complex interplay between conflict and disasters. However, progress has been made within the United Nations system to respond to climate and security including efforts to promote a common understanding of the complex interlinkages between climate change and peace and security, such as the Climate Security Mechanism (CSM) established in 2018.1 That year, Germany and Nauru established the Group of Friends on Climate and Security in the United Nations to advance the nexus between climate and security at the UN.

Eleven UNGA resolutions refer to the implications of the effects of climate change on peace and stability. The UN Security Council explored the security implications of climate change in thematic debates in 2019 and 2020. However, despite increasing attention for the ever-increasing scale of climate-related security implications, the Council, however, still lacks a systematic approach to climate-related security risks. Several proposals have been made to further develop the Council's tools for forecasting and early warning, risk assessment and conflict-prevention. There is an evident need to pursue both a context-specific and an integrated approach to climate-related security risks to inform decision making, to facilitate climate-related security risk assessments and to enable appropriate responses by the Security Council (Pasisi, 2019).

At the regional level, this complexity is recognised in the Framework for Resilient Development in the Pacific (2016), and Pacific Islands Forum Boe Declaration on Regional Security 2018 and its associated Action Plan (Pacific Islands Forum, 2018; Pacific Islands Forum, 2019). The Framework for Resilient Development in the Pacific (FRPD) provides voluntary guidelines for stakeholders and advances an integrated regional framework on climate change and disaster risk management in recognition of the overlap between climate change adaptation and disaster risk management tools and resources. The FPRD highlights the human security implications of climate change and disasters but does not provide guidance for communities experiencing climate or disaster induced conflict.

The Boe Declaration advances an expanded concept of security and identifies climate change as an 'environmental security risk, a human security risk and an existential national security risk a threat to the livelihoods, security and well-being of the peoples of the Pacific' (Pacific Islands Forum, 2019). The Boe Declaration Action Plan acknowledges the impact that climate change will have on the regional security landscape 'through its interaction with human security and conflict' and calls for research that will support the 'Pacific narrative of climate change as a security threat' (Pacific Islands Forum, 2019).

1. Climate Security Mechanism was created in 2018 as a joint initiative by the Department for Political and Peacebuilding Affairs (DPPA), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP) to strengthen the capacity of the UN system to analyse and address the adverse impacts of climate change on peace and security. See UNDPPA, Addressing the Impact of Climate Change on Peace and Security. https://dppa.un.org/en/climate-peace-security.

The Pacific Islands Forum regional architecture makes explicit the link between disasters and fragility including earlier declarations such as the Aitutaki Declaration on Regional Security Cooperation (1997) which acknowledged the Pacific's vulnerability to disasters and environmental damage and the implications for national and regional security. More recently, the 2050 Strategy for the Blue Pacific Continent, under the thematic area for peace and security, highlights the intersecting nature between threats to the security of Pacific peoples, including transnational crime, disasters and climate change noting the latter is the 'single greatest threat to security' (Pacific Islands Forum, 2022).

13.4 Policy responses to crime, instability and political security

13.4.1 Crime

The current regional security architecture charged with preventing and responding to transnational crime is a patchwork of agreements, arrangements and institutions (Wallis et al., 2021). Reflecting the complex challenges and growing urgency of tackling transnational crime in the region, the Pacific Islands Forum (PIF) elevated the issue in its Boe Declaration on Regional Security (2018), which identified transnational crime as one of four paramount challenges confronting the region (Pacific Islands Forum, 2018). A range of regional mechanisms have been established to combat transnational crime, including the PIF Boe Declaration on Regional Security (2018), the Pacific Transnational Crime Network, and the Pacific Methamphetamine Action Plan. The Boe Declaration recognises transnational crime as one of four primary security threats to the region, as did earlier regional security declarations, although their limited success demonstrates the need for corresponding national policies and political will. The Boe Declaration Action Plan seeks to align regional and national-level efforts and identifies eight proposed actions to combat transnational crime in the Pacific, ranging from strengthening national capacities to increasing information sharing (Pacific Islands Forum, 2019).

In 2018 Tonga declared a 'war on drugs' and established the Tonga Police Drug Enforcement Taskforce. In the first year of operation, the Taskforce made 263 arrests and seized over 30 kilograms of methamphetamines with a street value of more than NZ$26 million (Dreaver, 2018). In June 2019, Tonga requested assistance from the PIF Secretariat to draft its national drug policy. This is the first time a Forum member had requested assistance from the PIF to address drug-related issues and is a test case for both PIF leadership and oversight in supporting national-level policy and legislative initiatives. In 2020, Tonga amended its Illicit Drugs Control Act with acting Justice Minister Samiu Vaipulu stating that 'ice' (methamphetamines) is 'Tonga's killing virus, not COVID-19' (Radio New Zealand, 2020).

In 2004, Fiji passed legislation to strengthen its drug laws and policing powers, and in 2019 Fiji's Ministry of Defence and National Security drafted a national narcotics strategy and framework. Fiji Minister for Home Affairs, Pio Tikoduadua, stated this year that we know Fiji is a transit point. We know hard drugs are increasing' (Radinibaravi, 2023).

Moreover, national security strategies, which PIF members committed to under the Boe Declaration, have sought to align domestic focus on transnational crime with the regional architecture. The national security strategies of Samoa, Solomon Islands, and Vanuatu all identify transnational crime and the spill-over of drug abuse into local communities as key security issues (Government of Samoa, 2018; Government of Vanuatu, 2019; Government of Solomon Islands, 2020). Samoa's national security strategy identified transnational crime and the spill-over of drug abuse into local communities as a key security issue and links outlaw motorcycle criminal gangs (OMCGs) as an 'emerging threat' (Government of Samoa, 2018).

13.4.2 Policy responses to instability and political security

The Pacific Islands Forum Framework for Pacific Regionalism (2014) states 'our objective is security that ensures stable and safe human, environmental and political conditions for all' (Pacific Islands Forum, 2014). Accordingly, policy responses at the regional level to instability and political security in the Pacific seek to establish a robust architecture. The Pacific Islands Forum further identifies that the Pacific's security environment has become increasingly complex, that Pacific communities are vulnerable to security threats from transnational crime groups, climate change, terrorism, natural disasters, political instability, and internal conflicts, and that the consequences of these threats include domestic disorder, diminished border revenues, increased local crime, and weaker law enforcement. The Pacific Islands Forum seeks to provide the mechanisms to mitigate these threats through a stable of declarations including, the Honiara Declaration (1992) which acknowledges the link between security and development; the Aitutaki Declaration (1997) which provides principles governing security cooperation in the region; the Biketawa Declaration (2000) which sets the framework for regional crisis management and conflict resolution initiatives; the Nasonini Declaration (2002) which recognises the need for immediate and sustained regional action in response to the current regional security environment; and the Boe Declaration on Regional Security (2018) which adopts an expanded concept of security and identifies four security challenges in addition to climate change.

13.4.3 Politicisation of climate issues in the Pacific region and impact on changing geopolitical security

The Pacific Islands Forum, Boe Declaration on Regional Security (2018) recognises the tension between an 'increasingly complex regional security environment driven by multifaceted security challenges,...dynamic geopolitical environment leading to an increasingly crowded and complex region,...and that climate change is the single greatest threat to the livelihoods, security and wellbeing of the peoples of the Pacific' (Pacific Islands Forum, 2018).

As strategic competition in the Pacific intensifies between the United States and China, climate issues will increasingly and inevitably intersect with geopolitics. This is in part due to strategic competition playing out in the context of both resource security and the maritime domain, as well as the ability of state actors (and in some cases non-state proxies) to influence and leverage the domestic and foreign policy behaviours of Pacific states.

This tension is acknowledged in a series of official New Zealand foreign policy, intelligence and defence assessments. The Ministry of Defence Strategic and Defence Policy Statement (2018) identifies climate change as a 'complex disruptor' and argues that climate change will contribute to resource competition and that greater competition for influence in the Pacific will intersect with complex disrupters such as climate change which will provide further opportunities for a range of countries to increase their influence in the Pacific.

Similarly, the Ministry of Defence assessment The Climate Crisis: Defence Readiness and Responsibilities (2018) suggests that 'some states could look to use assistance in climate change disaster adaptation, mitigation, response, and recovery as a way to increase influence and access'.

Furthermore, the Defence Assessment (2021) identified strategic competition and climate change as intersecting with a range of sources of insecurity in the Pacific such as challenges to governance and human security. The New Zealand Security Intelligence Service threat assessment makes explicit the role of climate change as threat multiplier and states the impacts of climate change, both current and anticipated, are exacerbating trends including geopolitical (New Zealand Security Intelligence Service, 2023). Moreover, New Zealand's Ministry of Foreign Affairs and Trade Strategic Assessment Navigating A Shifting World Te whakatere I tētahi ao hurihuri (2023) states that the Pacific region is 'no longer strategically benign' and that shared challenges to regional stability and security include transnational crime and climate change.

As identified, there are several areas in which climate issues and geopolitics may intersect. This includes climate financing as the need for predictable, adequate and ease of access to climate finance to ensure that the Pacific can build and sustain their necessary resilience capacities becomes increasingly acute. Other areas where climate and geopolitics – and geo-economics – will likely intersect is around resource security, notably fisheries, as well as ocean governance and maritime boundaries.

The maritime domain and the blue economy will increasingly play a critical role in the political and economic affairs of Pacific nations and is a potential fault-line for geopolitical competition. Ocean or maritime governance is of critical importance to the Pacific region due to its dependence on fisheries resources and the blue economy. Securing maritime boundaries and the high seas is a critical challenge for the Pacific due to the immediate stresses on marine resources (specifically fisheries) and the longer-term impact of climate change. Moreover, maritime boundaries have strategic significance. Secure maritime boundaries are a national security issue, they influence navigation rights, and there is a potential convergence with strategic competition if external states sought to exploit vulnerabilities in order to gain access and influence. There are also clear implications with respect to the acknowledgment, recognition and upholding of Indigenous and traditional rights as demonstrated in the case of the contested maritime boundary between Vanuatu and France. Vanuatu has a contested maritime boundary with France/New Caledonia with respect to the Mathew and Hunter Islands. The dispute over the ownership of Matthew and Hunter Islands has been a focus for considerable diplomatic tensions. Despite negotiations proceeding, albeit slowly, neither party have shown any willingness to cede their claims. Of particular significance is the role of Indigenous knowledge and history in determining maritime boundaries. In 2009 New Caledonia's Indigenous Kanak independence movement, the Front de Liberation Nationale Kanak et Socialiste (FLNKS), signed the Keamu Agreement with chiefs of Vanuatu's southernmost province, acknowledging the disputed Matthew and Hunter Islands have traditionally been part of Vanuatu's southern islands, an Indigenous claim that has been downplayed by France (Naupa, 2021).

Moreover, there is a convergence of geopolitical interests in the Pacific maritime domain. Maritime security is intrinsically geopolitical since it is about projecting state power beyond one's external boundary within the 'global' maritime domain (Germond, 2015). Defence diplomacy activities in the maritime domain have emerged as key mechanisms 'to build relationships and influence, enable visibility and secure presence, and could ultimately serve as a form of deterrence in the Pacific' (Powles & Newton, 2024).

In response to the rising tempo of defence activities in the Pacific, the Defence Diplomacy in the Pacific project co-led by Grifith University and Massey University documents the rise in defence diplomacy across twelve categories of engagement and five countries between 2018 and 2023. The project tracker reveals a significant increase in both maritime security related activities and maritime security actors (Newton et al.,2023). For example, the United States has expanded its Coast Guard partnerships with Pacific nations, including ship-rider agreements such as that with Papua New Guinea and Vanuatu. In 2024 this included a combined operation with Vanuatu officers supported by U.S. Coast Guard crew members from Harriet Lane conducting multiple boardings of six Chinese fishing vessels, during which they found multiple violations of Vanuatu law.

In response, China's ambassador to New Zealand, Wang Xiaolong, argued, albeit incorrectly, that the use of 'so-called shiprider agreements' to 'carry out law enforcement activities against China's fishing vessels' was a violation of international law and the agreements were not binding on China's fishing fleet (Wang, 2024). China has also increased its coast guard presence in the Pacific with the registering of twenty-six Coast Guard vessels with the Western and Central Pacific Fisheries Commission in 2024 to patrol the Pacific and conduct high seas boarding and inspection.

Consequently, the growing contest for influence and access in the Pacific Ocean is manifesting in a number of competing and potentially disruptive ways. For example, the New Zealand Maritime Security Strategy (New Zealand Government, 2024) argues that state and non-state actors may attempt to influence regional priorities, particularly regarding security arrangements and agreements on fisheries and climate change and that collective action on maritime security challenges may be displaced by the pursuit of geopolitical objectives.

As strategic competition intensifies in the Pacific, geopolitics and humanitarianism, specifically humanitarian assistance and disaster relief, will increasingly converge. As Grare writes 'geopolitical considerations have always influenced humanitarian and disaster response (HADR) operations' (Grare, 2024) however increasingly HADR has become a vector for geopolitical rivalries.

The international response to the Tongan eruption and tsunami in January 2022 illustrates the emergence of geopolitical humanitarianism – a trend which is likely to continue due to the frequency of disasters in the Pacific. For example, former Australian prime minister and ambassador to the United States Kevin Rudd posted on social media that Australia must be first to give Tonga assistance because failing that…China will be there in spades (Powles & Newton, 2024). Another country official reportedly said at least we got there before China did (Powles & Newton, 2024).

China's emergence as a HADR actor in the Pacific is a reflection of its broader ambitions as a humanitarian responder and a key stakeholder in disaster responses. This was evidenced by the inclusion of humanitarian assistance in the framework agreement on bilateral security cooperation signed in April 2022 between China and Solomon Islands (Ministry of Foreign Affairs, 2022); and following the Tongan disaster, the two countries signed cooperation deals on disaster relief (Zhang & Shang, 2022).

The international response to the Tongan disaster also reflected a critical feature of HADR in the Pacific: that of overcrowding. Australia, New Zealand, the US and others coordinated their response through the ad hoc HADR International Coordination Cell. China, however, chose to remain outside the cell and mounted its own response. The refusal to cooperate is 'turning an initially cooperative field of action into a competitive one' (Grare, 2024). This resulted in competition for pier-side support, access to tarmacs and flight scheduling, as well as poorly coordinated donated equipment (Wallis & Powles, 2023). For example, 75 eight-tonne inappropriate and unwanted one-bedroom prefabricated homes donated by China were left on the wharf in Nuku'alofa (Wallis et al., 2023).

The potential for friction between the two groups was circumvented in this case by the fact that most assistance was delivered through contactless means, to limit the introduction of COVID-19 (Wallis & Powles, 2023).

In light of the increased frequency of disasters in the region, it is therefore only a matter of time before defence personnel from these states are deployed to deliver humanitarian relief in the same geographical area, raising serious coordination challenges with potentially adverse consequences for the host Pacific nation and for the personnel delivering assistance (Wallis & Powles, 2023). Moreover, there are legitimate concerns that geopolitical agendas are driving competing regional architecture in response to disasters following the launch of the China – Pacific Island Countries Disaster Management Cooperation Mechanism and the China – Pacific Island Countries Center for Disaster Risk Reduction Cooperation in Guangdong in early 2023 and the proposed China – Pacific Island Countries Sub-Center for Marine Disaster Risk Reduction Cooperation.

One of the clearest responses to these concerns can be found in the 2023 South Pacific Defence Ministers Meeting (SPDMM), the premier ministerial dialogue for regional defence ministers. The SPDMM identified climate-induced disasters, the increasing demand for rapid Humanitarian Assistance and Disaster Relief responses and the establishment of the Pacific Response Group, maritime security, and non-traditional security challenges, such as Illegal, Unreported and Unregulated (IUU) fishing and transnational crime, as key areas for deeper cooperation (South Pacific Defence Ministers Meeting Joint Communique, 2023).

There is a clear need for further scholarly and policy research to be conducted on the nexus between the politicisation of climate issues and the impact of geopolitics, including on the capacities of current mechanisms and architecture at the regional and national levels to mitigate and respond to these challenges. There is currently no regional institution for humanitarian assistance and disaster relief and the Pacific Islands Forum does not play a prominent role in coordination (although as the Pacific Humanitarian Pathway demonstrates, there is capacity for doing so). This includes examining the benefits of adopting a collective security approach modelled on the successful collective ocean's diplomacy and climate diplomacy campaigns.

13.5 Policy implications

Drawing upon the preceding analysis, this chapter identifies the following policy implications:

- Climate change, transnational crime and geopolitics are identified as distinct and at times, direct challenges to the vision of a 'resilient Pacific Region of peace, harmony, security, social inclusion and prosperity, that ensures all Pacific peoples can lead free, healthy and productive lives' (Pacific Islands Forum, 2022).

- Climate change is a systemic threat to the Pacific; transnational crime is an enduring threat; and the geopolitical vulnerability of the Pacific region is a persistent threat. Mitigating responses will therefore need to reflect the multi-dimensional nature of the challenges posed.

- Climate change and transnational crime are often felt most acutely in 'settings where public institutions are already failing to meet the population's needs. Moreover, geopolitics is increasingly regarded as a 'disruptor' in the Pacific threatening to overwhelm and 'undermine…peace and security efforts' (Pacific Islands Forum, Pacific Security Outlook 2022-25)

- However, climate change, transnational crime and geopolitics are cascading and converging threats with the ability to create vulnerability across societies and nations. The implications of this snowball or threat multiplier effect are under-appreciated.

- As a consequence, researchers and policymakers have inadvertently siloed the three issues and in doing so failed to recognise the areas of potential convergence and mitigation responses.

- A more nuanced understanding of the intersection between climate and transnational crime will require the prioritisation and allocation of funding across funding streams.

- To address this, the authors recommend further research to map and understand the patterns and convergence of climate change and transnational crime in the Pacific. This would allow for the identification of existing points of friction and the projection and trajectory of future possible flashpoints.

- The failure to understand and respond to the intersection of climate change and transnational crime will not be readily mitigated against with profound implications for Pacific societies and states. For example, climate insecurity is often felt most acutely in contexts where public institutions are already struggling to meet the population's needs; transnational crime contributes to governments already under duress, is fuelled by corruption and contributes to elite capture, undermines governance and contributes to the erosion of the state.

- Managing the intersection of climate change and transnational crime with the geopolitical agendas and ambitions of partner countries will become increasingly challenging as competing regional architectures challenge regional unity.

13.6 Conclusion

The Pacific is facing an array of complex and, at times converging, security challenges ranging from the existential threat posed by climate change to the enduring threat of transnational crime. Increasingly, however, geopolitical competition is threatening to 'distract the region and its partners from efforts to address its existing security priorities…addressing climate security, supporting human security and disrupting criminal activity' (Pacific Islands Forum, 2022).

This chapter has explored the relationship between climate change, a systemic risk to the Pacific, the geopolitical vulnerability of the Pacific region as a persistent threat, and transnational crime as an enduring threat to the region. It has concluded that in order to respond to these distinct but increasingly converging and cascading threats, siloing of policy responses and academic research must be overcome. This chapter advances several proposed ideas to better understand and therefore mitigate against these threats including through the development of visual integrative mapping of current and future flashpoints across the three risks.



> The locals, I don't think they will understand what climate change is so, but there are more other issues that are more pressing than climate change. Like for us highlanders we have more pressing issues like conflicts like tribal warfare its epidemic up in the highland's region, sorcery related violence, to name a few

Lhondessha Pupaka
Port Moresby
Papua New Guinea
2023
(POCCA research team interview, 2023)

The Porebada coastal community in Port Moresby, Papua New Guinea, often experiences sea water inundation during high tides (Photo: POCCA Team).

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Chapter 14

Loss and Damage: Save the Pacific, Save the World

Authors

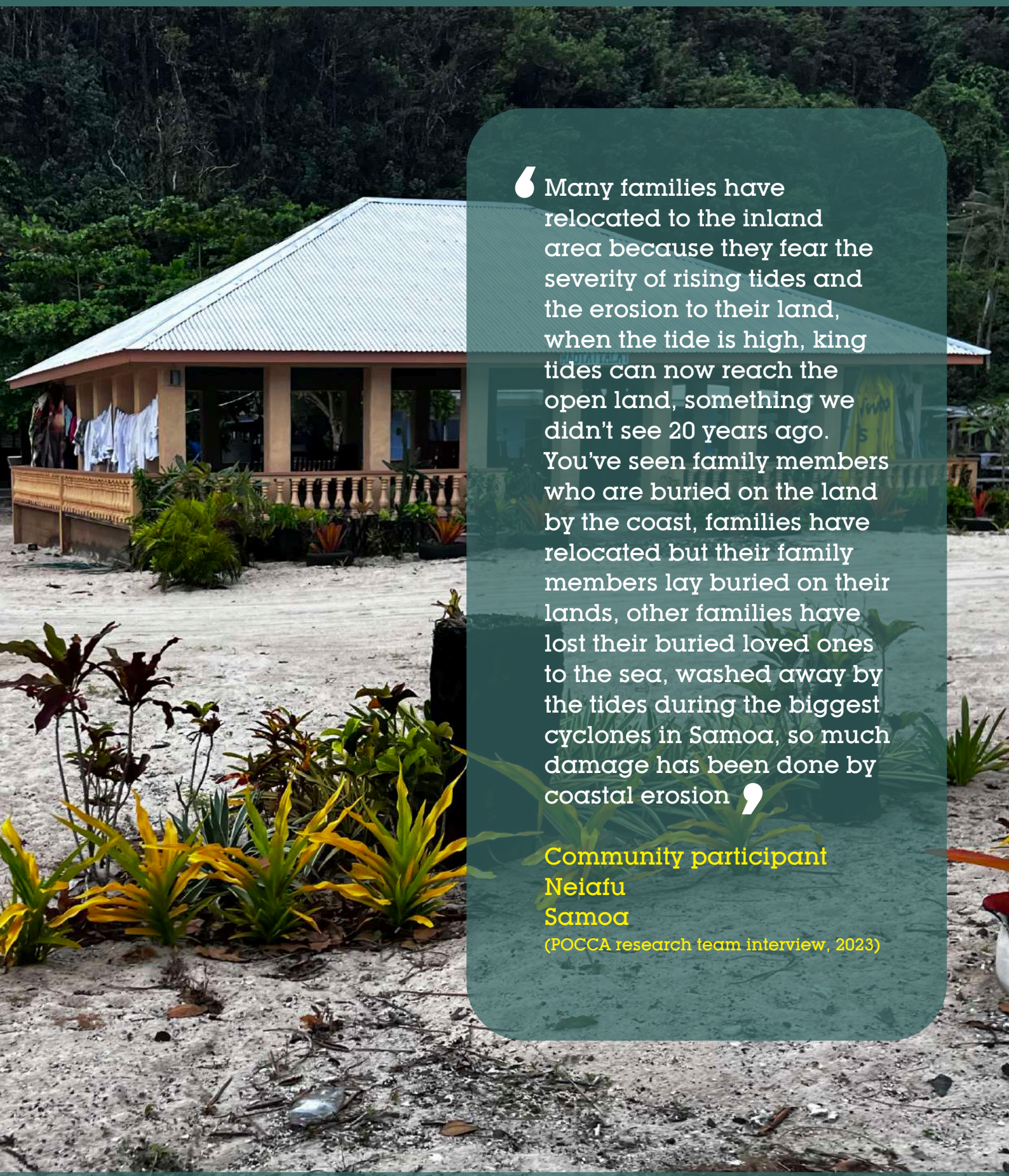
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Sacred relics and sites, such as the graveyard in Lilisiana (pictured), Malaita Province, Solomon Islands, are increasingly at risk of coastal inundation due to climate change (Photo: POCCA team, 2023).

Abstract

Pacific leaders and climate change advocates have been pushing hard for the establishment of a Loss and Damage Fund (LDF) for years, which was eventually endorsed at COP28. Unfortunately, the amount of funds committed are both far below target and yet to be accessed due to challenges around operationalisation of the fund. Pacific Island communities are exposed to unavoidable loss and damage due to the increased intensity of extreme events and irreversible impacts of climate change. There is limited documentation of stories of real experiences of loss and damage and how households struggle to address them. This chapter addresses this by looking at different case studies showcasing unavoidable losses, especially as they relate to farmers, fishers and Micro and Small Enterprises (MSEs). The chapter also provides examples of different initiatives such as the use of limited savings (meant for education of children), remittances, cultural and social capitals and traditional knowledge to cope and recover after losses. With more unavoidable losses due to climate change, local communities continue to develop adaptation mechanisms to avert, minimise and address loss and damage. Due to the persistent occurrence of destructive climate-related calamities, many communities find themselves in a situation of perpetual recovery in between disasters.



> “Many families have relocated to the inland area because they fear the severity of rising tides and the erosion to their land, when the tide is high, king tides can now reach the open land, something we didn’t see 20 years ago. You’ve seen family members who are buried on the land by the coast, families have relocated but their family members lay buried on their lands, other families have lost their buried loved ones to the sea, washed away by the tides during the biggest cyclones in Samoa, so much damage has been done by coastal erosion”
>
> Community participant
> Neiafu
> Samoa
> (POCCA research team interview, 2023)

A fale in Samoa at risk of being inundated by sea level rise (Photo: POCCA team, 2023)

14.1 Introduction

The Pacific Island Countries and Territories (PICTs) are highly vulnerable, geographically and socio-economically, to the adverse impacts of climatic and non-climatic hazards such as tropical cyclones, droughts, tsunamis, volcanic eruptions, and earthquakes (Lee & Zhang, 2022). Frequent climate shocks severely hinder development and result in damages worth billions of dollars. In 2016, Fiji was hit by Severe Tropical Cyclone Winston (Category 5), which impacted approximately 540,000 people – or around 62.5% of the country's total population – with an estimated loss and damage of US$1.3 billion (Government of Fiji, 2016). Tonga and Vanuatu were severely impacted by tropical cyclones Gita in 2018 and Pam in 2015, which caused damages that represented 37% and 64% of the countries' GDP respectively (Corno et al., 2022).

The damage caused by climatic and non-climatic induced disasters led to financial hardships for families, stemming from income loss and high repair costs. Given that about 60-80% of PICTs rely on agriculture and fisheries for income and food security (Georgeou et al., 2022), farmer and fisher dependent households tend to be the most affected in terms of making a choice of what needs to be repaired first with the little savings households have. Farmers, fishers and other vulnerable groups, including women, youth, and persons living with disabilities have little financial capacity to cope with the economic shocks that follow any natural hazard (The World Bank, 2014).

There are some interventions to help countries recover after disasters. Regional insurance mechanisms, such as the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI), and budgetary support for recovery are available. However, these resources are primarily allocated for public recovery, including the restoration of public utilities, services, and infrastructure following cyclones (OECD and International Bank for Reconstruction and Development/ The World Bank, 2016). Personal response and recovery efforts are largely the responsibility of individual households. Although the impacts of cyclones at the national level are well captured through the Post Disaster Needs Assessments (e.g., Government of Fiji, 2016; 2013), there is limited knowledge on the specific impacts on farmers and fishers' livelihood and wellbeing of their households. There is also limited information on coping, adapting and especially disaster risk financing processes at the household level in PICTs. There is no information available for the levels of access to finances and other options by farmers and fishers to help them prepare and recover after cyclones and droughts.

Loss and damage disproportionately affect vulnerable groups in the PICTs - those on the front lines of the crisis - who have contributed the least to climate change and are least equipped to respond. Increasingly, many communities are experiencing climate impacts that are impossible to adapt to, leading to permanent loss and damage.

For example, those in the Pacific who face the growing risk of being forced to flee or abandon their homes due to rising sea levels and destructive storms. These 'losses and damages' occur when climate impacts cannot be avoided, either due to the climate tipping point of irreversible impacts being reached or due to lack of resources to adapt (Climate Council, 2022).

Loss and damage funding refers to finance that directly addresses unavoidable climate change catastrophes that developing countries are particularly vulnerable to. For instance, the money needed to rebuild homes and hospitals after a disaster; or provide shelter, food and emergency cash transfers after a cyclone; or preparing for the slow building catastrophes from sea level rise inundating villages and towns. Loss and damage finance also addresses compensation for non-economic losses which includes things such as culture, traditional knowledge, health and wellbeing (Climate Council, 2022).

Climate impacts are occurring worldwide, but rich countries have the resources to protect, and rebuild. It is essential that developed countries which have contributed significantly to the climate crisis take responsibility. The wealth accumulated through the extraction and burning of fossil fuels must now be used to support those countries that have not similarly benefited and are now disproportionately impacted by climate disasters.

Most of the information on loss and damage in PICTs reflect impact on sectors at the national level. These are usually calculated from Post Disaster Needs Assessments or risk assessments of critical infrastructures and potential losses from both extreme events and slow onset climatic hazards. There is limited capture of real stories of loss from households and local communities. In this chapter, we address this gap by providing details of experiences of loss and damage at the community level. These stories reflect the plight of households (farmers, fishers, small and medium enterprises) across the PICTs. Most importantly, we are sharing stories of how households deal with loss and damage using their own limited savings, relying on limited remittances from relatives, and support from their neighbours. These are unavoidable losses incurred from increased intensity of cyclones, droughts, floods and sea level rise.

At this point, it is important to note that hereafter, we will be using the capitalised Loss and Damage (L&D) to refer to the formal negotiations, processes and outcomes of L&D within the UNFCCC and Article 8 of the Paris Agreement. On the other hand, the real and potential loss and damage experienced and faced by local communities are represented in non-capitalised loss and damage (l&d).

14.2 The climate leadership: Inspirations from Pacific Island Leaders

The leadership of PICTs in fighting global climate change and setting up of the L&D agenda in the UNFCCC is well documented. At the Rio+20 UN Conference on Sustainable Development in 2012, the late Honourable Minister Tony de Brum of the Marshall Islands, when asked by reporters if he was there to save his country, famously responded: 'We are actually here to save the world' (NYU Law, 2013, p. 1). de Brum further explained in 2013 when he was interviewed about the Majuro Declaration on Climate Leadership, 'we are not just trying to save our islands…we are trying to save the entire world. If the Pacific islands disappear, then it will already be too late for everyone else' (NYU Law, 2013, p.2).

The same theme was echoed by Tuvalu's former Prime Minister Enele Sopoaga and UN Secretary General Mr. Guterres 'saving Tuvalu will save the world' (UN News, 2019, p. 1).

14.2.1 Lost in the wilderness: 32 years of Loss and Damage journey

In 1991, Vanuatu on behalf of the Alliance of Small Island States (AOSIS), within the works of the Intergovernmental Negotiating Committee (INC) for a framework convention on climate change, proposed the establishment of an international insurance pool as a 'collective loss-sharing scheme' to be funded by assessed mandatory contributions from industrialised countries to provide compensation to countries affected especially by sea level rise (Warner & Zakieldeen, 2011). Although this proposal was not adopted, the recognition of insurance as a means of addressing losses from climate change was incorporated into the framework convention.

No progress was made on the inclusion of or reference to L&D in any of the agreements made at any Conference of the Parties (COP) until 2007, at COP13. This is when the Bali Action Plan call for risk management and risk transfer mechanisms as well as for 'disaster reduction strategies and means to address loss and damage associated with climate change impacts' (UNFCCC, 2007).

Real action on L&D under the UNFCCC negotiations was still slow, however, at COP19 in Warsaw, the Warsaw International Mechanism (WIM) for Loss and Damage associated with Climate Change Impacts under the Cancun Adaptation Framework (CAF) (UNFCCC, 2013) was established. The WIM consists of an executive committee (Excom) that was tasked to enhance the understanding of L&D and find ways to avert, minimise and address the adverse impacts of climate change. A major milestone was reached when L&D was included in the Paris Agreement under the standalone Article 8 where parties 'recognise the importance of averting, minimising and addressing loss and damage associated with the adverse effects

of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage' (UNFCCC, 2015).

However, with decision 1/CP21 in paragraph 52, any type of funding for L&D was excluded and 'does not involve or provide a basis for any liability or compensation' due to the fear by developed countries of legal consequences for past historical emissions. Therefore, L&D as it is recognised in the Paris Agreement has been a contentious and politically charged topic (Pill, 2022; Calliari, 2021). Nevertheless, with L&D manifested in Article 8, the way was paved for the inclusion of L&D in the Enhanced Transparency Framework that allows developing countries for the reporting of national past, present and future L&D under section G115 (UNFCCC, 2019). At COP25 in Madrid in 2019, countries agreed to establish the 'Santiago Network' on L&D to connect developing countries with providers of technical assistance (UNFCCC, 2020).

At the close of COP26, the question of how countries would address the need for finance for loss and damage hung in the air. Global South countries called for the commitment to a new funding scheme that would see money channelled directly from Global North countries to compensate for loss and damage. Pushback on this request from the European Union and United States led to the creation of the Glasgow Dialogue on Loss and Damage. This opened discussion on possible funding arrangements, which was set to run until 2024. Canada, Denmark, Germany, New Zealand and Scotland signalled their support for loss and damage financing. The Glasgow Pact agreed on at COP26 in 2021 included a dedicated section on L&D and urged developed-country governments and relevant organisations to provide 'enhanced and additional support' for activities addressing loss and damage. However, no fund was created. Instead of setting up a fund, the Glasgow Dialogue was created as a platform for discussing the arrangements for funding activities related to loss and damage. This was seen as a compromise, and to the disappointment of Global South countries, fell short of expectations (Illius, 2021).

Following long and difficult negotiations, COP27 saw a breakthrough agreement to provide finance for L&D and create new funding arrangements for vulnerable countries impacted by climate change. Governments also agreed to establish a 'transitional committee' to make recommendations on how to operationalise both the new funding arrangements and the fund at COP28 in Dubai. In another historic move 'new and existing funding arrangements, including a fund for loss and damage for developing countries that are most vulnerable' (UNFCCC, 2024 p.6), was operationalised on the first day of the negotiations. A contentious issue throughout the meetings of the transitional committee and later in the Governing Instrument (GI) was that the World Bank was chosen as the administrative host of the Fund (UNFCCC, 2023).

The agreed initial Governing Instrument of the 'Fund responding to Loss and Damage' (FRLD) at COP28 will be under further development in 2024 (UNFCCC, 2024). Two notable features of the GI are a focus on programmatic approaches and direct access to funds through 'functional equivalency.' However, many features of the FRLD still remain unresolved and require further development by the Board in 2025 as it is not (yet) able to disperse finance. In addition, guidance in the GI is still vague and requires further refinement. For example, there is no clear allocation mechanism other than a minimum floor for SIDS and LDCs, nor is 'functional equivalency' defined or clear in relation to how funds are directly distributed to governments and organisations. Early pledges to the fund totalling US$700 million, were also announced at COP28, with the largest contributions from several European countries such as Germany, France, and Italy as well as the United Arab Emirates. These pledges, however, are far from sufficient since they amounting to less than 0.2% of the estimated annual requirement of between US$200 to US$400 billion annually by 2030 to cover economic and non-economic losses. Yet, there is no fund for mobilisation strategy other than calling for voluntary contributions on a four-year replenishment cycle and allowing finance to come from a 'wide variety of sources' including the private sector and innovative sources like philanthropies (Amnesty International, 2023).

14.3 Unavoidable loss and damage and community responses

14.3.1 Case study 1: Coping mechanisms of fisher communities

This case study was part of a Master of Science thesis research (Dass-Nand, 2023), it was conducted in two Indigenous coastal communities of Fiji. The communities were Nataleira village in Dawasamu district of Tailevu province and Serua island in the Serua Province. A total of 32 key informant interviews and eight focus group discussions (FGDs) were carried out in these fisheries communities. Nataleira village and Serua island were selected as case studies because of the involvement of the fishers in the small-scale fisheries, and the impact of natural events that has affected their food security and livelihood. The research focused on disaster risk management, adaptation strategies and the loss and damage experienced by the fishers of the studied communities.

Disaster risk management actions employed by fishers

The impact of natural disasters aggravated by climate change has affected the coastal communities of Nataleira village and Serua island. The respondents (women) of the case study highlighted actions in different phases of the disaster management cycle. These are preparedness, response and recovery and they require the effective utilisation and management of resources such as natural resources, adaptive capacity, and social capital within communities (Cvetkovic et al., 2018). Actions associated with disaster preparedness are forms of 'adaptation actions' with intentions to minimise loss and damages. As shown in Table 14.1, activities associated with disaster response and recovery phases by fishers are intended to address loss and damage in the short term and long-term scenarios.

Disaster preparedness phase	Disaster response phase	Disaster recovery phase
Community activities • Early harvest of crops and securing of fishing gears, cattle. • Men call meeting to discuss the action plan in case of emergency evacuation. • Women stockpile food and water. They also pack essentials in case of evacuation. • Being prepared and aware of a disaster reduces fear and anxiety. • Traditional coping mechanism is followed during this phase. Women embrace the traditional skill and knowledge of salting, drying and smoking fish in both the communities to preserve fish. • Women also preserve root crops like cassava and tubers to ensure they are available for consumption during and after disaster.	**Building Social resilience** • The fishers shared with the researcher the importance of Vanua (land and people) and the religious grounding and their strong culture that binds the community together in times of any crisis. **Traditional storytelling** • The respondents also shared with the researcher the importance of traditional storytelling and the experiences of disasters by their elders. The stories gave the younger generation the hope and strength needed to cope in times of a disaster. • Incorporating social inclusion and relying on each other's capabilities, knowledge, skills, and experiences enhances community resilience in a community which was evident from the fishers focus group discussions.	**Impacts and responses** • Decline in fish numbers because of the damages on coral reefs from cyclones, coral bleaching and flooding. • Not able to fish because of damaged fishing equipment and gears. • Women's health and sanitation needs are usually compromised after a disaster due to water shortage and financial constraints. • Children drop out of school due to food shortage and financial difficulties. • Psychological impact on women and children. • Men get mentally affected because they cannot provide for their families, so they sometimes take this frustration out on their women by physically or verbally abusing them. • Trauma caused by the loss of resources, facilities and infrastructure affects the fishers however, they shared with the researcher that 'No one talks about these hidden pain'.

Disaster preparedness phase	Disaster response phase	Disaster recovery phase
Some drawbacks • Women are the last ones to be informed of early warning of hazards. • There is no structured or written protocols or Standard Operation Procedures to follow in case of a hazard or disaster for both the communities. • Before cyclone Winston in 2016, both the communities agreed that they took the early warning of cyclones very lightly, however, they mentioned that TC Winston was an eye opener for them to take heed of disaster warnings. • Exclusion of women from Disaster Risk Management (DRM) and Climate Change Adaptation (CCA) discussions and actions of the community. The work of women during the DRM phase is not accounted as productive that is why women's opinion and suggestion is not taken during meetings in fact they are excluded from in these meetings.	**Some drawbacks** • There is no proper evacuation procedure in place in times of evacuation for both the communities. • In Serua island, the Community Hall that is used as the evacuation centre gets flooded. • Women' s workload increases after a disaster; they take care of the household, family needs, the communities need as well as the maintenance work. • Women usually ignore their health problems and nutritional needs trying to provide and cater for the needs of their family. • Women also face domestic and verbal abuse during the recovery and response phase because of the frustration that comes due to the lack associated with food and water insecurity.	

Table 14.1: Different disaster risk management actions fishers employ to prepare and cope with climatic hazards such as cyclones

Adaptation measures

Longer hours spent on fishing

The number of fish have declined in recent years, and this reduces further after natural disasters. The fishers of Nataleira village and Serua Island fish for longer hours to catch the same number of fish they used to catch in the past (20-30 years ago). This is further impacted when coral reefs are damaged by cyclones, floods and bleaching events. While fishing for longer hours is an adaptation strategy, it is seen as a problem for women and men alike. Women traditionally manage household needs, which limits the amount of time they can spend away from home. They are responsible for both reproductive household duties and productive work, such as catching fish and invertebrates for family consumption or sale in markets. The need to juggle and multitask between these roles places an extra burden on women, leading to overwork. Meanwhile, men spend long hours at sea fishing, which poses risks to their health and wellbeing, especially during cyclones. The boats they use often lack proper safety equipment and early warning communication systems. In patriarchal societies, addressing gender inequality is crucial, particularly in the context of Loss and Damage (L&D), to improve the wellbeing of women and households.

A shift from fishing to farming

Fishers in Nataleira village have transitioned from traditional fishing to farming in the highlands due to a significant decline in fish catches in recent years. They can no longer earn a living from selling fish. The coral reefs have been damaged by strong waves during cyclones and by heavy silt and debris from floods, leading to severe coral bleaching. While women in Nataleira continue to fish for household consumption, men have shifted their focus to root crop and cattle farming. As a result, the traditional craft of fishing and its associated knowledge are not being passed down to their children and grandchildren. Fishers from both Nataleira and Serua Island communities have shared that, due to the risks associated with fishing, inadequate facilities in small-scale fisheries, the climate crisis, and declining fish numbers, they are reluctant to pass on fishing skills and knowledge to the next generation.

Relocation of households

Similarly, the population of Serua Island has declined over the years, as many fishers have relocated to a new settlement on the mainland due to the impacts of climate change on their homes, fisheries, food security, and livelihoods. The fishers reported that the challenges posed by the shrinking size of Serua Island—caused by sea level rise, coastal flooding, and declining fish populations—forced them to move to Talenaua settlement on the mainland (Viti Levu). They also noted that this relocation was not planned by the government but was carried out by the fishers themselves. Those who have transitioned from fishing to farming sometimes wonder if moving from Serua Island was the right decision. They feel detached from their land and community while still struggling to make a living and provide for their families. Although the relocation to Talenaua settlement was voluntary, it was compelled by the loss of land due to sea level rise, the destruction of reefs, and the decline in fish stocks.

14.3.2 Case study 2: Agricultural loss and damage

Agriculture contributes directly or indirectly to the income and food security of about 80% of PICTs households (Iese et al., 2021).

Fiji

Agricultural productivity in Fiji is determined by a combination of climatic and non-climatic factors. Non-climatic factors include land availability, socio-economic conditions, labour shortages, institutional support, and market accessibility. Climatic stressors affecting agricultural production include changes in weather patterns, including earlier onset of rainfall, warmer temperatures, more intense cyclones, frequent droughts, severe flooding, sea-level rise, increasing salinity which affects soil fertility, and pest and diseases (Currenti et al., 2019; Pearce et al., 2018). These climatic stressors not only affect farmers' livelihoods but have adverse implications for agriculture, food security, and human health (Pearce et al., 2018).

Tropical Cyclone Winston

On February 20th 2016, Tropical Cyclone (TC) Winston, a category 5 system of unprecedented strength and destruction made landfall in Fiji. The agriculture sector suffered damages worth FJ$81.3 million while estimated losses amounted to FJ$460.7 million. The Fijian agricultural sector incurred the highest production losses estimated at 65% (Esler, 2016).

Crop subsector: Estimated losses were FJ$ 207.9 million. Significant losses were noted to cash crops (cassava, taro, and kava), tree crops (coconut, breadfruit, cocoa, and citrus), food gardens, and food security crops (kumala, cassava, taro, and vegetables).

Sugarcane: Losses amounted to FJ$53.6 million (12% of total sector losses). The sugar industry recorded the lowest production to date. One of the most significant damages encountered during TC Winston by the sugar industry was the forced closure of the Penang sugar mill (FSC, 2016).

Livestock: Estimated losses were FJ$5.1 million. This included death of animals, decline in meat and milk production.

The devastating losses and damage to the agricultural sector affected household income, nutrition and food security. Cascading effects such as a drastic increase in vegetable prices were noted after the cyclone. Post-cyclone, limited access to markets, road access to new and more stable markets, and suitable planting conditions further affected farmers' livelihood (Esler, 2016). Even though the widespread destruction left by TC Winston was clearly evident, however, less visible was the psychological trauma and emotional well-being inflicted by the cyclone (WHO, 2016). Six weeks later, TC Zena passed southeast of Fiji causing major flooding and torrential rainfall and further devastating the agricultural sector (Esler, 2016).

Saltwater intrusion

Farmers from Koroqaqa sugarcane settlement in Ba, Fiji, are experiencing a drastic decline in sugarcane production as a result of saltwater intrusion into their farms. Due to saltwater intrusion, 25 farms are waterlogged, adversely affecting farmers' income and livelihood. For example, before the saltwater instruction, farmers produced around 400 tonnes of sugarcane, however, during the 2019/2020 season, farmers harvested only 80 tonnes of sugarcane (Environews, 2021).

Similar experiences have been noted in Korovatu settlement in Fiji where farmers are facing a severe decline in sugarcane production and loss of arable land (Turangaiviu, 2020).

1997/98 Drought

The 1997/98 El Niño drought in Fiji was described as a 1-in-100-year event and led to a severe water crisis, reducing agricultural production, increasing mortality of livestock, causing numerous health problems, wildfires, loss of soil fertility, and saline water intrusions (Rhee & Yang, 2018; Terry, 2005; The World Bank, 2018).

Since Fiji's agricultural sector largely depends on rainfall rather than a formal irrigation system (Barnett, 2011), extensive damages were noted in the agricultural sector. Sugarcane production declined while seasonal commercial crops and rain-fed rice failed altogether. Stable crops such as cassava, taro, and yams were severely affected, and the Fijian government had to provide emergency food rations. Food rations for drought victims increased from 27, 137 households in June 1998 to over 30, 000 by August 1998. In total, one-third of Fiji's population needed emergency food rations (Terry & Raj, 2002).

Overall, Fiji's economic loss was estimated to be FJ$275-300 million (Richards, 2018). Yet, the estimated loss did not include non-economic losses such as health-related costs for dengue fever, heat stroke, cardiovascular disease, and respiratory disease (Richards, 2018). Government assistance and external aid were heavily relied on for recovery purposes, but they did not meet the needs of vulnerable communities (Feresi et al., 2000).

Vanuatu

The Vanuatu agricultural sector has identified sudden and slow-onset events such as cyclones, flash flooding, drought, inland and coastal erosion, sea-level rise, and saltwater intrusion as significant contributors to L&D in the agricultural sector. The impacts of climate change on the agricultural sector include reduction in crop yield, damages from cyclones, reduction in water availability, increased incidence of pests and diseases, and changes in the growing season. Evidence of soil erosion and soil fertility have also been noted (Talakia, 2015).

Tropical Cyclone Pam

TC Pam made landfall in Vanuatu between March 12th–14th in 2015. Associated torrential rain, flash flooding, and strong winds devastated the agricultural sector in Vanuatu. The agricultural sector faced the highest economic loss, estimated to be 33% of total losses. Total damages amounted to VT$1421 million while total losses were estimated at VT$4641 million (Esler, 2015). Fifty percent of the households in disaster-affected provinces lost all or part of their crops and required immediate assistance to meet basic needs (Esler, 2015). Additionally, the environmental sector suffered devasting losses to ecosystem services. Regardless, these losses were not accounted within the impacts to GDP (Esler, 2015).

Saltwater intrusion

Due to sea-level rise, coastal areas are experiencing substantial soil erosion and coastal inundation. An increase in sea-level would cause saltwater intrusion into groundwater lens in coastal regions (APEC Climate Center, 2020). Saltwater intrusion poses a significant threat to agricultural production with much of the cultivated land in coastal areas. Saltwater intrusion has been observed to cause reduced yield and crop failure (The World Bank Group, 2021).

14.3.3 Case study 3: Unavoidable loss and damage experienced by farmers in Vanua Levu, Fiji

This case study is based on a research partnership between the UN Capital Development Fund (UNCDF), The University of the South Pacific and UN University Institute for Environment and Human Security (UNU-EHS) to improve climate and disaster risk insurance products in the Pacific and Caribbean (USP, 2022).

The Northern Division of Fiji is one of the most disaster-prone regions of the Fiji Islands (Figure 14.1). The Northern Division was severely hit by three tropical cyclones between December 2020 and January 2021. According to the IFRC (2022) Disaster Response Emergency Finance Final Report, TC Yasa made landfall on 17 December 2020 as a category 5 cyclone, causing extensive damage across Vanua Levu, with estimates of 97,000 people affected. It was the most destructive cyclone since TC Winston in 2016. Just over a month later, on 30 January 2021, TC Ana made landfall as a category 2 cyclone across Vanua Levu and Viti Levu, heavily damaging crops, weakening house structures and causing power failures. Significant flooding, accompanied by extremely high seas and storm surges, caused coastal inundation.

A day later, on 31 January 2021, TC Bina brought more rain. The worst impacted communities were in Macuata and Cakaudrove Provinces in the Northern Division, which were still recovering from TC Yasa. A total of 14,755 evacuees in 422 evacuation centres were supported as part of the early warning and response. TC Yasa alone recorded a total damage of more than FJ$147 million to the agriculture sector. About 94% was for damage to crops, 5.4% for livestock and 0.6% for agricultural infrastructure (Talei, 2021). Based on the above information, the households covered in this case study (interviewed in March and May, 2022) were still recovering from the three tropical cyclones just more than 12 months before. The same farmers were also impacted by severe drought conditions during the El Niño period of 2015-2017

The study collected the information needed from 434 farmers and 55 fishers (total of 489 households) from 28 villages and 21 settlements in three Provinces, namely Macuata, Bua and Cakaudrove in the Northern Division. Out of the 489 participants, 26.6% were female, 73% are male and 0.4% as others. The coverage of 26.6% of female in the study was about 2 times higher than the national percentage of female farmers (14.4%).

The study was carried out more than 12 months after the three extremely severe tropical cyclones from December 2020 - January 2021, as mentioned above.

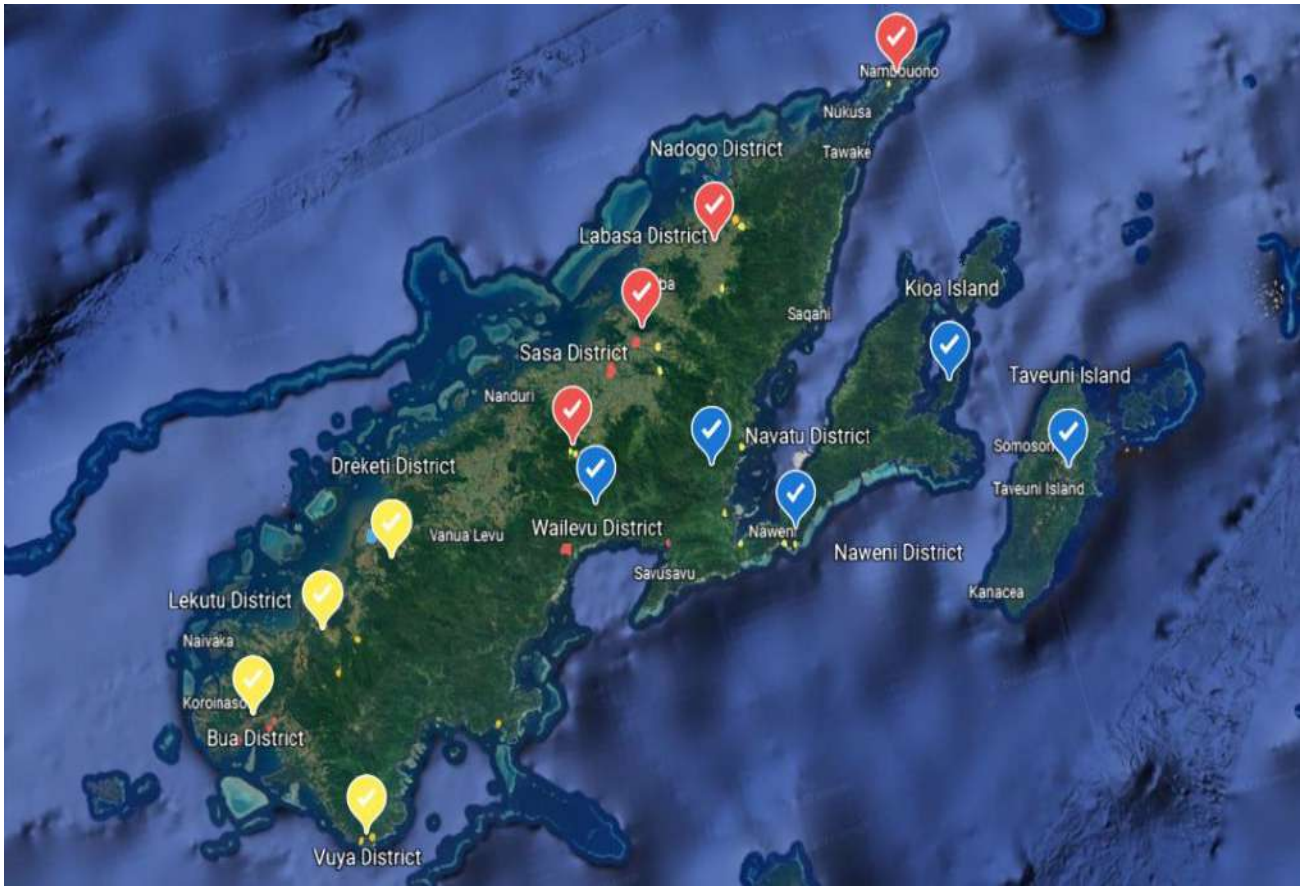


***Figure 14.1**: Map of Vanua Levu, Fiji showing the districts covered during the field data collection (Red labels are Districts in Macuata Provinces; Yellow labels are Districts in Bua Province; and Blue lables are Districts in Cakaudrove Province).*

Risk reduction as a priority for cyclones

Most of the participants agreed that reducing tropical cyclone risk is a very high priority for their households. About 90% of all participants considered reducing the risks of cyclones a high to very high priority for their household. The other 10% replied 'don't know' perceived reducing cyclone risks as low or not a priority for their households.

Specifically, 93% of copra farmers and 93% of sugarcane farmers perceived reduction of tropical cyclone risk as a very high priority. This was followed by 78% of kava farmers, 79% of taro farmers, 75% of cassava farmers and 79% of livestock farmers. The very high prioritisation among farmers of the level of risks is due to the high exposure to cyclones of the type of commodity they are relying on for livelihood. For example, coconut trees, sugar cane, kava, are upstanding crops that are farmed on hillsides, flood plains, and on cleared areas making them highly exposed to very strong winds and flood waters during cyclones. Some of the farms are also located closer to the sea, exposing them to saltwater inundation from storm surges.

As farmers shared during the focus group discussions (FGD), the need to prioritise risk reduction comes from the experiences of severe impacts of cyclones on agricultural commodities. For example, the copra farmers shared that the cyclones fell the coconuts and it took many months to recover. While their source of income has declined because of the impacts on coconut trees, the cost of living continues to increase.

> When a tropical cyclone happens, most of our coconut trees tend to fall off and many green coconuts are also damaged and this affects the copra farming. So, during the dry season there is also less coconuts that we collect...There was a lot of trees that were damaged and we lose a lot of green coconuts, so we have to wait after six months so we can actually harvest and process again, so it does take time to produce coconuts…when the tropical cyclone comes, there is less production in the copra farms, there is decrease in copra prices and increase in cost of living, it is very hard to save now. So, from us to travel to Savusavu before was FJ$8.00 but now it has increased to FJ$12.00. (Focus group 14, Female copra farmer).

For the livestock farmers, the wind speed and excess flooding kill the livestock and damage the infrastructures. As some farmers shared during a focus group discussion:

> Yes…the pervious cyclone has caused a lot of damage...Majority of the livestock has died because of cold and some drown in the flood…sometimes branches falls on them as well…so they die, houses were also damaged during the cyclone. After cyclone Yasa…most of our goats died… from 150 goats…we were left with only 30 goats…And only 4 chickens were left ((Focus group 6 women, crops and livestock farmer).

The 78% of fishers that considered reducing tropical cyclone risks as a very high priority is because strong winds and high storm surges not only damage their fishing gears but stop them from going fishing for a while after the cyclones. For rice (58%), vegetables (61%) and fruit tree farmers, the lesser percentage of agreement for very high priority for reducing cyclone risks is because rice and vegetables are harvested before the cyclone season and fruit trees have been grown in the wild, without farmers planting or caring for them.

Risk reduction as a priority for droughts

Most of the participants considered reducing drought—induced risks as a very high priority. About 79% believed it is a high to very high priority to reduce risks related to droughts. The other 21% either did not respond or considered drought-related risks as not a priority (Figure 14.2).

About 82% and 92% are copra and sugarcane farmers respectively. Droughts reduce the sizes and numbers of coconut fruits. Droughts also inhibit the growth of sugarcane and increase the risks of fire destroying matured cane. More rice farmers (71%) and livestock farmers (86%) considered drought risks as a higher priority than cyclones. This is because most of the rice farmers cultivate low land rice that relies on good supply of water and irrigation systems to grow and get a good yield. Droughts also last longer than the 3 to 6 months needed for growing rice from planting to cultivation. Many farmers reported major losses of livestock during droughts because of the lack of water for drinking and dryness of grass, limiting the food and water supply for livestock.

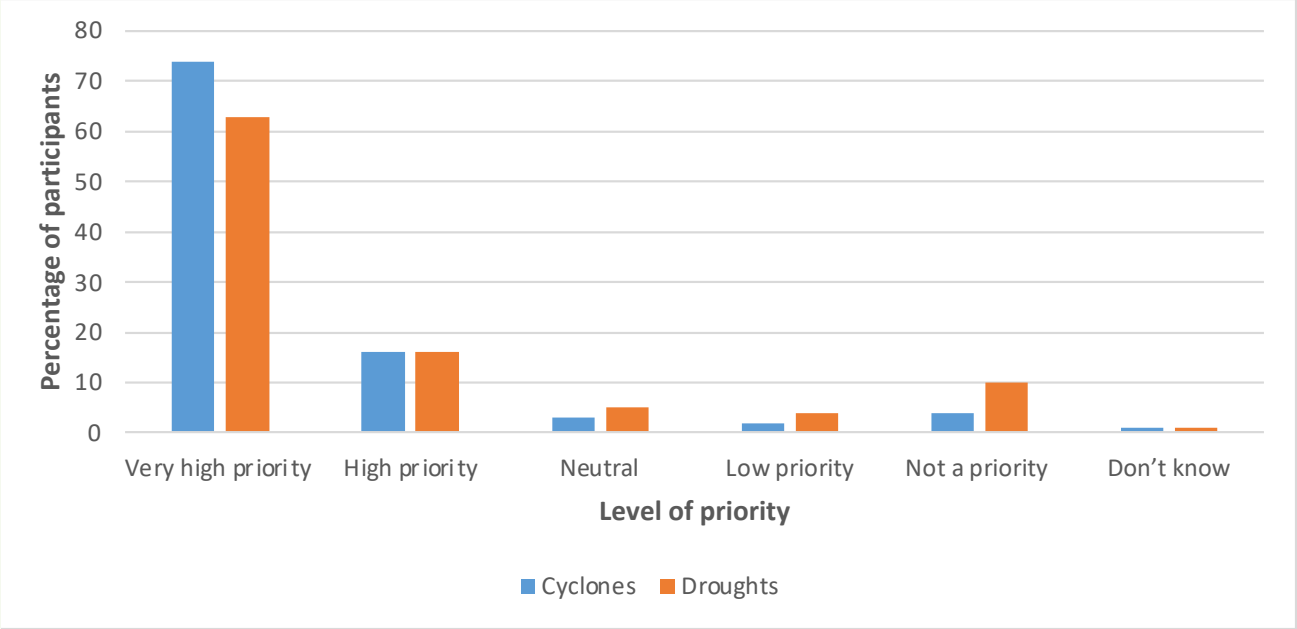


Figure 14.2: Priority to reduce tropical cyclone and drought risks for all participants.

Adapting to and coping with cyclones and droughts

As part of a long-term preparation for cyclone and droughts, most of the households (around 98%) have carried out activities to adapt their farming and fishery systems to reduce the impacts of cyclones on their commodities, food, income and livelihood of their households. The most common adaptation activities are changing the planting time of crops (33% of all households), planted different crops or raise different livestock that are less likely to be impacted by tropical cyclone (33%). Only 1% of all participants bought cyclone insurance and 5% of all studied households changed their fishing methods. About 23% of all studied households changed their livelihood or income generating activities to reduce the risks of cyclones. Changing sources of income is becoming a common adapting strategy for households, as different members contribute to earning an income in different ways. For example, women made brooms, opened canteens and involved as laborers to harvest cane.

> Well, our crops are destroyed after the cyclone and many of us women revert to making brooms for fast cash to feed our families and for survival. Yes, we switched to making brooms, opened a canteen and harvesting sugarcanes…we also catch crabs for consumption and to supplement income (Focus group 11, Women, iTaukei).

As with the adaptation actions to cyclones, about 1 out of 3 participants are adapting to droughts using different crops and breeds of livestock, changed planting time of crops and shifted their sources of livelihood and income.

For drought insurance, 1% of rice, 3% of copra and 1% of cassava farmers have bought drought insurance to help address the impacts of droughts and help them recover faster. For example, participants shared the diversity of practices they are implementing to adapt and to cope to reduce the impacts of cyclones and droughts on different commodities.

> In drought we leave the livestock outside the paddock…And at random places we place water drums for livestock to drink water…Sometimes we keep the animal at home and feed them under shed (Focus group four, Men iTaukei, Livestock farmer)

For the rice farmers, they use irrigation systems and reduce the size of farms to minimise the losses during the droughts.

> Drought also affect rice farm…but we have irrigation system…in case long period of drought we don't plant in large quantity… we also can't grow other vegetables for home consumption (Focus group one, men Indo-Fijian, rice farmer).

In addition, some rice farmers are not changing the crops they are planting because of the nature of the soil and landscape they farm rice on, but they have added small livestock in their farming systems to diversify the sources of income in case cyclones and droughts reduce the yields.

> No…we have not changed the crop…we still grow rice only…because that's our livelihood…and we really can't switch because the soil type and land suits rice farming best…but we can try switching no harm in that…provided we have good market source for our new commodities. For example…if the government can find a market source for ginger…than we can start farming ginger because we know that the market is there to sell.

> But…instead of switching crops…We are keeping livestock to help us with the income… we keep livestock in small number (Focus group two, Indo-Fijian men, rice farmers).

Specifically, the adaptation measures taken by different farmers are listed in Table 14.2 below.

Adaptation measures for cyclones	Adaptation measures for Droughts
• Planting on hilly land or slopes in the long run • Resort to long post houses in the long run • Reinforce housing structure • Roofing iron or hurricane shutters over windows before a cyclone • Kava and other crops farmers harvest plants that are ready for, or nearing harvest before a cyclone • Farmers secure livestock before a cyclone, like moving them to higher grounds • Secure fiber boats before a cyclone • In Dreketi, Vanualevu a warehouse to store rice has been built • Change the planting schedule for some crops	• Plant trees to provide a shade for their gardens • Allow grass to grow over their young kava plants. This also provides shade from the sun • Rice farmers plant a specified yield instead of overplanting • Irrigation system for rice farms • Water their crops on a timely basis • Change the planting schedule for some crops

Table 14.2: Detail of actions taken by households to adapt to cyclones and droughts

Coping mechanisms

Households use several coping mechanisms to recover after the cyclones and droughts. The most common coping mechanism is using household savings to recover after a cyclone and droughts (29% of all participants). One out of every five households relying on kava, copra, rice, taro, livestock, cassava and fruit crops and one out of every three vegetable farmers use up their savings to recover (Table 14.2). Although some participants mentioned that, they could save money to cover the losses, the FGDs mentioned that households do not usually save for disasters. The households save for better houses and healthcare, education for children, and other developmental needs of the household. But when cyclones and droughts happen, households use their savings, which only last for 1-3 months, to recover and deprioritise other important household security needs. About 26% of all participants cultivate different crops, especially the early matured crops to earn income during the recovery period.

The next common coping mechanism for the same farmers is reducing consumption (12% of farmers), delaying consumptions (8%), scaling down operation (6%) and delaying expenses (8%). Support from relatives is an important support system for recovery especially for farmers that rely on sugarcane, and fishers. This support is through remittances especially from the domestic sources for fishers as shown earlier. Given that there are less remittances for sugarcane farmers recorded in our study, the assistance from family and relatives are through donations, and non-cash support to clean up and lending equipment and farm tools.

Key findings

- Farmers are employing different adaptations to build the resilience of their farming systems to cyclones and droughts. But given the frequent exposure to drought-cyclones-cyclones-drought sequence in a short period of time, the residual loss and damage are unavoidable.

- However, most of the farmers cannot cope with the impacts, they shoulder the losses themselves, and rebuild their lives, or what is left of it. Others, move to informal settlements and away from farming.

- Other farmers use their limited savings to cope and rebuild back after the cyclones and droughts. But these savings only lasted for a month, and they were not meant for recovery from cyclones and droughts. The limited savings were meant for better house, education for children, food security and health.

- It takes about 6 to 12 months to recover from cyclones, but more than that for droughts. Farmers tried to earn income from non-farming activities during these recovery times. These include cutting grass, sowing or making brooms for women, or construction work. Very few farmers rely on insurance to support their recovery.

- Support from relatives (remittances, physical labour, sharing of food, communal support solesolevaki, etc.) is very important to address the loss and damages at the household level.

- But with increase intensity of cyclones, floods and frequency of droughts, and these hazards often follow each other in a sequence, the farmers are always in a 'recovery mode.'

14.3.4 Case study 4: Micro and small enterprises sector

MSEs in Ba are especially vulnerable to floods and cyclones (Figure 14.3) because of its location in close proximity to the main river, the sea-level geography of its coastal area, and the lack of coastal protection system. This case study is based on the PhD research of one of the authors (Michael, 2022).

Physical assets

Flooding and cyclone events inflicted severe structural and non-structural damage to the premises of MSEs. In most cases, parts of their premises had been damaged due to the strong force of flood waters, or the wrath of cyclone winds. Typical structural damage reported by MSE participants included: (i) complete collapse of walls, particularly for those businesses operating in older buildings or semi-engineered buildings with plyboards; (ii) damage to water and sanitation infrastructure; and (iii) progressive damage to interior structures.

Loss in income

Climate hazards contributed to major income losses for MSE businesses. MSEs in Ba, Fiji, shared how the town is closed for up to three days in the aftermath of a flood event because authorities cordon off highly damaged areas from members of the public. During this time, the authorities, specifically the security forces (Fiji Military and Fiji Police), would clean up the town and remove flood waste (e.g., debris and mud), while MSE owners also cleaned up their premises. However, in the perspective of MSEs, the period of closure is an 'additional expense' because, at times, they have to rent equipment for cleaning their own premises, such as water pumps, as well as buy additional labour and cleaning supplies, which are not recoverable until their daily income (sales) levels are restored.

Disruption to supply chains

In Ba, floods tend to inflict significant disruption to the supply chain, particularly for businesses such as eateries that significantly rely on fresh produce to stay operational. Restaurant owners described how the scarcity of products such as vegetables, meat and seafood had significantly affected their income. Seafood and vegetables supplied from local communities in Ba were difficult to acquire due to the destruction in transportation disruptions and the local suppliers being unable to meet local demands. For instance, a seafood restaurant owner operating in Ba for 23 years, in explaining about local suppliers being affected, stated:

> Usually, we get our produce from market vendors in Ba but during the floods their farms are severely affected. Even our alternative suppliers are unable to deliver the goods because the roads between Ba and the highlands are cut off (Personal communication, male, 37 years).

Constrained growth opportunities

As evidenced in disaster scholarship, losses associated with hazards are known to negatively affect MSEs' survival and growth (Zhou & Botzen, 2017). MSE participants confirmed that growth opportunities were limited because of their inability to access external finance for disaster recovery, expansion or even diversification of product lines. Quite often MSEs mentioned that they had resorted to using their personal savings to recover in the aftermath of a disaster.



Figure 14.3: Flood impact on cabbage and eggplant produce in Ba province (Source: Participant, consent obtained)

14.3.5 Case study 5: Traditional knowledge to address loss and damage

The intricate relationship between cultural and environmental contexts profoundly influences the adaptive strategies rooted in Traditional Knowledge (TK) across PICTs. In each unique cultural context, Indigenous practices, deeply ingrained in the fabric of daily life, serve as the foundation for climate change adaptation. For instance, in Fiji, the Mataqali system, reflecting kinship units, shapes community-led efforts to manage marine resources, emphasising the integration of cultural values into sustainable practices (Takasaki, 2016). Similarly, in Vanuatu and the Solomon Islands, traditional governance systems, such as the Nakamal and Vanua, respectively, guide decision-making processes, fostering communal responsibility in climate resilience initiatives (McDonnell et al., 2015; Wendy, 2017).

The intricate interplay between the environmental context, cultural values, and specific climate-related risks profoundly shapes the adaptive strategies embedded within traditional knowledge (TK). The unique biodiversity, geographical vulnerabilities, and region-specific challenges of each Pacific Island Country intricately weave into the fabric of traditional practices. These practices are not static; rather, they dynamically evolve to address contemporary challenges posed by climate change while preserving the cultural heritage of Indigenous communities. The integration of cultural and environmental factors gives rise to holistic approaches to climate change adaptation, wherein TK not only proves effective in mitigating impacts but also maintains its cultural resonance. This dynamic nature of TK reflects its responsiveness to the ever-changing environmental landscape, embodying a living legacy that adapts to safeguard communities against the evolving threats of climate change while upholding the rich cultural traditions of the Pacific Islands.

Fiji

Marine Resource Management: In Fiji, where overfishing threatens marine ecosystems, traditional knowledge (TK) plays a crucial role in sustainable fisheries management. Indigenous fishing practices, such as seasonal taboos on certain species, help conserve fish populations and maintain the ecological balance of coral reefs (Kitolelei et al., 2021).

Climate-Resilient Agriculture: TK has been instrumental in adapting agricultural practices in Fiji to changing climatic conditions. Shah et al. (2018) and Leweniqila & Roskruge (2023) note that Indigenous knowledge, passed down through generations, guides farmers in selecting resilient crop varieties, adjusting planting calendars, and implementing soil conservation techniques. For instance, the traditional practice of agroforestry has proven effective in maintaining soil fertility and preventing erosion, contributing to sustained agricultural productivity despite shifting rainfall patterns.

Community-Based Disaster Risk Reduction: Fiji integrates TK into community-based disaster risk reduction strategies. Indigenous knowledge of local ecosystems and weather patterns informs early warning systems and community responses to climate-induced hazards. This approach strengthens community resilience by combining ancestral wisdom with modern technology, enhancing disaster preparedness and response (Pearson et al., 2020).

Cyclone Resilience: Traditional knowledge also contributes to cyclone resilience in Fiji. Indigenous construction methods using materials like bamboo and thatch help build structures capable of withstanding cyclonic winds. Additionally, knowledge of natural indicators for cyclone forecasting contributes to early warning systems, allowing communities to prepare for and mitigate damage (Janif et al., 2016; Elkharboutly & Wilkinson, 2022).

Early Warning Systems: Fijian communities have developed sophisticated early warning systems deeply rooted in traditional knowledge and the local environment. These systems use environmental indicators, such as changes in wind patterns, cloud formations, and animal behaviour, to predict impending weather events. Indigenous knowledge extends to observing subtle changes in ocean wave patterns, which may signal approaching storms or tsunamis. The integration of this knowledge into early warning systems enhances community response effectiveness while preserving cultural heritage and fostering resilience (Chand et al., 2014; Lagi, 2015; Johnston, 2015; Chambers et al., 2019).

Sea Level Rise and Dried Water Sources: In response to challenges like sea level rise and drought, the Vatutavui community in Fiji has effectively combined TK with contemporary approaches. Strategies include Vanua Sauvi, a marine area restriction to restore marine resources, and Solesolevaki, a communal reforestation effort to rehabilitate coastlines and prevent seawater intrusion. The community also incorporates spirituality, holding evening worship sessions to discuss sea level rise and mitigation strategies. Traditional farming practices, such as cultivating salt-tolerant sweet potatoes with charcoal, further demonstrate the community's reliance on TK for sustainable living. Through the preservation of cultural identity and ontological security, the Vatutavui community highlights the importance of Indigenous knowledge in achieving social-ecological resilience and promoting sustainable futures (Raisele & Lagi, 2023).

Kiribati

Climate-Resilient Agriculture: In Kiribati, where rising sea levels cause salinisation, traditional knowledge (TK) informs innovative agricultural practices. Communities incorporate salt-tolerant crop varieties and use traditional water management techniques to maintain soil fertility despite saltwater intrusion, ensuring food security amid changing environmental conditions (UNDP, 2021; UNDP, 2023).

Cultural Responses to Climate Change: In Kiribati, TK has long played a crucial role in responding to escalating climate change risks. Practices such as food preservation techniques and the communal system of bubuti (exchange based on non-refusable requests) illustrate how knowledge and resources are shared among household groups (kainga). Traditionally, communities built and maintained te buibui (seawalls) as protective barriers against rising waters. However, the increasing frequency and severity of climate impacts have made these seawalls inadequate, with repair costs becoming unsustainable. Even traditional songs have become a form of climate change response, raising awareness of its impacts.

The egalitarian values embedded in te aba (culture) guide resource management and environmental response strategies, emphasising social networks and reciprocity. Cultural identity serves as a source of strength in Kiribati's fight against climate change, fostering community resilience. This underscores the active role of the I-Kiribati in using traditional methods to protect their environment and highlights the importance of integrating Indigenous knowledge into modern climate change solutions (Avia, 2021).

Palau

Coral Reef Conservation: In Palau, where coral reefs are essential to both fisheries and tourism, traditional knowledge (TK) is applied in coral reef conservation. Indigenous wisdom informs the establishment of traditional marine protected areas and fishing regulations, ensuring the sustainable use of marine resources and the preservation of healthy coral ecosystems (Pilbeam et al., 2019).

Traditional Agroecological Practices: Palauan's apply traditional knowledge in sustainable agriculture, particularly in cultivating crops resilient to climate variability. Indigenous agroecological practices, such as intercropping traditional staple foods with climate-resilient varieties, contribute to food security. These methods also improve soil fertility and reduce the impact of extreme weather events on agricultural productivity, demonstrating the integration of TK into climate-resilient farming.

Navigation and Sea Level Rise: Palauan's traditional navigation techniques, passed down through generations, are employed to navigate changing maritime environments. As sea levels rise, TK plays a crucial role in preserving knowledge of reef navigation, wave patterns, and celestial navigation. This wisdom helps communities adapt to altered coastal landscapes and mitigate the risks associated with rising sea levels (Island Time, 2022).

Cultural Practices for Conservation: Palauan's cultural practices, including traditional storytelling and rituals, are integrated into conservation efforts. TK is used to convey ecological knowledge, highlighting the interconnectedness of ecosystems and the importance of biodiversity preservation. By incorporating these cultural practices into conservation strategies, Palauan's foster community engagement and promote environmental stewardship (GCED, 2017).

Solomon Islands

Community-Based Disaster Preparedness: In the Solomon Islands, where communities face the risks of earthquakes and cyclones, traditional knowledge (TK) plays a vital role in disaster preparedness. Indigenous construction techniques, informed by TK, are used to enhance the structural resilience of buildings. Locally sourced materials and specific architectural designs help create earthquake-resistant structures that minimise potential damage during seismic events. TK is also integrated into the design of cyclone shelters, guiding the construction of robust structures capable of withstanding strong winds and heavy rainfall. By incorporating traditional materials, these shelters not only provide durability but also ensure community safety during cyclonic events, showcasing the adaptive strength of TK in mitigating a range of natural disasters (Hagaria, 2022).

Weather Forecasting: In the Solomon Islands, biological indicators are a key element of Indigenous weather forecasting, significantly reducing loss and damage from adverse weather events. Communities rely on the behaviour of animals, plant responses, and other environmental cues as predictive signals for impending storms or cyclones. For example, changes in bird behaviour, flowering patterns of certain plants, and shifts in marine life behaviour often serve as early warning signs. This Indigenous approach allows communities to take proactive measures such as securing property, evacuating vulnerable areas, or reinforcing infrastructure, thus minimising the impact of extreme weather and contributing to community resilience (Chambers et al., 2017).

Resource Conservation: Traditional knowledge plays a critical role in conservation efforts in the Solomon Islands, helping to address loss and damage caused by climate-related challenges. By integrating Indigenous ecological knowledge and customary land tenure systems, communities establish sacred sites where access is restricted, effectively creating protected areas. Social prohibitions and regulated access further promote the regeneration of natural resources. For example, the successful protection of the bumphead parrotfish and sustainable vanilla production demonstrate how TK supports conservation, food security, and livelihood enhancement while maintaining soil quality. In this way, TK serves as a powerful tool in addressing climate-related challenges (Prasad et al., 2022).

Food Security: Communities in the Solomon Islands rely heavily on agriculture and fishing for sustenance, and traditional knowledge passed down through generations provides critical insights into sustainable farming practices, local crop varieties, and traditional fishing methods. This knowledge contributes to biodiversity preservation and helps communities adapt to environmental changes. For instance, Indigenous practices often involve planting diverse, climate-resilient crops, reducing vulnerability to climate-related risks. Additionally, TK includes effective storage and preservation techniques that minimise post-harvest losses. By integrating these time-tested methods with modern agricultural approaches, the Solomon Islands can enhance resilience to climate change, ensuring food security and protecting livelihoods (Gomese, 2017).

Tonga

Weather Forecasting: In Tonga, traditional knowledge plays a crucial role in weather forecasting, particularly on remote islands where communication infrastructure is often unreliable. Without consistent access to modern forecasting technologies, Indigenous communities rely on oral history and natural signs to predict the arrival of cyclones. This deep-rooted knowledge enables communities to prepare for extreme weather events and has proven invaluable in regions where conventional systems are less accessible (Johnston, 2015).

Tuvalu

Coastal Erosion and Protection: In Tuvalu, where rising sea levels pose a significant threat, traditional knowledge (TK) is applied to coastal protection efforts. Communities leverage this knowledge to implement nature-based solutions, such as planting vegetation like mangroves, to stabilize shorelines and mitigate erosion. These practices not only provide a natural buffer against storm surges and high tides but also help preserve coastal ecosystems (Tuvalu Coastal Adaptation Project, 2020).

Water Harvesting: In Tuvalu, freshwater scarcity is a pressing issue. To address this, traditional knowledge is employed in water harvesting practices. Local communities use Indigenous methods to construct coconut holes with clam shells, creating rainwater catchment systems that ensure a sustainable and reliable supply of freshwater during periods of low rainfall.

Agricultural Practices: In response to changing climate patterns affecting agriculture in Tuvalu, traditional farming practices are guided by Indigenous knowledge. This includes selecting crop varieties that are well-suited to the shifting climate, incorporating drought-resistant and salt-tolerant species. Additionally, traditional crop rotation and agroecological methods are employed to maintain soil fertility and enhance agricultural resilience (Tui & Fakhruddin, 2022).

Vanuatu

Marine Resource Management: In Fiji, where overfishing threatens marine ecosystems, traditional knowledge (TK) plays a crucial role in sustainable fisheries management. Indigenous fishing practices, such as seasonal taboos on certain species, help conserve fish populations and maintain the ecological balance of coral reefs (Kitolelei et al., 2021).

Limitation of TK in study of loss and damage

While traditional knowledge can be valuable in addressing climate change and reducing associated losses and damages, it also has its limitations. Some of these limitations include:

a. *Limited documentation:* Traditional knowledge is often passed down orally, making it susceptible to loss or distortion over time. The lack of systematic documentation can hinder its transmission to future generations and limit its integration into broader climate change adaptation strategies.

b. *Varied applicability:* Traditional knowledge is often specific to certain regions and ecosystems. Practices that work well in one context may not be directly applicable or effective in a different climate or geographical setting, limiting its universality.

c. *Resistance to change:* In some cases, communities may be resistant to adopting new or modified practices, even if supported by scientific evidence. This resistance can be rooted in cultural attachment to traditional methods, hindering the implementation of more effective climate change adaptation strategies.

d. *Incompatibility with modern technologies:* Traditional knowledge may not always align with or complement modern technologies and scientific approaches. This incompatibility can impede efforts to integrate the strengths of both traditional and scientific knowledge for more comprehensive climate change mitigation and adaptation.

e. *Gender bias:* Traditional knowledge systems may sometimes exhibit gender biases, with certain information and practices being restricted to specific genders. This can result in the exclusion of valuable perspectives and strategies, limiting the overall effectiveness of climate change adaptation initiatives.

f. *Loss of traditional practices:* Globalisation and cultural shifts may lead to the erosion of traditional practices and knowledge. As younger generations become more exposed to external influences, there is a risk of losing valuable insights that have been traditionally passed down through communities.

g. *Insufficient scientific validation:* While traditional knowledge has proven its effectiveness in some cases, it may lack the scientific validation required to gain broader acceptance. This can limit its integration into formal policies and strategies aimed at reducing climate change impacts.

Future of traditional knowledge in loss and damage

The future for traditional knowledge in addressing loss and damage through climate change is likely to be shaped by a combination of challenges and opportunities.

a. **Integration with scientific Knowledge:** There is a growing recognition of the importance of integrating traditional knowledge with scientific approaches to address climate change impacts effectively. Future initiatives may focus on combining the strengths of both systems, acknowledging the value of Indigenous wisdom while leveraging scientific advancements for a more comprehensive and adaptive approach.

b. ***Community-Based Adaptation Strategies:*** Traditional knowledge is often deeply rooted in local communities and ecosystems. The future may see an increased emphasis on community-based adaptation strategies that draw on Indigenous practices, empowering communities to take the lead in developing and implementing measures to reduce loss and damage.

c. **Documentation and Preservation:** Efforts to document and preserve traditional knowledge are crucial for its continued relevance. Future initiatives may involve the development of digital archives, educational programs, and collaborations between communities, researchers, and policymakers to ensure the safeguarding of this valuable knowledge for future generations.

d. **Cultural Resilience:** Recognising the role of traditional knowledge in maintaining cultural resilience is essential. Efforts to strengthen cultural identity and pride can contribute to the preservation of traditional practices, fostering a sense of community ownership and responsibility in addressing climate change challenges.

e. **Policy Integration:** As awareness grows regarding the efficacy of traditional knowledge, there may be increased efforts to integrate it into formal climate change policies and strategies. Governments and international organisations may collaborate with Indigenous communities to develop policies that respect and incorporate traditional approaches to adaptation and mitigation.

f. ***Knowledge Exchange and Collaboration:*** Future initiatives may prioritise knowledge exchange and collaboration between Indigenous communities, scientists, and policymakers. This collaborative approach can facilitate a more holistic understanding of climate change impacts and enhance the effectiveness of strategies to reduce loss and damage.

g. ***Education and Empowerment:*** Education programs that highlight the value of traditional knowledge in climate change adaptation may become more widespread. Empowering communities to adapt their practices based on a combination of traditional wisdom and contemporary scientific insights can contribute to increased resilience.

h. *Ethical Considerations:* It is crucial to approach the integration of traditional knowledge with ethical considerations, respecting the rights and autonomy of Indigenous communities. Future developments may involve establishing ethical guidelines and frameworks to guide the respectful and equitable incorporation of traditional knowledge into broader climate change initiatives.

While there are challenges, the future for traditional knowledge in addressing loss and damage through climate change holds promise as societies increasingly recognise the importance of diverse knowledge systems in building resilience and sustainability. Collaborative and inclusive approaches that bridge traditional wisdom with contemporary scientific understanding are likely to be at the forefront of effective climate change mitigation and adaptation efforts.

14.3.6 Case study 6: Use of remittances to address loss and damage and development needs

Remittances as self-help for residual loss

Defined as cash and in-kind transfers that migrants share with their families and communities at home, remittances have been, and continue to be important in development and resilience for individuals, households and communities the world over. As an important people-to-people development fund, the UN General Assembly (A/Res/72/281) has since 2015 recognised the 16 of June as the International Day of Family Remittances (IDFR) (UN, 2018). This global recognition is telling.

In-kind remittances for loss and damage

In-kind remittances come in diverse forms – food and non-food – are not easy to quantify, yet important to receiving countries. In times of natural disasters, in-kind remittances have proven their value in meeting essential needs. Further, remittances have outperformed Foreign Direct Investment (FDI) and Official Development Assistance (ODA) as a source of income for low-income countries during COVID-19 (Collins, 2023). For a long time, remittances have stimulated the growth of small businesses and other income generating opportunities too in Samoa and Tonga (Connell & Brown, 2005) and especially for women (Dutta-Powell & Spadina, 2020). Studies by Muliaina (2006) have found that Samoans invested remittances to improve farms, education and training, well-being and to improve or protect homes from the natural hazards.

Although international remittances are reflected in countries' national accounts, this is one part of the puzzle. Domestic remittances are valuable too. This refers to cash and non-cash transfers that migrants working in urban areas send to kins in rural and maritime areas. Unlike the former, very few studies address this important gap.

As a bundle, remittance, sourced from off-shore or in-country, is an enabler of, and for development finance in receiving countries.

Remittances in the Pacific

Remittances have been the lifeblood of many PICTs for years (Collins, 2023) owing to the traditional culture of giving, gifting and caring for one another. Recently, the number of Pacific Island countries participating in labour mobility schemes such as the New Zealand's Recognised Seasonal Employer Scheme (RSE) and Australia's Pacific Australia Labour Mobility (PALM), has increased the amount of remittances sent to the islands.

Since Vanuatu's participation in the RSE Scheme, families on the island of Ambrym have not only found a new source of income but remittances now form part of resources circulation within the communities (Bailey, 2013). In another case, NZ Foreign Affairs & Trade told of Ken's success, a former RSE worker from Vanuatu, whose participation has afforded him improvements in his home and investment in the education of his children. But, to further harness the development potential of remittances in the future is a matter of priority.

Contrary to predictions of remittances decay in the Pacific (see, Brown, 1998; Simati & Gibson 2001; Connell & Brown, 2004), in-flows have endured. Remittances may fluctuate from time to time as all things do, but they never stop as Figure 14.4 shows. For Fiji, Samoa and Tonga, remittances have grown over time.

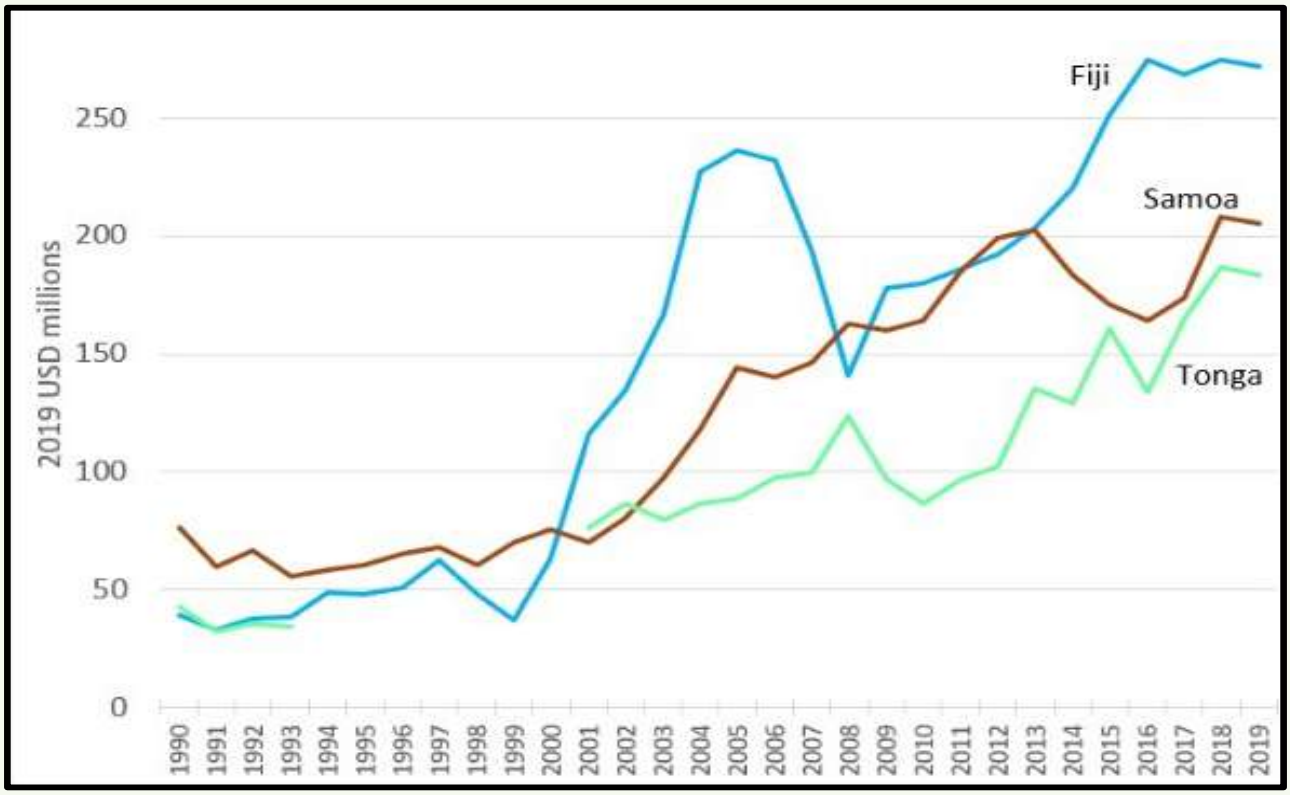


Figure 14.4: *Remittances in Fiji, Samoa and Tonga, 2019 (USD millions)*
Source: Howes and Surandiran, 2020, p. 1.

As a percentage of national income, Figure 14.5 shows remittances constitute an important portion of countries' finances. They constitute 29.4% and 46.2% of national income for Samoa and Tonga respectively.

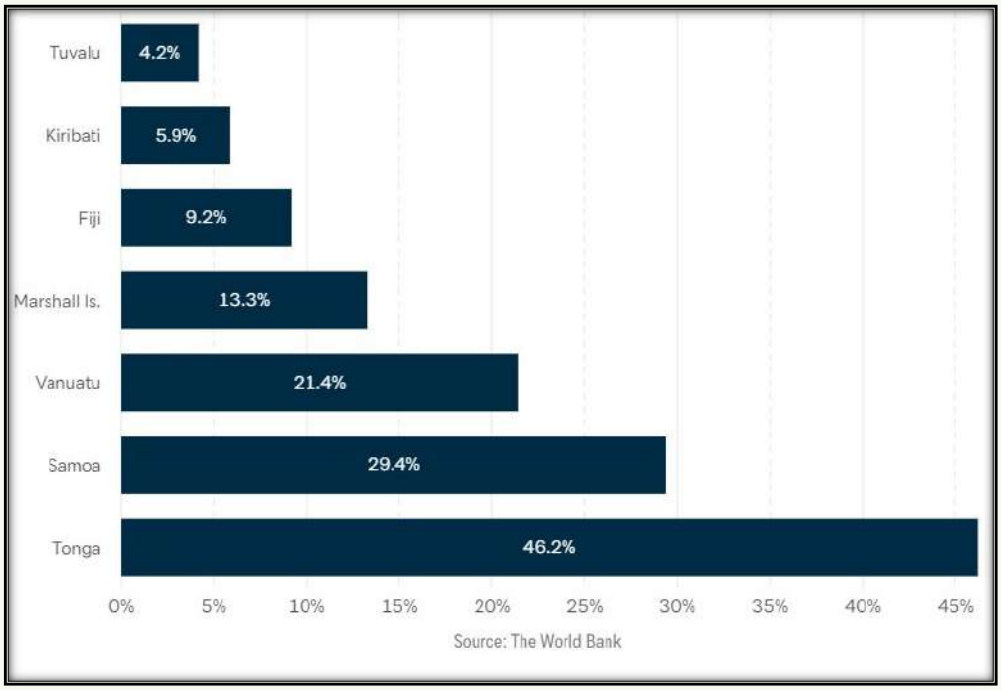


Figure 14.5: *Remittances as a percentage of national income, 2021 Source: The World Bank*

As table 14.6 below shows, remittance in-flows to Samoa in the first nine months of 2023 as been consistently high.

	Jan 23	Feb 23	Mar 23	Apr 23	May 23	Jun 23	Jul 23	Aug 23	Sep 23
By Recipient (*tala* millions)	**55.08**	**56.00**	**64.98**	**50.03**	**75.74**	**73.75**	**74.25**	**80.22**	**66.79**
Banknotes	4.15	5.64	3.90	4.01	12.15	4.83	3.20	4.38	8.48
Church, school, Charities	0.56	2.12	2.67	0.85	6.82	2.98	4.33	7.17	0.65
Individual/Family/Households	48.88	47.56	56.81	43.30	55.17	64.50	65.50	66.73	54.09
In-kind	0.82	0.55	1.04	0.75	0.79	0.82	0.70	0.81	0.85
Others	0.68	0.13	0.57	1.11	0.81	0.63	0.62	1.12	2.73
By Country (*tala* millions)	**55.08**	**56.00**	**64.98**	**50.03**	**75.74**	**73.75**	**74.25**	**80.22**	**66.79**
American Samoa	3.12	3.23	4.07	2.90	4.00	4.02	3.98	3.51	3.51
Australia	20.65	20.61	23.05	16.01	23.28	28.16	29.48	32.65	24.05
New Zealand	22.90	21.32	27.88	22.40	31.85	28.29	24.27	28.72	25.78
USA	7.87	10.34	8.87	8.32	9.53	10.90	13.18	10.84	11.22
Others	0.54	0.50	1.12	0.40	7.09	2.38	3.33	4.50	2.23
By Channel (%)	**55.08**	**56.00**	**64.98**	**50.03**	**75.74**	**73.75**	**74.25**	**80.22**	**66.79**
Banks	8.7	13.6	13.9	19.6	21.7	19.4	22.1	26.5	26.6
Non-Banks *	91.3	86.4	86.1	80.4	78.3	80.6	77.9	73.5	73.4

Source: Central Bank of Samoa * includes Money Transfer Operators (MTOs)

Table 14.6: *Remittances in Samoa (in tala million)*

Remittances at work

Remittances, cash and in-kind, are an integral part of life in Samoa. They sit at the heart of the Fa'aSamoa, the Samoan culture or a way of life. On a higher level, it is a framework through which Samoans view the world and sanction their relationships with others. Understandably, Samoans invest resources, remittances included, in living Fa'aSamoa for they have 'reasons to value' (Sen, 1999, p.291).

There is an interplay between remittances and Fa'aSamoa (Muliaina, 2006). Muliaina (2017) first examined the relationship between remittances, social system and development in the village of Fusi, Saoluafata in 1998. The study sample consisted of four groups – 30 households at Fusi, 30 market vendors at Fugalei market, 40 households of the Pacific Island Presbyterian Church (PIPC), Mangere, Auckland, New Zealand and 20 employed adult children from eight households in the last group. The second study argued for a broader understanding of population movement of Samoans. The sample size – 22 households of the Wesley Methodist Church (WMC), Papatoetoe, Auckland, New Zealand and 28 households from the Samoan community in South Auckland. The second leg of the field work included interviews with relatives of the same households in Samoa.

As part of a household resource pool, remittances have enabled, assisted, improved, supported and facilitated household-based development in Samoa. Study respondents in the village of Fusi received cash and in-kind remittances from relatives in American Samoa, Australia, New Zealand and the USA. However, 60%, received remittances exclusively from New Zealand. Suggesting that the economic prosperity of relatives in New Zealand may dictate the economic well-being of villagers in Fusi.

Respondents received varying amount of cash remittances. Sixty seven percent received amounts of up to WS$1,000. This amount may have been compensated by remittances in-kind. The remaining 33% received amounts in excess of WS$1,000 but less than WS$13,000.

Seventy percent of households received in-kind remittances mostly from American Samoa. Geographical proximity is a factor. Further, respondents talked of the assortment of goods received in the aftermath of cyclones included construction materials and equipment, hardware supplies, furniture, private vehicles, audio equipment and television sets. The more mundane items were food, confectionaries, second-hand clothes, kitchen utensils and crockery. The variations among households in their receipt of remittances is indicative of considerable circulation among kin within Fusi.

Social and cultural development

Except for special occasions—such as Father's Day, Mother's Day, a parent's birthday, White Sunday, and Christmas—all respondents reported that remittances were not received regularly. It was rare for money or commodities to be sent without a request. Typically, assistance was provided only after a direct request for cash or other support was made.

Financial requests to relatives abroad were commonly made for church-related activities, village social events, family occasions like weddings and funerals, the bestowal of matai titles, court fees for disputes over matai titles or land, and children's educational expenses.

In contrast to the conventional understanding of saving and investment (Connell, 1997), respondents perceived their commitment to the stated purposes above in the context of Fa'aSamoa. Within this framing, 'the practice of sending remittances is Fa'aSamoa in action' according to a male respondent. It is an expression of alofa (love) and tautua (service). Also, Teaiwa (2004, p. 220), captured the essence of the same when she said, 'I do not know of a single Pacific Islander who saved…As a general rule, we liked to spend our money.'

But, make no mistake that Samoans spend money without reason. Rather, Samoans save and invest by spending on their 'aiga and fa'alavelave for they have many 'reasons to value' (Sen, 1999, p. 291). Whether spending on fa'alavelave or taking care of children and educational expenses or health care of family, is indicative of deliberate intentions.

Diversification of livelihoods

Remittances have been an impetus to diversify household livelihoods. Land is available and motivation abound. Seventy percent of respondents in Fusi have grown their own food crops such as taro, bananas, breadfruit, yam, vegetables including eggplant, pumpkin, beans and pele in their backyard. The impact of the taro leaf blight that decimated Samoa's major export commodity, taro, was enough to convince respondents to embrace the diversification of livelihood without delay. Claiming that, 'putting all eggs in one basket is not a wise idea at all' in the view of one respondent.

While respondents were aware of government assistance they could tap on, accessing it takes time. Instead, respondents looked to remittances to facilitate this transition. A departure from growing taro to alternative root crops such as giant taro, sweet potato, yam, manioka and vegetables. The aim was not only to diversify but to ensure family food needs were met first, and potentially sell some later.

Besides the taro leaf blight, perceptions were also influenced by the impacts of cyclones Ofa and Val that preceded the blight. While respondents did not frame these events in the context of climate change, they perceived them as a sign that 'God is angry…His anger is shown in fierce storms and destructive plant diseases.'

All sellers of root crops and vegetables at the Fugalei market come from villages that are not under customary land ownership. As a 'business-oriented' group, they already valued the potential of remittances to develop and expand their farms. As recipients of remittances, they have invested in food production, purchased seeds, fertilisers and inexpensive garden tool.

Secondly, remittances have contributed to the development of other income generating activities. At Fusi, 60% of respondents have ventured into a range of small-scale development projects such as cattle and piggery farms. These are culturally important animals in funerals, weddings and dedication of a new church and capital projects in the village to name a few. A respondent said,

> I received cash from an uncle in New Zealand to start my cattle farm. I bought two cows, a bull and heifer, from a friend in from a neighbouring village. Now, I have six cows already.

Another respondent spoke positively of how remittances, cash and in-kind have helped him established a piggery farm. Besides cash, he received construction materials including barbed wire, nails and taps, from his relatives in Pago Pago (American Samoa). In his view, it 'is working fine…A sow can have as many piglets.'

With assistance from government, this respondent could generate biogas from pig manure to supply his cooking gas needs at home. Further, cows and pigs can easily fetch a good return when sold at the market. There are fa'alavelave, always in a family and/or in other families, village or church that people need these animals. Finally, remittances have created, supported and expanded a range of business ventures in Fusi. Two of the respondents owned and operated small vessels that are used for fishing.

Then, three of the respondents received pick-up trucks from relatives in New Zealand and American Samoa after Cyclone Val. The owners used them to generate income by transporting people and their agricultural produce to Apia, moving villagers' belongings around the island and taking farewell parties to the airport. One of respondents from this group operated a small motor repairs business in the village.

Two respondents operated a grocery shop each in the village. In-kind remittances, mostly assorted food items from American Samoa complemented the usual stock of basic foods such as canned fish, corned beef, flour, sugar, tea, coffee, Vailima beer, party ice and other sundry goods for these traders.

Freehold land acquisition and home improvements

The acquisition of freehold land and building, improving and protecting home for respondents have been possible through remittances. Auckland-based Samoans have contributed to the purchases of freehold land and homes in Samoa. Securing a freehold land in Apia has always been a dream for Samoans in rural areas. This so that they are not only close to but have a place in Apia. A respondent from the island of Savaii described this when he said,

> Our quarter acre of land at Falelauniu is our base in Apia. To have our own a place there (Apia) was a family goal. We bought it through remittances from my siblings in New Zealand, Australia and the USA. An older brother built a two-bedroom there for our family. It is a place to stay when we visit Apia or return from overseas travels.

If anything, the above speaks of the same story for all respondents. Remittances from children and relatives residing abroad have enabled families, urban or rural, to secure freehold lands in Apia. In fact, Falelauniu is part of the fastest growing, freehold residential area of Northwest Upolu.

Remittances have also been used for home renovations and protection. Respondents pointed to remittances being their 'savior' during natural disasters. Thus, 'request remittances' were intentional. In the aftermath of cyclones Ofa and Val in 1990 and 1991, remittances have been the lifeline of families almost immediately after. Similarly, observations during the post-tsunami assessment in 2009 revealed the invaluable role of remittances in post-disaster recovery (Dominey-Howes & Thaman 2009; van Zijll de Jong et al. 2011). To rebuild life after a natural hazard is never easy. Besides the physical damage or loss of properties, there was also an emotional toll on people that time can only heal. Seeing remittances as Fa'aSamoa in action helps people to cope in the knowing that their wider aiga may be absent but present through the act of sharing/giving.

Natural hazards have made significant imprints on people's minds and outlook. Respondents have viewed remittances as an important part of their protection and preparation for future hazards. Because of Fusi's location along the coast, soil erosion has been a concern. There is also a small stream flowing into a mangrove area/wetland before discharging into the sea. Villagers have been worried about the slow but advancing impact of coastal erosion along the beach area. While mangroves may have offered a level of protection from the sea, the stream has eroded places along its bank where villagers reside. With onset of cyclones and tsunami, respondents have now framed their vulnerability in the context of climate change and sea-level rise. A respondent put this idea plainly when he said,

> This (pointing to the beach and eroded part of the stream) has been happening for some time. We did not think of it seriously then. We have many things to worry about, to raise the children, village and church things. Now, it is getting worse that we need to protect ourselves and prepare. We know that we need to do something. We talk with our children in New Zealand about securing our home.

For now, remittances from children and relatives overseas provide the means to secure homes and properties in whatever way possible. Reinforcing current structure, making home-made sea walls by filling unused tyres with dry leaves, rocks and a generous dose of faith for the best have been temporary interventions. Relocation is always an option, but it is not all rosy. For respondents in Fusi, land may be available inland, but any relocation means enduring the rough terrain and (re)adjustments around access to water, electricity among other comforts of life. Perhaps the construction of 1.4 km access road as part of government's climate proofing of coastal and inland roads in 2015 (UNOCHA, 2015) was timely. To opt for an access road instead of building a seawall was the best option. The road has provided several benefits. Despite the rough terrain, villagers can access farms by foot or vehicle with ease. The road offers greater protection than a seawall in times of natural disasters.

Time will tell as to when people will make calculated decisions to relocate further inland considering their specific needs. As it stands, relocation will be the last resort when everything else fails. Thus, keeping the status quo appears to be a coping mechanism in the interim.

Health and well-being

Remittances have been invested to improve Water, Sanitation and Health (WASH) facilities according to 40% of respondents in Fusi. Contrary to previous assumptions that remittances fuel conspicuous consumption (Connell & Brown, 2005), respondents' use of remittances was intentional. Intentions were clear and have reasons to value to improve WASH outcomes. Perhaps WASH was not a priority for other respondents.

Thirty three percent of respondents spoke of some cash remittances being spent on the care of an elderly parent and/or related medical expenses. This care also included visits to and payment of a traditional healer. Further, a female respondent talked of the value of remittances to a mother of a sickly child needing immediate medical intervention and evacuation. In her words,

> My daughter had been diagnosed with hydrocephalus since birth. It was not easy for any mother. The treatment, times in the hospital and many sleepless nights. It was harder when she could only be treated in New Zealand. Thankfully, the government (of Samoa) paid for our fares. Our families in New Zealand sent money to help our fundraising here. They took care of our expenses at the hospital, accommodation, doctor's appointment and follow-up visits.

In times of critical personal need, remittances can make all the difference to a life in desperation.

Remittances are people-to-people resources of great development potential. They have been part of Samoans resource pool for family development. Drawing from it as the need arises. Sharing, giving and gifting embodied in the practices of remittances reflect people's agency and resilience. This self-help development at the individual and household level is development at its best.

Let the late Epeli Hau'ofa has the final say on this:

> Ordinary Pacific people depend for their daily existence much, much more on themselves and their kin, wherever they may be, than on anyone's largesse, which they believe is largely pocketed by the elite classes. The funds and goods that homes-abroad people send their homeland relatives belong to no one but themselves. They earn every cent through hard physical toil in the new locations that need and pay for their labour. They also participate in the manufacture of many of the goods they send home; they keep the streets and buildings of Auckland clean; they keep its transportation system running smoothly; they keep the suburbs of the western United States (including Hawai'i) trimmed, neat, green, and beautiful; and they have contributed much, much more than has been acknowledged (Hau'ofa, 2008, p. 36).

14.4 Conclusion, policy and research implications

The examples of loss and damage experienced by local communities in PICTs are mostly unavoidable because of the increase intensity of climatic hazards and increase sequence of tropical cyclones followed by droughts and vice versa. Some of the losses as discussed in different case studies are unavoidable and irreversible. From our collective research experience across PICTs, the households are suffering ongoing losses due to climate change, and they are not accessing to resources to address loss and damage and recover faster after extreme events. Despite the availability and accessibility to different modalities of climate financing, including the new funds for loss and damage, key policy and research prioritisation should be considered.

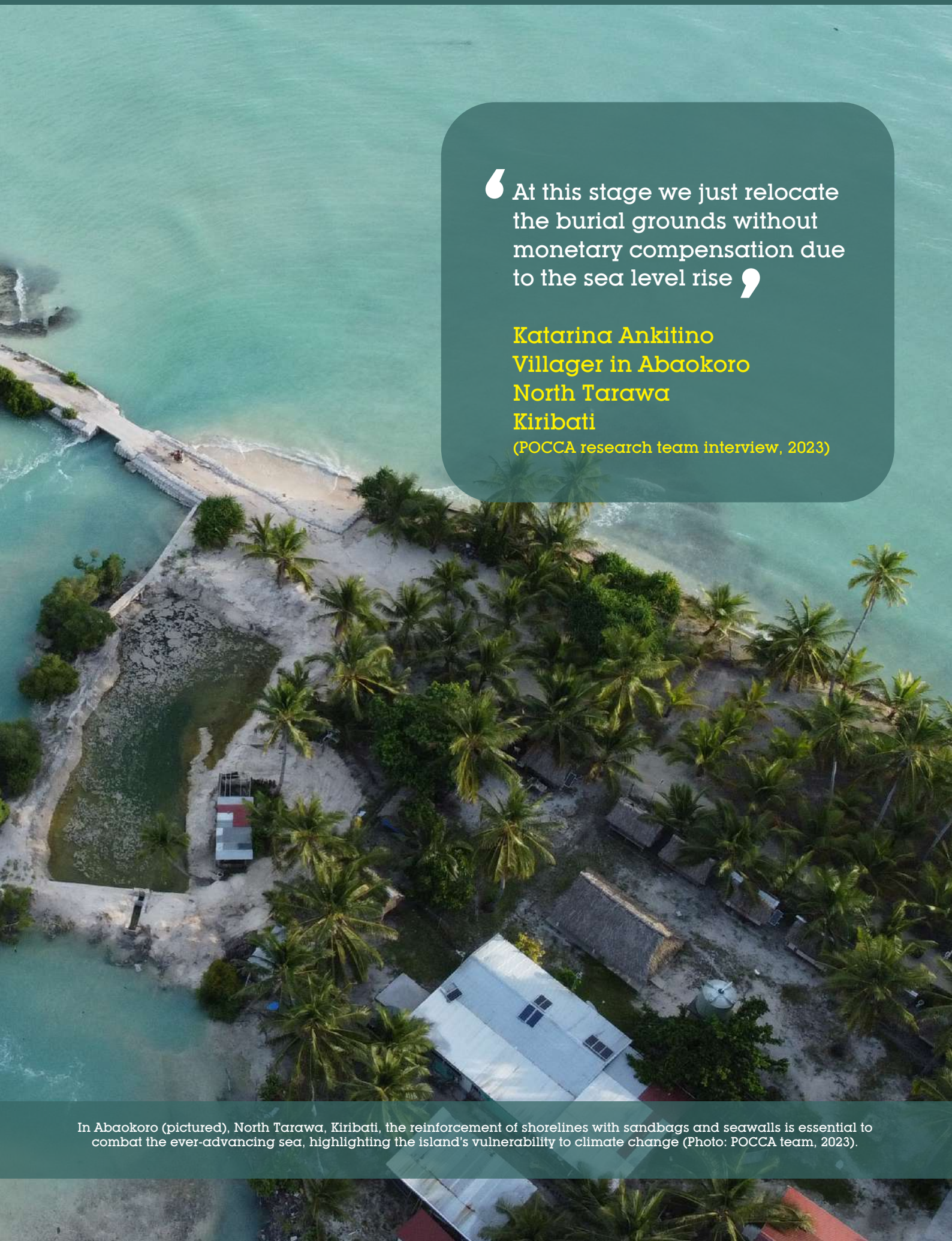
a. The need to increase the availability and sufficiency of funds to avert, minimise and address loss and damage. Also to ensure easy access and distribution of resources to national governments, non-government organisations, SMEs, Private sector and communities.

b. New financing mechanisms should be established for households and communities to access to rebuild their lives, farmers after disasters. Resources allocated based on Post Disaster Needs Assessments are not sufficient.

c. Documentation and capture of loss and damage information, stories from households, SMEs, private sector and communities are needed to support national, regional and global negotiations on mobilisation of more resources to avert, minimise and address loss and damage.

d. Better methodologies and processes should be established to incorporate averting, minimising and addressing loss and damage in adaptation evaluations.

e. More research and education of PICTs communities on effectiveness of adaptation, capture of residual, unavoidable losses, and understand the limits of adaptations in planning.



> “At this stage we just relocate the burial grounds without monetary compensation due to the sea level rise”
>
> Katarina Ankitino
> Villager in Abaokoro
> North Tarawa
> Kiribati
> (POCCA research team interview, 2023)

In Abaokoro (pictured), North Tarawa, Kiribati, the reinforcement of shorelines with sandbags and seawalls is essential to combat the ever-advancing sea, highlighting the island's vulnerability to climate change (Photo: POCCA team, 2023).

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Chapter 15

Climate Change and Impacts on Socio-economic and Infrastructural Development

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Funafuti Atoll, Tuvalu, during Cyclone Pam (Photo: USP In-Country Coordinator in Tuvalu, 2015)

Abstract

This chapter follows diverse economies approach to explore existing socio-economic and infrastructure development challenges presented by the climate crisis, while privileging alternative Indigenous responses and possibilities. The chapter starts with an outline of the diverse economies' perspective and its application to the Pacific. In Part A, we present a broad literature review of existing studies on the climate impacts for agriculture and fisheries, tourism and infrastructure. In Part B, Indigenous approaches to the economic impacts of the climate crisis are explored. These revolve around Indigenous innovation, solidarity economies and resilience. In doing so, this chapter privileges Indigenous agency within constraining global conditions.

Glossary of key terms

Fa'asamoa	The Samoan way of life
Solesolevaki	Communal reciprocal living
Kumala	Sweet potato
Uvi	Tropical yam
Vure ni sisili	Bathing spring
Neitou salusalu ni matavura	The flowers of our shores
Mataqali	Land owning unit
Wanbel	In one mind or collectivity

> Humans are destroying this world with pollution from factories etc. The pollution has penetrated the ozone layer – giving better access to the sun's direct heat

Miniva Depaune
Buada District
Nauru
(POCCA research team interview, 2023)



A picture showing new resettlement area as part of the Nauru Government's relocation project (Photo: POCCA team).

15.1 Introduction

This chapter situates the socio-economic and infrastructure development challenges and opportunities within a simplified but overlapping conception of economic development. Firstly, there are Indigenous economies that have always existed, and have been maintained throughout history, despite being actively suppressed in many contexts. Secondly, there is mainstream socio-economic development that has emerged since imperial expansion from Europe and is intimately tied in with the global economy. In many cases, the mainstream development trajectory has exacerbated the climate crisis. Finally, there is a sphere where these two overlaps, where Indigenous perspectives contribute to mainstream development and/or where mainstream perspectives contribute to Indigenous development. All of these must be analysed to get a more comprehensive picture of the possible impacts of the climate crisis on socio-economic issues, and what is to be done.

Mainstream approaches tend to overemphasise the impacts of the climate crisis on what is measured in the capitalist economy. This underestimates the impact on what is not measured, as well as the possibilities outside of what is measured for development, adaptation and self-determination. What is measured is merely the tip of the iceberg and there are ample examples of economic relationships that exist under the surface that enable people to meet their own needs now and, in the future, (Gibson-Graham et al., 2013; Jarillo & Barnett, 2022; Vunibola et al., 2022). The mainstream approaches above the surface focus on waged labour, commodity markets and capitalist enterprise (Gibson-Graham et al., 2013). Under the surface a multitude of economic practices that enable communities to flourish, both keep these mainstream approaches afloat, while also containing the seeds for alternatives (Gibson-Graham et al., 2013).

Depending on the discipline or field of study, alternative economies take on different names and have different emphases and frames of analysis. These include diverse and community economies (Gibson-Graham et al., 2013), moral economies (Ratuva, 2021), solidarity economies (Iyer et al., 2021) and Indigenous economies (Vunibola et al., 2022). As the commonly used iceberg visual representation may not be the most suitable metaphor for the warm Pacific, a team of researchers rethought and illustrated the metaphor as diverse economies represented by a coconut as shown in Figure 15.1 (Carnegie et al., 2012). This framing also draws attention to the gendered nature of economic practices and possibilities, which is another key thread to be woven through climate crisis impacts and Indigenous responses.

In this chapter, we follow this framework and highlight where challenges and opportunities exist. Firstly, we describe how the climate crisis is and will affect the livelihoods of Pacific peoples. In this section we focus on the general and predominantly mainstream economic implications of climate impacts, with a focus on agriculture and fisheries, tourism, and infrastructure.

However, a continuing focus on the impacts of the climate crisis on these activities, usually understood narrowly through the mainstream perspective introduced above, obscures the capabilities of Indigenous adaptation and mitigation. To counter this, we highlight already existing Indigenous responses to the climate crisis embedded within three themes: Indigenous innovation, solidarity and resilience. These tend to emerge from the already existing Indigenous economic perspectives that have persevered and are resurging as a result of escalating crises. We then conclude with policy recommendations that take both perspectives seriously, especially where they overlap.



Figure 15.1: *Diverse economies coconut (Source: Carnegie et al., 2012).*

15.2 Socio-economic impacts of climate change

The climate crisis is a global economic justice issue (Morrissey, 2021). There is a strong correlation between a country's current and past level of greenhouse emissions and its wealth (Rasheed et al., 2022). The global super economies, including the United States and European Union countries, were responsible for 30.3 percent and 22.1 percent respectively of CO2 emissions between 1900 and 1999 (Barnett, 2005). Recent studies show China, the United States, India, the Russian Federation, and Japan as the top five countries that emit the most CO2 (Rasheed et al., 2022). These countries benefit economically from their CO2 emissions but are less vulnerable to the climate crisis than The Pacific Island Countries and Territories (PICTs) because of the adaptive capabilities gained through wealth accumulation activities via industrial and commercial production.

Climate change is threatening the very existence of Pacific peoples and their way of life. The most immediate and visible impact of climate change is rising sea levels, which is leading to coastal erosion and the inundation of deltas and inland flooding (Morrissey, 2021; Monnereau & Abraham, 2013; Watkin, 2013) among other impacts. Saltwater intrusion creates problems for coastal aquifers, estuarine systems and farmland (Mangubhai et al., 2018). This disrupts the delicate balance of coastal and land ecosystems that many Indigenous communities rely on for their sustenance as well as a source of economic livelihood (Brown et al., 2017). Anthropogenic climate change has also been associated with increasing severity and volatility of tropical cyclones. In 2016, for instance, Tropical Cyclone Winston was recorded as the most intense tropical cyclone in the Southern hemisphere and the costliest tropical cyclone in the South Pacific Basin (Finau et al., 2018). Fiji was the most affected country as the cyclone left approximately 131,000 Fijians (approximately 10% of the population) homeless (Aquino et al., 2018). The climate crisis is affecting Pacific economic livelihoods now in a profoundly disruptive way.

15.2.1 Impact on agriculture and fisheries

PICTs have a noteworthy reliance on agriculture, fisheries, and aquaculture; however, climate change continues to place significant pressure on the survivability of these sectors and its contribution to economic development (Barnett, 2020; McCubbin et al., 2015; IPCC, 2019). The vulnerability of economic livelihoods depends on the degree of ecosystem dependency to support those livelihoods. For instance, farmers are more dependent on the ecosystem than bankers (Barnett, 2005). More than 80% of land across PICTs is under customary tenure and has been the livelihood support system for many Indigenous groups. These groups still practice subsistence means of survival that depend on their reciprocal relationships with the environment (Vunibola & Scheyvens, 2019). A delicate equilibrium exists between ecosystem dependency and human vulnerability to the climate crisis. A climate impact meta-analysis projected a long-term deterioration of crop yield by 2030 (Challinor et al., 2014) and the 2021 IPCC report stated that land surface is warming faster than the ocean (by 1.4 to 1.7 times, (IPCC, 2021). Although crops need warmth for growth efficiency, daytime temperatures are forecast to exceed crop-specific requirements, intensifying crop vulnerability and drastically reducing yields (IPCC, 2021).

Although 10 years ago, Bell et al. (2013) provides a useful snapshot at that time. According to these authors, government revenue from the fisheries sector is remarkable as seven out of the 22 PICTs obtain around 40% of their revenue (in the form of taxes) from tuna fishing licences traded to offshore fishing countries, and five receive up to 25% of their GDP from commercial fisheries and fish processing (Bell et al., 2013). Staple crops and fish are the primary food sources in the region, whereby fish consumption is estimated to be two to four times the global average and provides 50 to 90% of dietary protein in rural Pacific communities (Bell et al., 2013). Likewise, around 50% of coastal communities in PICTs receive their first- or second income selling fish, 20% of the average GDP obtained from aquaculture, thousands of people are employed through pearl farming on remote atolls, and fish farming is becoming popular in inland PNG (Bell et al., 2013). Coral reef fisheries, inland, and coastal aquaculture could decrease by 20% by 2050 (Bell et al., 2013), drastically impacting the sector's efficiency, production, and well-being of communities that depend on them for survival.

Although there are ample case studies on how the agriculture and fisheries sectors across PICTs continue to adapt in response to the climate crisis, we purposely share the case study of Fiji's first relocated coastal fisheries community in Vanua Levu (one of Fiji's two main islands) called Vunidogoloa Village. The village of Vunidogoloa is located in the province of Cakaudrove in the district of Koroalau, 40 kilometres from Savusavu (the second largest town on Vanua Levu) and 100 kilometres from Labasa, the main town of Vanua Levu (Charan et al., 2017; Witschge, 2018).

The village is made up of 26 houses, with a population of 153 people, that in 2014 were moved about 1.5km inland (refer to Figure 15.2 below). The villagers approached the government and formally asked for relocation assistance in 2006, at a time when the impacts of floods and erosion were becoming harsher. With this request, Vunidogoloa set a precedent, as it was the first village to ask to relocate due to climate change related-events. However, the socio-economic losses incurred from the relocation were harsh with villagers diverting towards alternative sources of livelihood. For example, an author of this paper refers to his fieldwork analysis from 2019, which highlighted how villagers that were largely dependent on sale of fish and handicraft materials made from agricultural products like coconut and pandanus had struggled to cope because of rising sea-level. A 47-year-old village elder shares:

> Our old village was originally situated on the coast for approximately 100 years. Many people had relocated to the coast autonomously to be closer to the sea and access its resources. Then almost 20 years ago, we started experiencing so many issues including tidal inundation, coastal erosion and saltwater intrusion. This really impacted our livelihoods and made growing food crops increasingly difficult. Most of us have now switched to fish ponds, pineapple plantations, and cattles, and women find it difficult to access pandanus leaves so they are incurring huge transportation costs to go and get materials from elsewhere.

However, the elder also added that people expressed a strong sense of safety since the relocation as they feared the rising tides and did not take into full consideration the implications on sustainability of livelihoods. In sum, the climate crisis will affect both formal and informal economic livelihoods related to agriculture and fisheries in the Pacific, as well as government revenue and therefore their ability to support adaptation, mitigation and social security.



Figure 15.2: *Map showing relocation of Vuni Dogoloa*

15.2.2 Impact on tourism

The tourism industry is the fastest growing industry in the Pacific region and the largest source of income and waged employment (Becken & Hay, 2007). However, many tourism-dependent destinations in the Pacific also face multiple development issues including the compounding impacts of climate change (van der Veeken et al., 2015). These include increases in annual rainfall, higher temperatures, sea-level rise, associated storms and increasingly intense tropical cyclones (Seneviratne et al., 2012). A common global response that has emerged is 'net-zero emissions' (Coles, 2021) and progress has been made in trying to understand and position tourism in climate change policy. In addition, PICTs (such as Samoa, Vanuatu, and Fiji) are heavily reliant on international tourism and unfortunately have suffered the worst economic impacts due to travel constraints during the COVID-19 pandemic (Connell, 2021). The findings of a survey of tourism businesses revealed that 50% of tourism businesses were inactive or fully closed whilst 35% were active but with reduced staff (IFC, 2020). This is a significant loss to the tourism industry and the economy as these businesses are the foundation of Fiji's tourism sector including accommodation providers, tourism activity providers, and suppliers.

In December 2021, Cyclone Yasa caused an estimated loss of almost US$250 million to infrastructure, livelihoods and agriculture which also led to increased incidence of diseases (typhoid, dengue fever and leptospirosis). In January 2021, Cyclone Ana caused extensive damage to tourism and general infrastructure in the Yasawa's, Vanua Levu, Viti Levu, Kadavu and Lau. The combined crises of the COVID-19 pandemic and climate change mean that access to and improved water, sanitation and hygiene (WASH) services and practices are increasingly threatened and weaken their ability to safeguard the health of communities and visitors. Escalating climate crises dramatically impact the tourism industry.

Existing climate change adaptation frameworks are predominantly focused on the process of ensuring coping with the impending risks and challenges (Loehr et al., 2022). Jopp et al. (2010), developed the Regional Adaptation Framework to identify key stakeholders in relation to demand and supply for a destination, identify risks, and understand vulnerabilities in relation to tourism. The framework also places strong emphasis on the role of the consumer and adaptive capacity of tourists. Njoroge (2014) likewise emphasised the adaptation process and the importance of feedback between actors at different decision-making levels to ensure sustainable adaptation. In particular, Njoroge (2014) proposed the Regional Tourism Sustainable Adaptation Framework that fulfils the basic principles of sustainable adaptation. Loehr and Becken (2021), proposed the Tourism Climate Change Knowledge system consisting of five knowledge dimensions: source of knowledge, knowledge creation, influence on knowledge, knowledge content and knowledge impact. However, despite the significance of tourism in the Pacific and its vulnerability to climate change impacts, there is still limited research on understanding the adaptation capacity and resilience of the tourism sector to respond to climate change.

Recent research has attempted to address this gap. Warrick et al. (2017), found that community-based adaptation (CBA) is becoming an increasingly popular approach to climate change adaptation in the Pacific. Wolf et al. (2021), suggest that CBA needs to be locally-led and driven by the community whilst being facilitated and resourced by donors to achieve local objectives. Loehr et al. (2022), also suggest Ecosystem-based adaptation (EbA) using ecosystems to manage the risks of climate change to create destination-wide benefits. The authors applied the framework to a case study site in Tanna Island in Vanuatu and found that the EbA approach created holistic benefits to destinations. More specifically in the tourism context, Parsons et al. (2018), examined the adaptive capacity of tourism operators in Samoa and found that *Fa'asamoa* (the Samoan way of life) plays a critical role in how tourism operators in Samoa plan for and respond to climate variability and extremes. An Indigenous Samoan tourism operator is considered part of a wider social network instead of an isolated individual, which influences how the business adapts to climate change. Parsons et al. (2018), suggest that ongoing and future adaptive capacity research takes into account the social, cultural, economic, political and environmental realities of Pacific communities (Parsons et al, 2018).

In addition, Pratt et al. (2018), found that there is a need for closer public-private cooperation within the policy environment for the tourism sector (specifically agritourism) to adapt to climate change. Public-private partnerships can contribute to adaptation in Samoan tourism in the areas of technical, educational and behavioural adaptation (Pratt et al., 2012). According to Becken et al (2020), policymaking on a global scale is becoming increasingly cross-sectoral and multi-level with both horizontal and vertical integration, and the mainstreaming of climate change into national tourism policies and frameworks has increasingly become a proactive adaptation measure (Klock & Nunn, 2019).

Fiji has adopted a proactive approach to aligning its tourism sector with global sustainability standards and enhancing its resilience to climate change impacts, for example, Fiji's National Climate Strategy aims to build a net-zero climate-resilient economy by expanding renewable energy sources, developing climate-resilient infrastructure and protecting vulnerable communities from climate impacts (World Economic Forum, 2022). Additionally, the Fijian government continues to integrate sustainability into post COVID-19 recovery by promoting eco-friendly investments and practices to ensure that the tourism industry contributes to long-term environmental health (IFC, 2023). Likewise, Vanuatu has been actively implementing various climate change policies for tourism, for example, the Rapid Climate Risk Assessment Framework was specifically designed for the tourism sector to allow for rapid analysis of climate-related risks and potential impacts on tourism infrastructure and services (SPREP, 2024).

There is growing research on the value of gendered local knowledge in responding to crises, including climate change (see e.g., Lane & McNaught, 2009; Carnegie et al., 2012; Movono & Dahles, 2017). Specifically, in Pacific Islands, the maintenance of culture and people's well-being in changing and uncertain environments for 100s of generations is testament to the resilience and capacity to adapt to change (Parsons et al., 2018). The gendered divisions of labour in communities inform the way and extent to which communities adapt to extreme climatic events (Lane & McNaught, 2009). In a case study of Tikina Wai in Viti Levu, Fiji, it was found that an understanding of gendered roles prior to determining natural resource usage was significant, particularly for donors and practitioners when identifying strategies for adaptation. Scheyvens et al. (2021), also support the notion that the tourism industry should identify opportunities to prioritise Indigenous development aspirations and support Indigenous knowledge in addressing climate change as one of the Sustainable Development Goals. However, the recent challenge for many PICTs is to adapt to global climate change alongside the impacts of COVID-19 (Carr, 2020). A large body of research has emerged out of the COVID-19 crisis that suggests resets of tourism and other industries are both necessary and possible as part of responses to crises. These take both gendered and Indigenous perspectives and possibilities seriously (see e.g. Hutchison et al., 2021; Movono & Scheyvens, 2021; Movono et al., 2022). We examine these possibilities further in section 15.3.

15.2.3 Infrastructural development and resourcing

The foundation for a stable and thriving economy is reliable and resilient infrastructure. The impacts of climate change on infrastructure in the Pacific extend beyond isolated sectors, as there is a complex interplay between various systems. Housing, hospitals, utility and power infrastructure, water infrastructure, community-based infrastructure, and energy infrastructure, including water tanks, all experience both rapid and slow onset effects due to climate change (Taylor, 2021). Climate-induced events such as tropical cyclones, storm surges, sea-level rise, coastal erosion, extreme weather, and changing rainfall patterns pose significant threats to infrastructure in the Pacific (Kumar & Taylor, 2015). These impacts range from immediate and acute damage to long-term challenges in maintaining habitability, access to critical services, and overall community resilience (Latai-Niusulu et al., 2020). The vulnerability of infrastructure in the Pacific to climate change necessitates a comprehensive approach that considers the interconnectedness of different sectors. It is crucial to develop adaptation strategies and implement resilient measures across infrastructure to ensure the sustainable development and well-being of PICTs.

PICTs face a number of challenges in building and maintaining infrastructure. Firstly, the geographic location within the Pacific rim of fire exposes PICTs to extreme natural events such as earthquakes, tsunamis and more recently volcanic eruptions. Coupled with the increasing intensity of anthropogenic climate change, the impacts of these extreme natural events will only be magnified. These natural events can destroy public infrastructure, devastating economies, with the poor and the most systematically excluded, being the most affected. Secondly, issues related to governance, transparency and accountability hinder the ability of PICTs to access finance to build and maintain infrastructure that can withstand the impacts of the climate crisis.

The majority of PICTs have a high percentage of shoreline in relation to land area which makes infrastructure particularly vulnerable to the effects of the climate crisis, especially cyclones and rising sea levels (Rockwood et al., 2015). Cyclones have increased in intensity and frequency as part of the climate crisis. In 2016, Tropical Cyclone Winston left a wake of destruction with Fiji bearing the brunt of the damage. The cyclone caused an estimated total damage of US$1.4 billion, leaving thousands without a home and claiming the lives of 44 people. A year prior, Cyclone Pam was noted as one of the worst natural disasters in Vanuatu and also affected Kiribati, Tuvalu, Solomon Islands, Fiji, New Caledonia and New Zealand. A study by Fakhruddin et al. (2015), assessed the vulnerability of infrastructure to climate change in Samoa using data from a Cyclone in 1991 to estimate damages to roads of US$22 million and damage to bridges of US$3.6 million.

Increasing urbanisation, primarily in coastal areas, has exposed more people to the impacts of the climate crisis (Bryant-Tokalau, 2018). This urbanisation has also altered the landscape of PICTs where rivers have been dredged or diverted and this has increased the incidence of flooding without proper planning. Brown et al. (2017), used 2012 flood data from two rivers in Fiji to project economic losses in Fiji.

Their study reveals that a moderate climate-change scenario is anticipated to result in annual economic loss of FJ$76.5 million. Similarly, a climate change scenario conducted by the World Bank estimated that the economic cost of climate change due to loss of land and infrastructure due to inundation for Kiribati to be US$430 million by 2050 (World Bank, 2000). The same study suggests that under a worst-case scenario, the village of Buariki in Kiribati could be inundated by 2050 along with 77% of roads and 59% of structures. Tuvalu for instance, is a low-lying atoll country that is highly vulnerable to marine flooding. And while seawalls are an option, Bettington et al. (2017) state that seawalls are too costly for PICTs such as Tuvalu. They recommend the use of large geobags filled with either reef top or dredged sand reserves as a more economical solution.

Infrastructure projects such as building seawalls, levees, desalination plants or dams to name a few are becoming regular features of climate adaptation strategies for many PICTs (Mackey & Ware, 2018). Recent studies have referred to upcoming infrastructure projects as the adoption of a 'no regret' or 'low regret' adaptation measure, wherein the emphasis is on the adjustment of development pathways and sacrificing of short-term economic gains if climate scenarios materialise (Haddad, 2005; Heltberg et al., 2009; Mackey & Ware, 2018).

Governments of PICTs must grapple with the financial, economic and social costs of climate change from sea level rise, natural disasters and climate-related displacement and relocation (Brown et al., 2017). Because of the low economic base of most PICTs and the need to access finance for infrastructural development projects, PICTs have adopted/adapted/developed innovative financing solutions. However, infrastructure development across PICTs is highly dependent on other countries and development partners in the form of grants or loans. Each PICT has specific circumstances and must make difficult budgetary decisions on infrastructure development. This discussion is taken up in more detail in Chapter 17.

Insurance is a product that helps manage the multitude of risks that we face in our everyday lives and given the pervasive impact of climate change, and the risk it entails, new climate-change related insurance products have been introduced for PICTs (Jain et al., 2022). The main challenge is making these insurance products accessible to the informal sector and to the most financially vulnerable. Climate-induced insurance for the informal sector is extremely high due to lack of state or institutional support and high transaction costs. Ramchandran and Masood (2019) report that only 3% of businesses and 1% of households in low and middle-income countries have insurance against catastrophic risks, where in the developed world, this figure is 30% for businesses. In 2021, the United Nations Capital Development Fund-led Pacific Insurance and Climate Adaptation Programme (PICAP) launched the region's first climate risk parametric micro-insurance product (UNDP, 2021). The product covers for cyclones and floods carrying a maximum coverage of FJ$1,000 which will be paid out within 14 to 21 days following the disaster.

The majority of these effects, and proposed interventions, are in the realm above the surface in the diverse economies ice berg or coconut. It is important to reveal the Indigenous innovation, solidarity and resilience that exists below the surface and it is to this that we turn next.



> “10 % hybrid and 90% of the households are traditional materials. Most households use traditional materials because it is cheaper considering the economic challenges and durability of modern materials in such an environment. It is much cheaper to maintain traditional materials than the modern ones in artificial islands. However, maintaining these traditional built houses in more frequent adverse conditions is even more challenging and stressful. We have to do frequent repairs and more adjustments to maintain our homes from being destroyed”
>
> Elizabeth Basui
> Firifau
> Malaita
> Solomon Islands
> (POCCA research team interview, 2023)

Picture of a traditional house in Firifau, Solomon Islands, that is often inundated with saltwater during high tide and storms (Photo: POCCA team).

15.3 Indigenous responses - innovation, solidarity and resilience

As has already been demonstrated, the climate crisis has and will profoundly impact socio-economic and infrastructural development in the Pacific. However, it is possible that the impacts will be more severely felt in industries that are reliant on the global economy, and developmental support from above, rather than those activities organised from below based on the existing and enduring strengths of Indigeneity in each place. For that reason, in this section we focus on Indigenous economic responses to the climate crisis, namely, Indigenous innovation, solidarity and resilience. We do so in line with the diverse economies' framework established above that seeks to surface otherwise obscured economic practices.

15.3.1 Indigenous innovation to enhance socio-economic resilience

In a mainstream approach, innovation is often reduced to individuals innovating within the mainstream economy for profit. In contrast, Indigenous innovation can be considered a collective endeavour towards collective wellbeing. Indigenous Peoples have always been innovators, but colonial interests have obscured this innovation, and climate science and policy are no exception. Eurocentric representations of Indigenous peoples as backwards and uncivilised have been dominant since European imperial expansion (Fry, 2019). This also applies to the concept of 'innovation' with the technologies introduced by colonists often put forward to justify colonialism, and erase and replace the existing innovations in place that had been developed by Indigenous Peoples across generations. At best, this represents a profound inability to recognise and understand innovation essential for sustaining Indigenous livelihoods. At worst, this is an example of systematic racism to advance colonial interests (Vunibola & Scobie, 2022).

A range of examples of Indigenous innovation as climate adaptation, mitigation and resilience appear in the literature and a lot more community practices are not documented. Examples of Indigenous innovation include navigation (Irwin & Flay, 2015); housing (Fujieda & Kobayashi, 2013); agriculture (Gegeo, 1998; Vunibola & Leweniqila, 2021); weather forecasting (Veitayaki, 2006; Chand et al., 2014) and governance (Parsons et al., 2021).

Vunibola and Scobie (2022) document the case of Aviva Farms, which transformed their operations in response to the limitations of the conventional development model. This transformation required the typical innovation characteristics of an entrepreneurial spirit, leadership and risk taking, but was informed by Indigenous knowledge and embedded within a wider set of obligations to people and place. In particular, the concept of solesolevaki (communal reciprocal living) guided decision-making as part of this type of transformational practices (Movono & Becken, 2018; Steven & Vunibola, 2022).

The transition back to Indigenous agricultural practices from the mainstream monocropping approach was no easy journey. The transition required re-growing 20 species of native trees for fruit, medicinal purposes, and to protect topsoil. Climate-resistant crops including kumala (sweet potato), uvi (tropical yam), taro, and giant taro were planted. Transforming the farm to have a more diverse range of both traditional and exotic trees and crops grown together also supported carbon sequestration and decarbonisation (Peichl et al., 2006).

In addition, Aviva Farms diversified their activities beyond agriculture to include education, consulting, tourism and nursery operations, making them more resilient to climate disruption. In 2016 for example, their papaya crop was destroyed by Cyclone Winston, but because of the other activities, Aviva Farms was able to stay afloat. Asan organisation embedded within the community, its resilience is heavily co-dependent with the survival of the community. Because the diversified Aviva Farms was now more resilient to climate disruption, this had some positive impact on the surrounding community.

More examples of Indigenous innovation to build socio-economic resilience occurred within the Yaro Village on Kia Island in Fiji. The 2020-2021 category 5 cyclone Yasa annihilated houses and structures in the village and was likened 'a' war zone' (RNZ, 2020). The cyclone also destroyed the village water systems, including the plastic tanks and piping systems supplied by the Government of Fiji's rural development initiative. Following the cyclone, solesolevaki was the means of rebuilding life in the village as various groups carried out specific activities, including ensuring fresh water was available. The following was shared by a village elder Aisake Katonibau:

> After the cyclone, one will never realise that people survive the destruction. We have no choice but to work collectively using solesolevaki and rebuild Yaro village. Solesolevaki includes those who get food and preserve them, clearing debris, erecting make-shift shelters and fetching fresh water. Remember, this island is so dry, and securing fresh water is an issue. We used plastic water tanks harvesting water from our roofs, now all destroyed (Personal communication with Aisake Katonibau, 2022).

The group in charge of securing water had a discussion with their elders, reflecting on the stories of how their ancestors were accustomed to climate catastrophe living on a tiny island in the South Pacific Ocean. The ancestors drew from two underground water holes, namely vure ni sisili (bathing spring) and vure ni unu (drinking spring), but they had not been used recently because of the water tanks provided by the development initiative. The springs, cradled by huge boulders, were cleared and had been the primary water source for the villagers, one of which was concreted later on to provide stability to the rock walls.

The rock walls show the innovation of their ancestors transporting and fitting huge boulders into place without modern tools. Reconnecting with these springs of the ancestors, was pivotal for the resilience of the community in the aftermath of the cyclone that wiped out their water tanks. They continue to provide water for current generations and stood both the test of time and the test of escalating climate disruption (see Figure 15.3).

During talanoa in Yaro village, the destruction to existing housing stock sparked reflection around Indigenous methods of thatched roof houses and outrigger canoes. For vale va'aviti (thatched houses), elders still remember and refer to neitou salusalu ni matavura (the flowers of our shores). This describes how colourful coral reefs used to be located around the village shores but are not there anymore.

> I had been thinking about this much. Our village is on the slope since there is not a lot of flat space to build houses. Everyone nowadays builds modern houses with roofing irons, and during heavy rain, all waters collected by the rooftops flow down into the ocean like creeks which take sediments and smothered coral reefs (Personal communication with Taniela Maafu, 2022).



Figure 15.3: *Vure ni sisili - bathing spring (left) and vure ni unu - drinking spring (right). Source: Suli Vunibola 2022*

Villagers continue to reflect on the possibility that modern construction practices are impacting on their surroundings and, in this case, the depletion of colourful coral reefs used to beautify the ocean near the village. The talanoa also surfaced how thatched houses previously absorbed and reduced the force of rainwater compared to the iron rooftops on modern houses. The force of a category five cyclone can easily tear houses apart, whether thatched or iron roofed, with dangerous debris fly around the village, causing destruction and huge amounts of noise:

> It was a frightening experience (cyclone Yasa), the strongest cyclone we ever experienced on this island. The destruction and the psychological impact (referring to the sound) of the debris including woods, roofing iron and everything else flying around the village at a tremendous speed (Personal communication with Selina Ciba, 2022).

Many elders had never seen destruction such as that of cyclone Yasa in their lifetimes (despite many cyclones) because they described those thatched houses tilt to the side or dropped straight to the ground without the severity of flying debris associated with iron roofs and related materials. Katonibau explained:

> I was brought up here all my life, and cyclones are part of who we are. Every year our elders will talk about preparing for such catastrophes. From my experience, thatched houses are safe during such times, and the materials are light compared to modern ones. We will again live in a house in a matter of days by repairing or just fixing the posts, but after two years of the cyclone, people are still struggling to buy materials and build modern houses. What will happen if the new modern house is again destroyed by another category five cyclone in the future? We need sustainable solutions (Personal communication with Katonibau, 2022).

Witnessing the struggles faced in the village, the people of Yaro are discussing opportunities by looking back to the innovations of their ancestors. The Indigenous knowledge systems and innovation capabilities engineered into water sources and thatched houses, respond to the ongoing occurrence of climate-induced disasters. They encompass possibilities for how to support collective wellbeing during such times. Indigenous innovation has endured under the surface, and examples such as these will continue to resurge as escalating crises reveal the shortcomings of the dominant development paradigm. In many cases, these innovations are in service of solidarity, kinship and collective resilience, and it is these that we turn to next.

15.3.2 Indigenous economic solidarity and kinship

Indigenous Peoples develop Indigenous economies within their own understandings of development, with attention to solidarity and kinship (Steven & Vunibola, 2022). This is in contrast to planning development projects or business initiatives from outside that miss local nuance (Scheyvens et al., 2020). Many Pacific peoples engage with the market economy to support social obligations rather than profit (Curry & Koczberski, 2013). Indigenous exchange, gifting, and reciprocity enrich quality of life and people's social status while still ensuring sufficient surplus to maintain operations. Curry (2003) finds a strong relationship between Indigenous gift exchange and Indigenous labour, working alongside market relations to enhance the 'effectiveness' of both.

A mainstream economic perspective will divide Indigenous economies into market and non-market activities. A diverse economies perspective considers how Indigenous groups engage with economies in diverse ways while maintaining their values and social networks (Amoamo et al., 2018; Bargh, 2012). This leads to a more nuanced understanding Indigenous economies. In the Pacific, this has been demonstrated in several case studies: the vanua entrepreneurship model in Fiji (Farrelly, 2009); wantok small business developments in Choiseul Province, Solomon Islands (Leokana, 2014); solesolevaki in Fiji (Movono & Becken, 2018; Steven & Vunibola, 2022; Vunibola et al., 2022) wanbel in PNG (Steven & Vunibola, 2022); and Barter for a Better Fiji (Finau & Scobie, 2022). All of these cases recognise Indigenous obligations and practices as essential to the success of a business and the functioning of Indigenous economies. None of this would be captured in a conventional analysis of capitalist relations.

There are diverse local economic practices all over the Pacific, as people make their livelihoods in the context of the climate crisis. Many of these practices are based on natural resources used to supplement livelihoods beyond what the market provides for food security, traditional ceremonies, and as a form of income. For example, in Tonga, diverse livelihoods depend on solidarity and kinship.



Figure 15.4: *A banana farm near Nukualofa (left), a mixed crop farm at Fahefa village (middle), a piggery showing, the food division for processing export commodities in Nukualofa (right). Show diversified economies based on natural resources in Tonga. Source: Suli Vunibola, 2023*

As shown in Figure 15.4 (pg 18), from Tonga, village-based primary industry contributes to economic diversification, which is also enhanced by the relationship with the diaspora community who live overseas. Local farmers plant crops on their family land, collectively harvest, and carry out post-harvest handling, including packing, biosecurity, and customs processes. The villagers follow the same export processes, especially women who weave fine Tongan mats and make tapa (Figure 15.5). These products are sent to their diaspora relatives who either distribute among themselves or sell them and remit the money back to Tonga. This is a new way of looking at remittances: a reciprocal practice where profit accumulation is not the motive but maintaining relationships and supporting livelihoods with their people back in Tonga. It also ensures culturally relevant practices using artefacts and food for diaspora communities who live away from home.

However, some of these activities are at risk as a result of climate change as expressed by a Tongan villager:

> Fine mat weaving is a form of economy for the women in various villages in Tonga. This is our base of operation since we know weaving and the skills, and we also have the pandanus plants here with us. Our families who live overseas are our main market. This has been going on for a very long time, but now we also realise that this activity is also under threat by the impact of climate. The pandanus plants are struggling to grow due to fluctuating weather patterns. For instance, we need longer, straighter pandanus leaves for the mats, but nowadays, we struggle to find good lengths of leaves and good quality leaves. It slows the process of weaving, which means the completion rate is lower, which entails more work and less money for us. (Participant 1, March, 2023)





Figure 15.5: *Women weaving fine Tongan Mats at Fahefa village (left), a paper mulberry farm for tapa making near Fahefa village (right). Source: Suli Vunibola, 2023*

Pacific solidarity economies are often embedded in place. Spiritual connections to land and ocean are crucial parts of Pacific identities, but these identities are evolving within and against the climate and other crises. For example, in Tonga, 'Ata'ataa Island (Figure 15.6) was destroyed by the 2022 Hunga Tonga-Hung' Ha'apai volcano eruption and tsunami. The government mandated the relocation of the village to a new village called 'Ata'ataa Sii near Tongatapu. The villagers regularly travel back to the island as their form of economy includes fishing and planting crops, which they are unable to do in the new village as the land area is too small. This is captured in the sentiments below:

> Our umbilical cords and embryo are buried on the island, and that's our spiritual connection to our spiritual mother, which is the land and the sea on 'Ata'ataa Island. That connection allowed us to keep travelling back and preserve what we had and use enough to support our families and part of that involved selling some of the produce at the Tongatapu market. (Elder Participant 2, March 2023).

The villagers of 'Ata'ataa now live on the mainland of Tongatapu but are still connected to their homeland, and that highlights how spirituality and connectedness support their economic practices through an extensive form of kinship between people and place.

These connections to place through kinship are not limited to those who live in that place. Forms of solidarity economy ripple outwards into diaspora communities that are part of the web of kinship. Village and town kava clubs contribute to fundraising for social obligations and other community-driven development initiatives.



Figure 15.6: *The deserted 'Ata'ataa Island but still revisited by villagers for fishing and gather crops to support families in their new village.*
Source: Suli Vunibola, 2023.

A participant reflected on the skills of his ancestors who built homes from scratch in Tonga and wonders why he and his community struggle to own a house despite that history. He believed that building a home can be accomplished and remains hopeful. He is part of a Tongan kava club where members gather to socialise and drink kava and contribute money towards a collective goal of owning a home, paying university tuition, building community halls and more. This is also done in New Zealand, Australia and the USA, where Tongan communities come together to share, and pool resources (see e.g., Pulo, 2023). It is a form of social protection wherever they are:

> I would like to take a moment to talk about the power of community and the importance of working together towards a common goal. At the Kava club, we discuss progress and take action to support our families. However, it is not just about helping our own families, it is about empowering each other and recognising the value of working as a team. Our community spirit is what keeps Tongan families close here. With the rising cost of living, we must develop innovative initiatives based on our ways of life and Indigenous practices to help our community. When we work together, we can achieve great things. By supporting one another and pooling our resources, we can create a better future for ourselves and future generations. The kava club is a perfect example of the strength of our community and the positive impact we can have when we work together towards a common goal. So, let us continue to build on this spirit of togetherness and use our collective strength to create a brighter future for all. We have nothing but to work together in response to the climate change challenge. (Participant 3, March, 2023).

These economies based on solidarity and kinship build on the innovative possibilities in Indigenous communities, in service of a more holistic understanding of resilience. While emerging from contemporary manifestations of Indigenous perspectives, it is also worth noting that, for example, Barter for a Better Fiji was established by a group of women, and the solidarity practices of weaving in Tonga are driven by women. Too often the formal economy (above the surface) has erased the contributions of women and gender minorities to economic development. We seek to reverse this erasure in this chapter to highlight Indigenous and gendered economic practices as of value. This understanding contradicts the deficit framing of Indigenous Peoples and especially Indigenous women, as marginalised victims and instead embraces the possibilities bubbling under the surface.

15.3.3 Indigenous economic resilience against climate change

Indigenous resilience is fundamentally about counteractions within the diverse contexts of vulnerability. Traditionally, resilience captures a system's ability to endure and tolerate changes and shocks, a term coined in the 1970s (see Holling, 1973). This is an important concept for climate-related scholarship. However, resilience takes many shapes throughout multiple disciplines. It is a term which resonates across physical and social sciences, and more so in Indigenous knowledge. According to Garcia et al. (2022), resilience also has a socio-political dimension linked to societal power relations and inequity due to global historical factors.

Weaver (2022), acknowledges that most working definitions of resilience include vulnerability and marginalisation as defining characteristics of Indigenous peoples. Resilience continues to be developed in a cauldron of trauma, hurt, and damage. The most promising way to depart from this deficit view is to interrogate and break the barriers and inequities proliferated by colonial structures and worldviews. These structures and worldviews are devious, invisible, and accepted as the norm. Indigenous resilience needs to progress and challenge these normative constructs to promote equity. In the case of the climate crisis in PICTs, supporting resilience should reflect that trauma and damage are only a small component of the story and that resilience and self-determination accomplish this complex picture (Weaver, 2022).

Two case studies of Indigenous economic resilience are outlined in Steven & Vunibola (2022). These authors highlighted the resilience of entrepreneurial settings in the Pacific because they drew from Indigenous notions of solesolevaki and wanbel (in one mind or collectivity). The Indigenous enterprises pooled resources including land, finance, Indigenous knowledge systems to work the land, time, and collective effort to establish ventures (without depending on external financial support). The enterprises range from tourism to agriculture, running their businesses and serving their communities in multiple ways. Indigenous resilience in these scenarios is twofold. Firstly, the resilience of the enterprises relies on assistance from and relationships with communities. For instance, tribal members would provide manual labour and crop planting materials after tropical cyclones to assist in rehabilitation of Community projects and other forms of livelihood. Secondly, these enterprises acknowledge that their success is deeply related to the community's success and consider their contributions to community development a vital part of their business model, including providing employment, scholarships, and contributions to socio-cultural obligations.

Another case study of resilience is illustrated through WASH in Fiji (Vada et al., 2021). The COVID-19 pandemic and increasing occurrence of natural disasters have had immediate and devastating impacts on tourism in Fiji.

More specifically, these events have highlighted the importance of maintaining good hygiene in locations where many people meet and interact, such as those in the tourism sector. To navigate the 'new normal' and provide reassurance to tourists and visitors that PICTs are a safe and popular tourism destinations, it is critical for tourism stakeholders, government and communities to deliver a clean and healthy environment for both staff and visitors. Low risk of illness, minimal pollution levels and fit and healthy staff in the tourism sector are critical to ensuring tourism flourishes during times of crisis. To maintain environmental and public health requires the provision of clean WASH facilities that can be accessed by all (women and men of all ages, as well as people with disabilities as hotel visitors and within the surrounding community). Without effective destination-wide WASH, tourist illness can lead to unpleasant experiences and create a negative image of Fiji as a tourism destination.

As part of the Australian Department of Foreign Affairs and Trade Water for Women funded project 'Engaging corporate actors in inclusive water, sanitation and hygiene', guidelines for hotels, government and communities in Fiji were developed to improve the resilience of communities and the sustainability of gender equality, disability and socially inclusive WASH services during the COVID-19 pandemic and climate-change related disasters. The formative research findings found that while hotel staff report practicing good hygiene at work, this did not always translate to the home setting or to other communities. There were also limited facilities designed to be accessible by people with a disability, the elderly, pregnant women or to support women's menstrual hygiene needs.

The rationale for a stronger focus on inclusive WASH in Fiji is that it not only enhances Fiji's competitiveness as a tourist destination via effective hygiene practices, but it also improves inclusive WASH for people in the community, including informal settlements and socially vulnerable groups. Women and girls usually have more household responsibilities such as house cleaning, food preparation and caring for children and the elderly that requires access to good water supply and toilets. Inclusive WASH programmes generated from and for the tourism sector and supported by government can work to ensure good WASH access within and surrounding hotel sites, and enhance knowledge and awareness of effective hygiene practices in the workplace and within local communities (Vada et al., 2021). Although WASH is supported externally, it seeks to build resilience in communities and organisations from the bottom up.

In this section we took a dive under the surface to explore Indigenous economic possibilities innovation, solidarity and resilience as a response to the climate crisis. We did so use a diverse economies framing that situates a multitude of economic practices supporting the tip of the iceberg, or coconut, that is visible above the surface. While these practices stabilise the mainstream economy, they also hold the seeds of possibility for alternatives. These alternatives are necessary for reclaiming the future. As the climate crisis reveals the fragility of the dominant development paradigm, Indigenous innovation, solidarity and resilient economic practices resurface as alternative possibilities. It is essential that climate crisis research and policy takes these possibilities seriously.

15.4 Conclusion and policy implications

This chapter has outlined at a general level some of the existing and predicted economic impacts of the climate crisis on PICTs. It focused particularly on agriculture and fisheries, tourism, and infrastructure. The focus of the conversation then shifted from the relatively mainstream economic analysis that dominates climate and related scholarship to centre Indigenous responses. We focused on the possibilities for Indigenous innovation, solidarity and resilience as alternative responses to the climate crisis. Because of this, it would be a contradiction for us to make policy recommendations from above, when we support alternative responses from below. With this in mind, we provide two policy suggests moving forward:

a. Comprehensive interdisciplinary assessment of the existing and potential impacts of the climate crisis on key mainstream economic activities including agriculture and fisheries, tourism, and infrastructure need to be carried out. Careful planning must be made and resources allocated to either support these activities, or transition PICTs economies out of these activities if the impacts are too severe. Changes need to be done along the lines of just transition, green new deals, and constructive reparations (Klein, 2020; Táíwò, 2022). While these can potentially be supported by innovative climate finance, further financialising these activities and transitions poses future risks that should be approached with caution.

b. That as part of this transition that policy makers, NGOs, climate researchers and communities look to the historical, enduring and possible Indigenous responses to climate challenges that do or can exist. Although the climate crisis has and will continue to affect key activities like agriculture, tourism, and infrastructure, there are possibilities for re-embedding these activities within Indigenous systems of knowledge and governance, that have endured and can be scaled out and up as a response to the climate crisis.



> ‘It will continue and become worse. We abuse the environment. A large truck and a bulldozer came to the beach and extracted as much sand as they could. This hastens sea level rising towards the road’

Verbena Adeang
Nauru
(POCCA research team interview, 2023)

A photo of a receding shoreline in Nauru with dead pandanus plants caused by drought (Photo: POCCA team).

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Chapter 16

Climate Crisis and Cultural Heritage: Conversations

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Levuka Town, Fiji's first capital and a UNESCO World Heritage site, faces the dual challenges of preserving its rich history and culture against the impacts of climate change. (Photo: POCCA team, 2024).

Abstract

There is a complex inter-connectedness between cultural heritage and climate change. In another sense, Pacific peoples' cultural heritage is vulnerable to, and threatened by, the rapidly increasing impacts of human-induced climate change. Importantly too, this cultural heritage forms a strong foundation from which Pacific Island peoples develop resilience and adaptation mechanisms to the climate crisis. In this chapter we adopt a *tok stori* approach, as a series of 'conversations' between different 'voices', or narratives. The people-centred, storied narrative, which is at the heart of the chapter, is in conversation with an 'institutional' narrative of law, policy, and administration. Engaging this 'conversational' approach, our chapter describes, through case studies and other material, the intersections between cultural heritage, Indigenous knowledges, and the climate crisis, and from this, proposes some recommendations for law and policy.

Glossary of key terms

Fa'asamoa	the Samoan way of life
Solesolevaki	communal reciprocal living
Kumala	sweet potato
Uvi	tropical yam
Vure ni sisili	bathing spring
Vure ni unu	drinking spring
Vale vaaviti	thatched houses
Neitou salusalu ni matavura	the flowers of our shores
Mataqali	land owning unit
Wanbel	in one mind or collectivity

> Our heart is here where our ancestors are buried and where our memories of growing up and memories of life exist. For us it's more than just the new life ahead that we need to look into but our connection and history that we have to leave behind. Just heart wrenching and unbearable

Community Participant
Nukualofa
Tonga
(POCCA research team interview, 2023)



A seawall in Tongatapu, Tonga built by the community to protect coastal villages from rising sea levels (Photo: POCCA team, 2024).

16.1 Introduction

The long-held cultural practices of Pacific peoples that can help withstand natural disasters and combat the impacts of climate change include forms of cultural knowledge and practices such as preparation of customary gardens, storing of food and harvesting of wild plants. Customary exchanges, 'kinship systems' and other forms of solidarity or 'social nets' are also means by which Pacific communities mitigate and adapt to climate change (Perkins & Krause, 2018, p.71). Fostering these types of practices can be a way forward to address preparation and recovery. There is also the question of the role of outside relief assistance. For example, Vanuatu, as a country, responded with little foreign assistance to the impacts of Cyclone Harold in 2020 (due to COVID-19). Communities drew on their traditional knowledge, practices, kinship relations and inter-island exchanges led by chiefs to address the consequences of Cyclone Harold. There were lessons learned, from that which can provide better understanding of good practices in recovery as climate change continues to lead to increased numbers and severity of weather events (Humanitarian Advisory Group & VANGO, 2020).

Pacific Island communities have long developed systems and practices to protect themselves from extreme weather events. For instance, although Cyclone Pam that hit Vanuatu in 2015 was the largest ever measured cyclone in the South Pacific (until Winston in 2016), observers were surprised at the low number of casualties. This was in part attributed to ni-Vanuatu forms of traditional shelters, nakamal (meeting houses for ceremonial purposes, and which also act as shelters during disasters) and house designs and to other practices. This Chapter will review documentation and voices of communities in relation to traditional sheltering and 'building back' that draws on cultural knowledge and practices.

Drawing from the examples such as responses to cyclones, the Chapter explores some of the many ways in which Pacific peoples' cultural heritage provides a foundation for resilience, adaptation, and risk management in times of crisis. Significant elements of this heritage that contribute towards this 'shield' include the ancient knowledge traditions, such as voyaging knowledge, seasonal and food-based knowledges, and know-how of traditional building techniques and structures that villages can draw on to mitigate, resist, and ameliorate climate change impacts. We can also look to ways in which age-old practices of story, narrative, poetry, song and dance – the performative and expressive aspects of cultural heritage - come into focus in the climate crisis.

This is not to diminish the urgent need to address the effects of the climate crisis on Pacific cultural heritage. Loss, erosion, and damage, and restrictions in access to cultural heritage, whether it is villages, lands and burial grounds, sacred places, officially designated national heritage sites, national parks and preserved traditional structures, or artefacts and designs, has raised alarm in recent years in many Pacific islands, and in sectors of the wider community.

Pacific communities maintain cultural heritage that has deep cultural symbolism, and the meanings and significance associated with this heritage are transferred through generations by means of genealogical and kinship connections. Pacific customary laws and practices protect this heritage, and national legislation and policy may also offer some form of protection. However, much of heritage receives little to no protection, and is left to the whims of the environment and other external disruptive forces.

This Chapter will also assess the impacts of climate crisis on land and sea as a form of cultural wealth (or 'cultural capital' as it is often denoted in conventional European-derived settings)[1]. Looking at land as cultural wealth offers a vitally important 'shield' for vulnerable communities facing the enormous devastation that the climate crisis brings.

There is no doubt that rising sea levels, and extreme weather events call for urgent actions to mitigate the effects of these on islands and villages, and to strengthen Islanders' capacity for adaptation, risk-management and resilience. Ways of mitigating the impacts of climate change are many and diverse, and must range across all forms of action, from policy at all levels, to on the ground initiatives. At a deeper, conceptual level, it is also important to consider ways in which the climate crisis is thought about, articulated, and embedded in discourse and in philosophies and cosmologies.

16.2 Discussion

16.2.1 Pacific peoples' cosmologies and worldviews

In this chapter, as throughout this entire report, it is important to centre the worldviews of Indigenous Pacific peoples. Some understandings of these worldviews will inform our articulation of how Pacific peoples frame their views on their heritage. In painting a broad picture of Indigenous Pacific worldviews, these can be understood as a family of thought traditions which share certain common features. These assumed features will require conceptualising heritage as integrated, and multi-dimensional, comprising cultural, spiritual, and social (encompassing linguistic relationships and processes), intellectual and material aspects. These features can be illustrated by looking to descriptions of Indigenous cosmology and thought traditions in the worldview of Mala'ita, Solomon Islands (Sanga & Walker, 2012).

Mala'ita, the most populous of the Solomon Islands, has twelve ethno-linguistic groups. Here, Indigenous people have 'dynamic, distinctive and particular ways of seeing and knowing' (Sanga & Walker, 2012, p. 225). In a similar way to other Indigenous peoples, 'to the Mala'itan mind, the human-spiritual realms exist as integrated and interlocking domains. In the Mala'itan cosmology 'the universe is both physically and metaphysically governed' and Mala'itan people 'recognise 'other' inhabitants and accept the interconnectedness of all'.

1. *For example, the Fijian concept of iyau, which is akin to 'wealth', or 'treasure' – (also see Māori taonga).*

In this way, Mala'itan cosmology provides the framework within which people can understand, have respect for, and communicate with, the natural world and maintain harmony between the human realm and the rest of the natural world (Sanga & Walker, 2012, p. 225). This interconnectedness and balance – human and ecological – offer a sound basis for resilience and adaptation to crises such as anthropogenic climate change.

From this brief outline of Indigenous peoples' cosmology and knowledge traditions in the Mala'itan Island of the Solomon Islands, a picture begins to emerge of the importance of understanding these cosmologies and knowledge traditions in forming the foundations upon which Indigenous Pacific peoples can respond to climate emergencies.

16.2.2 Cultural heritage, climate change and Indigenous knowledges: A people-centred, storied approach

Cultural heritage and climate change are in constant movement, like the ocean. There are conversations and there is dialogue between and among them. These conversations also engage with, and are founded upon and embedded in, Indigenous knowledges. Through the many conversations, the chapter acknowledges the distinctiveness and diversity of Pacific Island peoples' cultural heritage, highlighting the importance of local, situated village-based, practices, values and traditions. In a people-centred, storied understanding of cultural heritage and Indigenous knowledges, these are inseparable. One cannot be considered without the other. The multidimensional elements of Pacific Islands knowledge embrace voyaging knowledge, ecological knowledge (including of seasons), knowledge of fishing and foods, of traditional building practices and of artistic and performative expressions. In discussions about Indigenous knowledges, we also need to include ideas around Indigenous place-knowledge, as well as embodied knowledge. In this latter sense, it is important to consider how age-old Indigenous knowledge traditions reside in the human being, as identity and self. As such, what is the role of this knowledge in the contexts of migration and exile, as for example in mobility arising from the climate crisis? Reference can also be made to Chapter 17 for the important question of mobility.

16.2.3 Cultural heritage: Concepts, critique

Cultural heritage, understood within its frame of Pacific cosmologies, philosophies and knowledges, is a storied, people-centred concept. By cultural heritage, we acknowledge its multifaceted character, embracing physical and intangible elements. We also recognise that the concept of 'intangible heritage' is an imposed, European derived one. It is the language of UNESCO and allied UN agencies, often used to distinguish between the physical and the non-physical heritage. Notwithstanding that those organisations include references to the intangible heritage, it is also the case that this dimension of Indigenous cultural heritage is often not recognised or protected in various state laws and policies.

For many Indigenous peoples, including Pacific peoples, the physical (or tangible) and the intangible aspects of heritage are inseparable; they are both embodied in the whole entity that is cultural heritage. For example, in Niue there is a single term for culture/cultural heritage - taoga (taoga Niue- Niuean culture/cultural heritage).

In the European frame, intangible heritage is described in a typological or classificatory way, to embrace a wide range of expressive, performative elements, and includes languages, story, song, poetry, dance, ceremony, and all forms of artistic expression. It also includes the knowledge, meanings, and spiritual and cultural practices associated with sacred and secret sites, areas, places, and objects. The European frame fragments and divides Pacific cultural heritage, to render it amenable to regulation and management within the prevailing politico-legal systems.

However, as stated, for Pacific peoples, as with Indigenous peoples in other parts of the world, all the elements of heritage are inextricably intertwined; they form parts of a whole system, underpinned by customary norms, laws and values. It is also important to acknowledge that Pacific cultural heritage is a living, dynamic system; it is part of everyday life, and connects the spiritual dimension to the world of daily activities. Furthermore, as Henry and Jeffery (2008) remind us, 'heritage is not something fixed and given, but is actively produced in the face of change'. As such, they argue, 'cultural practices and ideas, objects, places, land and seascapes become valued as heritage in the face of their potential loss'. Thus, heritage can be understood as an ongoing 'creative process' reflecting what is important to the peoples it belongs to (Henry & Jeffery, 2008, p. 15).

In considering the concept of cultural heritage we are drawing attention to its formulation and articulation not only in and of itself, but equally importantly in terms of how it is expressed and situated, including historically, in language and discourse. That is, how cultural heritage is written, spoken, and considered in all elements of village life and beyond, including in public policy and law.

We are interested in understanding how cultural heritage as discourse, in policy, in practice, in law and through all levels of its usage, reflects and or is informed by and embedded in, structures of inequality and unequal power relations. In this context, cultural heritage globally, might be viewed within a frame of a Eurocentric, hegemonic discourse that is generally regulated, controlled and managed through dominant authoritative (and often patriarchal) structures and processes. What are sometimes referred to as discursive representations of Indigenous cultural heritage are embedded in, and contribute to, the shaping of the language and terminology of laws, policies and regulatory processes at global, regional and local levels. These discourses can be revealing of and reflect the framework and histories of Eurocentric hierarchical power structures and inequalities in which they have been developed.

Among the many questions that need to be considered in a decolonising, or Pacific people-centred cultural heritage are: whose heritage is it; and for whom, and for what purposes are protection measures developed? There are other equally important questions such as those concerning rights and recognition.

In a general sense, in settler-colonial nations, much of Indigenous cultural heritage has been eroded, marginalised, or removed from their cultural, social, and political contexts throughout colonisation, dispossession and settlement. For Pacific Islands heritage, while these are very significant factors to consider, there have also been different concerns and issues, with cultural heritage having been lost, destroyed or diminished in other ways, including through the impacts of colonialism and missionary influences, among other factors. In regards to the protection of cultural heritage, with which much state driven law and policy is predominantly concerned, it is important to note that Pacific cultural heritage should be understood in terms of its own, intrinsic values and dimensions, embedded in culture and cosmology, rather than only as something that is defined by its being threatened or at risk of destruction or desecration. In this context, we also need to consider the nexus between the imposed, state derived ('European'; bureaucratic) laws, and the existing customary laws and practices.

Heritage is well recognised as a 'slippery' concept that can be defined in a number of ways (Geismar, 2015, p. 72; Shepherd et al., 2022, p. 9), and risks becoming a catch-all term. In many cases, heritage has replaced the term 'culture' in its pervasiveness and application.

Brumann and Berliner (2016, Chapter 1, para. 9) suggest that 'much of what was previously addressed as 'tradition,' 'customs' or 'culture' is now presented under this new and rather voracious label'. For the purpose of this chapter, it is appropriate to briefly consider how it is used and defined, or not used at all. Shepherd et al. (2022, p. 9), in their white paper on climate change and heritage to United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Council on Monuments and Sites (ICOMOS), and the Intergovernmental Panel on Climate Change (IPCC), write that in the context of climate change, there are two aspects of heritage as a concept, the first of which works through three overlapping 'modalities' and the second relates to the scope and meaning of heritage. These definitions are set out in Table 16.1 and can provide a framework for understanding definitions and intersections, as a way of guiding the approach to climate change and heritage in the Pacific Islands.

Heritage Aspect 1: Three modalities of usage		Pacific climate change intersection
Modality 1	Popular usage of heritage (via a Western worldview): to mean identity, tradition, descendancy (culture, language).	Loss of heritage including culture, traditions and language connected to identity and place/land. Noting for many Indigenous Pacific people, ways of knowing and being are not understood as 'heritage,' so policy and action must be informed by local perspectives to ensure relevance, ownership and impact.
Modality 2	Official, legal and institutional usage: focused around definitions and distinctions—like those between cultural and natural heritage, and between tangible and intangible heritage' which informs the work of UNESCO and related organisations such as ICOMOS, and national departments of heritage. i.e 'heritage management,' that aims to create a community of practice and construct stable legal objects for the purposes of management.	Only eight World Heritage Sites, and three Intangible Cultural Heritage designations in the independent Pacific Islands. The extent to which these places and practices can be protected from climate impacts through their global designation is uncertain. National heritage and associated funding, capacity and capability through heritage departments and national parks, and museums is limited and generally not highly prioritised by Pacific Island governments.
Modality 3	The concept of heritage in research spaces: the interdisciplinary field of heritage studies, questions the understanding of 'value 'and 'authenticity' codified in modality 2, aiming to understand the full complexity of our relationship to the past and the present.	In the Pacific context, supporting the use of archaeological and anthropological data and research that is Indigenous-led, participatory and approved by the community, can contribute to mitigation, adaptation in shaping climate futures.
Narrower scope	A duty of care towards old (valued) things, sites and practices. This understanding of heritage directs us to think about practices of stewardship, custodianship, and care.	Bottom up and top-down collaboration for mitigation and adaptation to protect and preserve both tangible and intangible objects of cultural value. Guided by community decisions around what can and should be protected.
Broader scope	Accumulated human wisdom', the sum total of ideas and innovations accumulated through time and across space, across the immense variety of human experience. In this understanding, heritage becomes a kind of archive of our human experience, and we look to how we can draw on this archive to address the problems created and exacerbated by climate change.	The 'kete' or repository of Indigenous Knowledge (IK). Includes the humanities, archaeology, anthropology as well as natural science. The IK kete of cultural industries – the arts including literature, performance, fine arts to enact and express cultural/heritage resilience.

***Table 16.1**: Heritage aspects and their intersections with Pacific islands climate change impacts, definitions from Shepherd et al (2022).*

16.2.4 Cultural heritage and Indigenous Knowledge: In conversation

Critical to considerations of Indigenous cultural heritage, especially in a decolonising context, is the role of Indigenous knowledge (IK). IK is one of many inter-connected components of Indigenous cultural heritage, and these components are not separable, but are inextricably intertwined. In a decolonising critique of cultural heritage, what is, in Indigenous cosmologies, cultural systems and worldviews, a holistic and tightly integrated system of values, laws, codes of conduct, expressions, performances, and ways of knowing, becomes fragmented, dismembered, and compartmentalised within European frames. This fragmentation and compartmentalisation enable the machinery of government regulation, law and decision-making around cultural heritage to be dispersed among different departments and agencies within nation-state jurisdictional arrangements. Very often, these siloed departments and agencies tend to territorialise and protect their own legislative and administrative responsibilities and domains, thereby limiting, or perhaps resisting communication and conversations that can enable cultural heritage to be supported and recognised, protected and preserved, as a holistic entity, aligned with Indigenous notions and concepts.

The large body of writings about IK includes current and emerging issues and debates in policy, legal protection regimes, questions of definition, and the role of IK in development, anthropological and ethnobotanical studies.

The role of IK in the climate change context is still relatively under-developed. Questions involving protection of IK are often also discussed, framing this knowledge as a kind of 'intellectual property', a theme that invites considerable attention in itself. There is also extensive discussion around the characteristics of, and relationships between IK, science, and varieties of local and peoples' knowledge (see for example Davis, 2001; 2006; 2008).

IK, sometimes also referred to as traditional knowledge, or traditional ecological knowledge, or Indigenous ecological knowledge, forms a vitally important part of Indigenous peoples' cultural heritage.[2] The transmission over generations of ancestral knowledge of the natural world is essential for cultural identity and survival. These knowledge systems are vital in Pacific peoples' strategies for mitigating the impacts of the climate crisis, enabling people to innovate and adapt to changing environments and ecologies. Specific climate-related bodies of knowledge also form a large component of communities' knowledge that has been accumulated and transmitted over thousands of years. In one example of this, Malsale et al (2018) examined an innovative scheme in four Pacific Island countries, to document and record traditional climate-related knowledge, as part of an approach to being able to forecast climate change. Patrick Nunn, (in collaboration with others) has documented cultural resilience and Indigenous adaptation to climate variability and coastal change over long periods of history and discussed, mnemonic storytelling and oral traditions about environmental change, sea-level rise and fall and natural disasters across different Pacific countries (e.g., Janif et al., 2016; Nunn et al., 2017; Nunn, 2009).

2. *We will use the term 'Indigenous knowledge' throughout this Chapter.*

16.2.5 Revitalisation of traditional voyaging knowledge

> Transport is Micronesia's greatest heritage legacy. Since their exploration and settlement of the Pacific over the course of millennia, Micronesians excelled in developing and refining sustainable, cutting-edge transport solutions tailored to their unique ocean environment and from a highly limited resource base. The ocean was a bridge, a conduit to connectivity – not a barrier, as it is so often viewed today. The canoe was linked to the divine – a gift from those figures within Marshallese myth who held a discreet and powerful form of knowledge to be stewarded with caution and care (Republic of the Marshall Islands et. al., 2022, p.21).

The ancient voyaging and navigational knowledge and practices form a vitally important aspect of Pacific cultural heritage and Indigenous knowledge. A voyaging renaissance, steeped in cultural traditions, has been expanding across the Pacific for almost half a century. This movement, striving to overturn years of colonial and bureaucratic impediments to canoe travel, has revitalised the knowledge and practice, and is reconnecting young people with their ocean identity and ancestral sailing skills. It is a statement from the region to the world about threats to ocean health, pollution and climate change. Voyaging societies have become 'ambassadors of climate change awareness' (Cook Islands Voyaging Society, 2018) driving advocacy through multiple initiatives. These initiatives include:

- Hawai'i's Hōkūlea's round the world voyage, Mālama Honua from 2013 to 2019 and the current Moananuiākea voyage (2023-2027);
- The Mua Voyage to International Union for Conservation of Nature (IUCN) World Parks Congress in Sydney in 2014 where voyaging crews from the Cook Islands, Fiji, Samoa, Tonga and Aotearoa brought the Pacific Call for Global Action (Cook Islands Voyaging Society, n.d);
- Fiji's Uto ni Yalo Trust's capacity building of, and training for, island communities to use contemporary drua (double-hulled canoes) for daily transport of cargo and people;
- The Vaka Taumako Project in the Temotu Province of Solomon Islands and Wa'agey Canoe organisation in Yap's revival of traditional sea transport;
- Palau's navigational education programs conducted by Sesario Sewralur, son of the famous master navigator Mau Piailug (Island Times, May 14, 2019); and
- Samoa's Gau'alofa work fostering Guardians of the Ocean through citizen science and education bringing together traditional and contemporary knowledge to assist in improving management of marine resources and 'improve local resilience to climate change' (Conservation International, November 30, 2022) in partnership with Conservation International.

The reinvigoration of traditional navigation and canoe culture has not only raised awareness of climate change; it has also led to the Pacific region participating actively, and in some cases driving, sustainable and low carbon sea transport both regionally and globally to reduce dependence on fossil fuels.

The Republic of Marshall Islands (RMI) has been a leader in this area, drawing on its ocean and navigation heritage. Waan Aelõñ in Majel (WAM- Canoes of the Marshall Islands), an organisation established in 1996 by Alson Kelen and Dennis Alessio has been revitalising Marshallese navigation and sailing culture (Genz, 2018) through the building of traditional canoes and training of young people to sail. Since 2018,

WAM has focused on decarbonising local transport by building contemporary, hybrid proa and catamarans, 'climate friendly' vessels (Burns, 2020) drawing on Marshallese traditional canoe technology, for use across the islands for fishing (proa) and as transport for people and copra (catamarans) in partnership with the Marshall Islands Shipping Corporation and the Micronesia Centre for Sustainable Transport, with assistance from GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) as part of Germany's International Climate Initiative, and with more recent support from the National Energy Office (See https://changing-transport.org/film-sustainable-maritime-transport-in-the-marshall-islands/). WAM is working closely with traditional canoe and boat builders from across the RMI and testing out prototypes that are suited to the different islands' marine and weather conditions. The work includes training in maintenance and operation of the canoes. In Alson Kelen's words: 'We're Ocean people. It's time we go back to what we know and save our tiny islands' (Johnson, 11 November 2022).

WAM's initiative is a component of RMI's focus, articulated through its National Decarbonisation Framework, Rebbelib 2050: A Catalyst for Change, to transition towards full decarbonisation by 2050. Through its collaboration with GIZ, RMI will be receiving a first of its kind wind-propulsion cargo ship, the SV Juren Ae (a Marshallese term for a traditional outrigger canoe paddle), built in Korea, to be used mainly within Marshallese domestic waters. Alongside its domestic ambitions, the RMI has been leading efforts since 2015 (Corbett et al., 2020) at the International Maritime Organisation (IMO) to push the global shipping industry to reduce the use of fossil fuels and increase energy efficiency including through the adoption of a green-house gas levy.

The RMI, joined by Kiribati, Solomon Islands, Tonga and Tuvalu have been the architects of a proposal to introduce a 'levy on ships starting at US$100' per tonne of carbon 'emitted from ships' as well as a 'new fuel standard' that would eliminate fossil fuels (Fotheringham, 14 June, 2023). Negotiations at IMO were not as successful as hoped (see for instance Altman, 2023), but steps towards reduction of greenhouse gases in international shipping have been made and what is important to note here is the significant contribution of the Marshall Islands' IK and ocean heritage to generating innovative and forward-looking solutions and addressing the climate crisis.

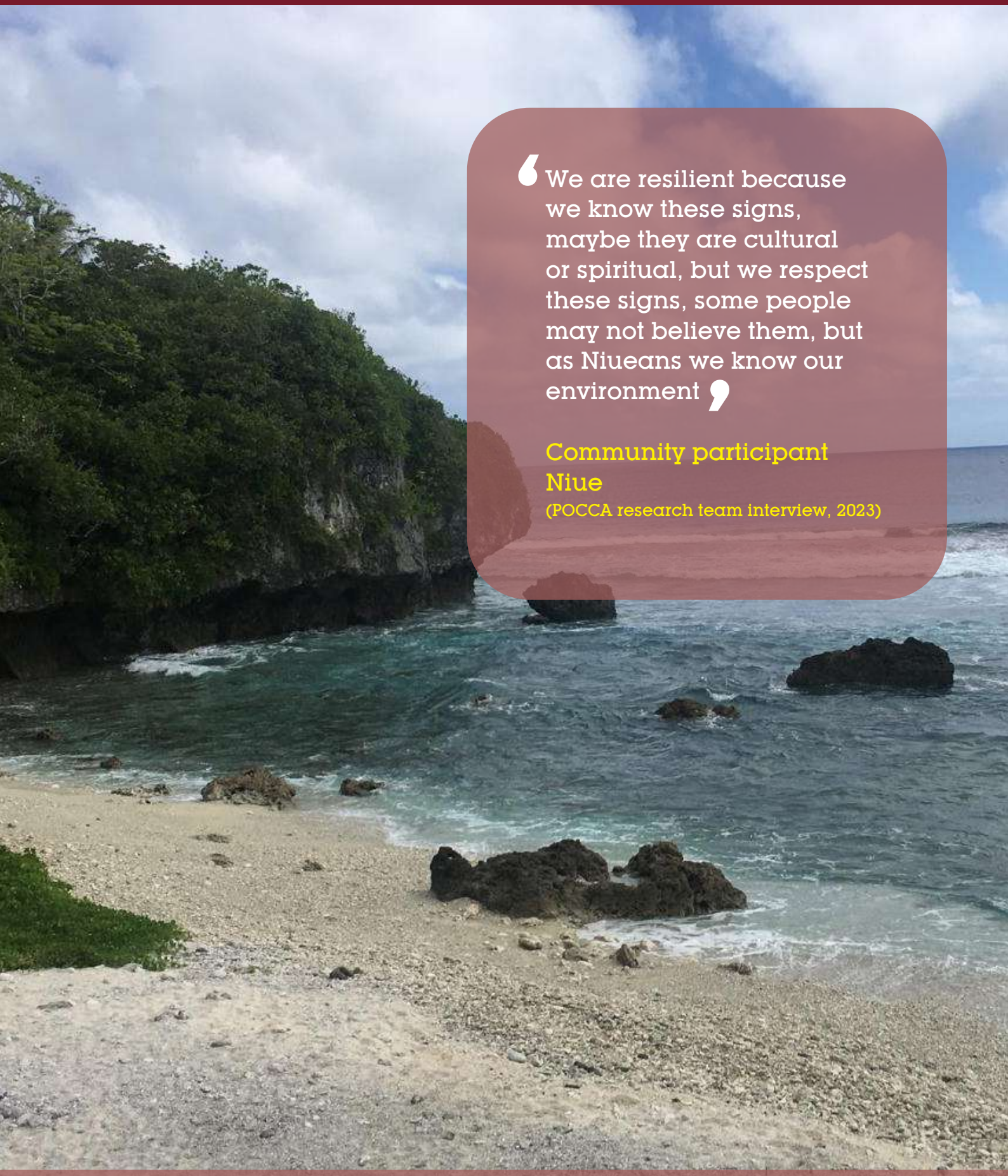
In an example of the conversations between things that guides this chapter, while the Marshallese example demonstrates the relevance and resilience of navigational heritage, climate change itself is impacting navigational knowledge culture. As described by Master Navigator Larry Raigetal, founder of Wa'agey Canoe organisation in Yap, navigational knowledge is being affected by changing weather patterns. At the time, there has been as yet little assessment of the impact of climate change on traditional navigation, but working with voyaging societies to better understand changes in ocean and weather patterns would be invaluable.

The ancient local, village-based knowledges and practices are vital to the development of patterns of resilience and adaptation in the face of climate change. A question remains though, is how do these people-centred approaches and practices resonate, or relate to the wider global context of heritage protection regimes by the various United Nations agencies, and regional ones?

16.2.6 Global cultural heritage protection

Turning to the global arena, the protection of cultural heritage from threats and disasters is articulated to an extent in international legal regimes, including through the role of the Special Rapporteur in the Field of Cultural Rights (Karima Bennoune) under the Office of the Human Rights Commissioner of the UN.3 Internationally, there have been measures to address risks to cultural heritage due to disasters (natural and human-induced) which are relevant in the context of addressing the impact of climate change in the Pacific Islands. Such measures are embedded in the many reports, guidelines and frameworks published through institutions such as UNESCO, ICOMOS, ICCROM, as well as by the World Bank and UNDP, in the context of disaster risk reduction and management. These guidelines and frameworks are tools to address the consequences of climate change. This chapter considers their applicability in the Pacific Islands contexts, how countries are drawing on them, in what timeframes, and how effective they have been, or are currently, in providing effective protection for heritage. The 1972 UNESCO Convention Concerning the Protection of the World's Cultural and Natural Heritage 'recognises the way in which people interact with nature and the fundamental need to preserve the balance between the two (UNESCO, 1972; see also Garcia, 2020, p. 102).

3. See her 2020 Report, at https://www.ohchr.org/en/documents/thematic-reports/a75298-report-climate-change-culture-and-cultural-rights.



> “We are resilient because we know these signs, maybe they are cultural or spiritual, but we respect these signs, some people may not believe them, but as Niueans we know our environment”
>
> **Community participant**
> **Niue**
> (POCCA research team interview, 2023)

Niue's coastlines at risk from rising sea levels and coastal erosion and sea level rise (Photo: POCCA team, 2024).

While this international instrument offers a critically important framework for protection, the focus needs to be at regional and local levels to understand how communities and their jurisdictions can develop strategies to protect cultural heritage from the impacts of climate change, as they understand and view it. A focus on local level protection is also essential, in the context of some conceptual problematics concerning notions of 'heritage' that are embedded in the international instruments, as the discussion in this chapter illustrates.

As stated, in considering the body of international instruments for heritage recognition and protection, it is most important to examine the application of these at local levels. For example, from 2015, heritage has been included in global policies such as the Sendai Framework for Disaster Risk Reduction 2015-2030[4] and in the Small Islands Developing States (SIDS) SAMOA Pathway. SIDS are a group of 39 States and 18 Associate Members of United Nations regional commissions that face similar environmental and social challenges.[5]

It will also be necessary to review the ways in which cultural heritage protection has been included in the work of other world bodies such as the World Bank[6]. The relative effectiveness of bodies such as UNESCO in providing real protection for cultural heritage needs to also be critically examined. The effectiveness is likely to be subject to many factors, including the ways that the machinery of global protection regimes and administering bodies functions, as well as the roles that other jurisdictions (State or national, regional, and local) have for a particular inscribed World Heritage site. Other factors include funding and resources, and overall capacity of these bodies to provide for rigorous heritage protection and management. The relative paucity of registered World Heritage sites, and Intangible Cultural Heritage (ICH) designations also may mitigate against the effectiveness of these bodies. For the Pacific region, East Rennell has been identified in IUCN outlook report (in 2020) as in 'critical' condition in terms of losing its 'universal value' due to site deterioration, and Nan Madol in Pohnpei is also considered 'in danger' and we also know that most sites in the Pacific are potentially at risk from the climate crisis.

4. The Sendai Framework was adopted at the Third UN World Conference on Disaster Risk Reduction and established goals and targets for states, in collaboration with civil society and the private sector, to reduce disasters impacts. It recognises the importance of cultural rights and cultural heritage and the role of Indigenous and local communities and their knowledge in DRR. See https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030.

5.On Small Island Developing States see https://www.un.org/ohrlls/content/about-small-island-developing-states.

6. The World Bank has produced a framework to address disaster and has increasingly considered culture as important for rebuilding– see for instance, https://www.worldbank.org/en/news/feature/2017/12/07/drmhubtokyo-knowledge-program-resilient-cultural-heritage-and-tourism; https://documents1.worldbank.org/curated/zh/306991493101225270/pdf/114520-WP-PUBLIC-ADD-SERIES-pdna-guidelines-vol-b-culture.pdf; and https://openknowledge.worldbank.org/entities/publication/f465176a-3d30-5440-9af9-da9dd3fedf34.

The guidelines developed by UNESCO and other entities are useful in as much as they have helped get culture and heritage included in Post Disaster Needs Assessments (so far Vanuatu with TC Pam, Samoa with TC Evan and Fiji TC with Winston). In this way, they can provide some direction, and are useful to departments of culture, as a basis upon which to apply for funds to help rebuild or support communities (for instance with replanting pandanus, establishing community nurseries, rebuilding destroyed heritage buildings or housing - such as Navala village in Ba, Fiji). These guidelines are needed at national level for culture to be funded in the face of disasters – that is really their function. They can help departments of culture make a case for more support at government level (as well as through development partners) and, in turn, strengthen the culture sector and human resources in the sector, for example through scholarships (there is a need for more people working in the sector who can also influence cross-sectoral development), so it becomes a kind of a 'snowball' effect.

In the international system of recognising and framing 'heritage' under definitions adopted by UNESCO, there are two main categories of designation: tangible heritage, which is governed by the World Heritage Convention for the Protection of the World Cultural and Natural Heritage (1972); and intangible cultural heritage (ICH), which falls under the Convention for the Safeguarding of the Intangible Cultural Heritage (2003). The definitions embedded in these instruments are as implied; with tangible heritage encompassing the physical domain of heritage, and ICH pertaining to the knowledge, practices and performative or expressive aspects, that are part of cultural heritage. The division between tangible and intangible representations of culture is based on the dualistic view permeating modern Western thought, that culture and society are not only separate from nature, but that they are dominant over it in a hierarchical structure (Byrne et al., 2013). But it is well understood by heritage scholars and practitioners that it is intangible heritage that brings value to tangible heritage (and vice versa, e.g., Pearson et al., 2021). As we emphasise in this chapter, for many Pacific Islands people, nature and culture, tangible and intangible heritage, cannot be understood as separate domains. People are connected to the cultural, natural, and supernatural through vanua/fenua/fonua/'enua which is central to how many Pacific people understand and relate to the world (Hau'ofa, 2008). Efforts to recognise this have been present in the successive Pacific World Heritage Action Plans but are particularly salient in the recent (unpublished) 'Weaving Nature and Culture World Heritage Work Plan for the Pacific, 2021-2025'. The Pacific Islands Framework on Nature Conservation and Protected Areas 2021-2025[7] which guides conservation policy in the region, also recognises the centrality of culture and spirituality in nature conservation. This understanding has been given further prominence with the creation of the Pacific Islands Roundtable on Nature Conservation's Nature Culture Working group which was established in mid-2022.[8] However, actual implementation of policy and programming recognising the deep connections listed above needs dedicated development and a shift in approaches in both heritage and conservation in the region.

7. *See https://library.sprep.org/sites/default/files/2021-11/2021-2025-Framework-nature-conservation-EN.pdf.*
8. *See https://www.pacificislandsroundtable.com/.*

16.2.7 Heritage and world heritage policy and protections for the Pacific

Heritage policies have the scope to provide an enabling environment for heritage development and preservation in the Pacific Islands region, with increased recognition of the importance the heritage sector to 'sustainable development' over recent years. The Pacific has drawn on global frameworks to inform greater integration, or 'mainstreaming,' of culture and heritage across national development policies and plans. However, prioritisation of culture and heritage in national planning and budget allocations in the region generally remains low, and like the rest of world, 'there has been no systematic assessment of the range of heritage types at risk from climate change, nor of the range and severity of climate impact drivers, and of losses and damages to heritage from climate change' (Simpson et al., 2022, p. 60).

World Heritage inscription is one avenue available to support the protection of heritage in Pacific Island countries. In 1994, UNESCO adopted a 'Global Strategy' to diversify heritage values and recognise more heritage sites outside of Europe (Isar, 2014). The 27th session of the World Heritage Committee in 2003 adopted the World Heritage Programme for SIDS, describing its role thus, 'The UNESCO SIDS Programme develops World Heritage activities in these areas, providing support for new nominations to the World Heritage List, and sustainable conservation and management practices for sites already inscribed.'[9] The World Heritage Programme for SIDS was eventually superseded by the Pacific World Heritage Action Plan 2016-2021 (Price, 2018).

In 2007 Pacific representatives lodged an appeal to UNESCO, 'The Pacific Appeal', to elicit more support for World Heritage development. Since then, UNESCO has inscribed eight of the nine World Heritage sites in the independent Pacific Islands region including 'cultural,' 'natural,' and 'mixed' sites, listed as of 2022. The Pacific Islands region still holds fewer than one percent of all World Heritage sites.

Pacific heritage is also recognised through the UN SIDS mechanism. The UN named 2014 as the International Year for SIDS with the 3rd UN International Conference on SIDS held in Samoa. The aim was to, 'Celebrate the contributions that this group of countries has made to the world,' stating that, 'Small Island developing states are home to vibrant and distinct cultures, diversity and heritage. People of Small Island Developing States are also at the forefront of efforts to addressing pressing global issues through ingenuity, innovation and use of traditional knowledge.'[10]

The 2014 conference recognised the role of culture in Pacific Islands sustainability. Its declaration the SAMOA Pathway, recognised the following:[11]

9. *https://whc.unesco.org/en/sids/*
10. *https://whc.unesco.org/en/sids/*
11. *https://sustainabledevelopment.un.org/sids2014/samoapathway*

> SIDS possess a wealth of culture, which is a driver and an enabler for sustainable development. In particular, Indigenous and traditional knowledge and cultural expression, which underscores the deep connections among people, culture, knowledge and the natural environment, can meaningfully advance sustainable development and social cohesion, strongly supporting the efforts of SIDS to promote cultural diversity, intercultural dialogue and international cooperation in the cultural field in line with applicable international conventions, in particular those of UNESCO and to develop and strengthen national and regional cultural activities and infrastructures…including through the network of World Heritage sites, which reinforce local capacities, promote awareness in SIDS, enhance tangible and intangible cultural heritage, including local and Indigenous knowledge, and involve local people for the benefit of present and future generations.

All these developments signal a step towards better recognition of, and embeddedness of Pacific heritage in international and regional bodies, instruments and reports. To some extent, as seen, these also flow on to, and/or are prompted by, local level needs and initiatives. Notwithstanding these positive shifts, it is also crucial to remain vigilant, and to adopt a critical and inquiring lens, to ask to what extent these developments can affect real and lasting progress in climate crisis mitigation for the Pacific cultural heritage. Further, in our conversational, Pacific people frame, we would also ask how (and if) local people perceive these developments in global and regional law, policy and planning to be enacting a transformation in heritage protection at local village levels.

In the 2030 Agenda for Sustainable Development, UNESCO developed a series of Thematic Indicators for Culture to measure and monitor the progress of culture's contribution (encompassing heritage) to the national and local implementation of the global goals and targets (UNESCO, 2022). Indicator three focuses on climate adaptation and resilience and aims to assess measures taken to foster climate change mitigation and adaptation and enhance resilience through sustainable safeguarding and management of tangible and intangible cultural heritage, as well as natural heritage. From the 2030 global agenda, the Pacific region adopted one indicator to 'strengthen efforts to protect and safeguard the world's cultural and natural heritage' as a cross-cutting under Goal 11: Sustainable Cities and Communities (SPC, 2022). The indicator measures the proportion of the national budget allocated to culture, including for protection, preservation (heritage) and promotion to track progress on improving cultural development.

While there has been increasing emphasis on the critical role of culture and heritage, and cultural preservation in the face of climate change globally and regionally, currently only East Rennell Solomon Islands is on UNESCO's list of World Heritage sites in danger. Two systems are in place for the global monitoring of World Heritage sites: the State of Conservation (SOC) system which is part of the World Heritage System, and the IUCN World Heritage Outlook developed only for 'natural' and 'mixed' properties. The IUCN Outlook assessment report in 2020 reported that climate change is now the most common threat to all natural World Heritage Sites, already impacting a third of all sites (Osipova et al., 2020).

Site monitoring is focused on conservation of the Outstanding Universal Value (OUV) that qualifies heritage sites for international recognition. 'If cultural and heritage value that is not specified as part of a site's OUV are being affected or impacted by climate change, this would not be reported in these systems' (Simpson et al., 2022, p. 59). Most Pacific heritage (world heritage or otherwise) is situated in marine environments and threatened by climate change impacts, but is not recognised as being at risk through these systems.

From the above, notwithstanding the inscription of Pacific cultural heritage on UNESCO's registers, and the discussion of this heritage in reports and meetings at the various regional and global levels, including as it relates to the climate crisis, there is much more that needs to be done to recognise and protect this heritage in meaningful and enduring ways. Below, we explore further some of the issues in regards to Pacific Islands world heritage in the context of the climate crisis.

16.2.8 Overview of Pacific world heritage

For understanding and capturing the relationships between the climate crisis and cultural heritage in the Pacific as it is institutionally defined, it is useful to begin by identifying places and practices that are recognised and, at least in principle, protected by global heritage conventions. UNESCO has acknowledged the imbalance of World Heritage sites with a concentration of sites in Europe, also acknowledging the lack of recognition of the Pacific Islands (Isar, 2014; Smith & Turk, 2013). There are just twelve UNESCO World Heritage Sites in the Pacific Islands region, with eight located in the independent countries of the Pacific. These represent only a small proportion of the hundreds of state-designated national heritage sites across Pacific Island countries and territories, and an even greater number of unique and culturally sacred sites and spaces recognised among thousands of different local communities. Due to the diverse geographical and topographical situations of the islands, these sites are extremely vulnerable to severe weather, sea level rise, coastal inundation, flooding and erosion. Most of the World Heritage designated sites in the Pacific (shown in Table 16.2) are already experiencing these impacts.

Country	Name of Site	Type of Site	Year inscribed
Federated States of Micronesia	Nan Madol: Ceremonial Centre of Eastern Micronesia	Cultural site with built structures	2016
Fiji	Levuka Historical Port Town	Mixed site with built structures	2013
French Polynesia	Taputaputea	Cultural site	2017
French Polynesia	Te Henua Enata – The Marquesas Islands	Mixed site	2024

Country	Name of Site	Type of Site	Year inscribed
Kiribati	Phoenix Islands Protected area	Natural site	2010
Marshall Islands	Bikini Atoll Nuclear Test Site	Cultural site	2010
New Caledonia	Lagoons of New Caledonia: Reef Diversity and Associated Ecosystems	Natural site	2008
Palau	Rock Islands Southern Lagoon	Mixed site	2012
Papua New Guinea	Kuk Early Agricultural Site	Cultural site	2008
Solomon Islands	East Rennell	Natural site	1998
Vanuatu	Chief Roimata's Domain	Cultural site	2008

Table 16.2: *UNESCO World Heritage Sites in the Pacific Islands Region (including French territories, excluding Hawai'i)*

Country	Name of ICH	Year inscribed
Samoa	'Ie Samoa, fine mat and its cultural value	2019
Tonga	Lakalaka, dances and sung speeches of Tonga	2008
Vanuatu	Vanuatu Sand Drawings	2008

Table 16.3: *UNESCO's List of Intangible Cultural Heritage (ICH) in the Pacific Islands Region is even more limited (total countries and territories)*

Nan Madol located in Micronesia, and East Rennell in the Solomon Islands have been designated by UNESCO's World Heritage Committee (WHC) as 'World Heritage in Danger' due to natural and human activity. At Nan Madol, WHC has recognised that storms, siltation, and sea level rise is threating the conservation of the site.[12]

Table 16.3 above represent a mere few out of numerous cultural practices that risk being lost as climate change threatens their continuity, and by extension the role they play in shaping heritage and identity for Pacific people. For example, rito (coconut leaf fibre) fine weaving in Tongareva, the northern most island of Cook Islands facing depopulation and frequent drought exacerbated by climate change (Radio New Zealand, 2021).[13] Weaving techniques are protected knowledge, carefully shared among the women weavers on the island in closed gatherings (Tongareva Island Government and the Cook Islands National Council of Women, 2017).

12. https://whc.unesco.org/en/news/1899/
13. https://www.rnz.co.nz/international/pacific-news/434229/water-being-shipped-to-drought-stricken-northern-cook-island

It is one of the only sources of income on the island. Further migration from the island due to increasingly harsher living conditions threatens this traditional practice. Pearson et al. (2021, p. 11) highlight those practices such as Vanuatu's sand drawings, 'an artful geometric pattern drawn in sand to communicate knowledge about history, rituals, kinship systems, farming techniques and so on', are vulnerable to the impacts of climate change, despite being safeguarded by the national government and UNESCO ICH designation. These kinds of traditional practices also have a crucial role in enabling resilience to the climate crisis, providing a foundation of cultural heritage and a strength to draw upon.

As we have mentioned, Pacific Island nations are particularly vulnerable to the catastrophic effects of rapidly advancing climate change. Most disturbingly, rising sea levels, and extreme weather events call for urgent actions to mitigate the effects of these on islands and villages, and to strengthen islanders' capacity for adaptation, risk-management and resilience. Ways of mitigating the impacts of climate change are many and diverse, and must range across all forms of action, from policy at all levels, to on the ground measures. At a deeper, conceptual level, it is also important to consider ways in which the climate crisis is thought about, articulated and embedded in discourse and in philosophies and cosmologies.

The cultural heritage of the Pacific cannot be underestimated in its importance for a range of reasons. It is vital to the identity and ongoing sustainability of communities and village livelihoods; and it also plays a significant role in the economies of Pacific countries, with tourism forming a large component of revenue (see e.g., Wolf et al., 2021). Not only is cultural heritage vital to preserve and maintain in itself; it is also embedded in the ways in which peoples in the islands express themselves, through language, in story, poetry, song and dance. It is in this context that the threats to cultural heritage, the loss and erosion of all forms of heritage through the impacts of climate change, also become embedded in expressive culture. The ongoing inter-generational transmission of cultural heritage, including through its expressive and performative aspects, is vitally important for the continuity and sustainability of Pacific identities, and plays a vital role in providing a shield against crises such as the climate emergency.

In the Pacific Islands, the notion of 'heritage' extends beyond narrow western definitions, and it could be argued that even treating cultural preservation through a 'heritage' lens limits our understanding of how Pacific peoples view the past and interact with it. The term 'heritage' was borne of Western experiences of history and notions of linear progress marked by the industrial revolution, and perceives culture as something that originated, and was perhaps even laid to rest, in a pre-modern past. Heritage renders cultural life as something old and from the past to be memorialised and museumised, when it still very much informs contemporary life and ways of knowing and being, that is dynamic and not a stagnant artifact to be kept in a glass box. For example, in the Federated States of Micronesia, cultural heritage properties such as Nan Madol are significant for the community not as national monuments or tourist sites, but in their 'on-going place in people's daily lives, and their beliefs about themselves, their ancestors, and their environment' (Hanlon, 2011, p. 130).

For the Kwara'ae of Mala'ita, Solomon Islands, according to Gegeo and Watson-Gegeo (2001), heritage is part of falafala (kastom or culture). An umbrella concept, falafala is widely shared, and 'embraces culture, tradition, norms, values, modes of behaviour, ways of thinking, doing, and creating and, of course, Indigenous epistemology' (Gegeo & Watson-Gegeo, 2001, p.5). As well, falafala also has variations within shared culture, 'that is, differing beliefs, perspectives, values and behaviours that vary with individuals, villages, or districts within Kwara'ae…, as well as the practices and beliefs of other cultural groups.' Gegeo and Watson-Gegeo, (2001) also note that falafala is always changing (falafala rokisi'anga 'the process of culture change'). Further, the Kwara'ae make a three-way distinction of falafala as traditional culture that have come down to them (falafala 'ua'ua, literally, 'culture ancient /earlier than now'), culture as changing from generation to generation (falafala rokisi, literally, 'culture changes/is changing'), and culture as introduced or imposed from the outside through missionisation and globalization (falafala faolo/fi'i dao, literally, 'culture new/just arrived') (Gegeo & Watson-Gegeo, 2001). In addition, the Kwara'ae and their coastal neighbours of East Mala'ita would often refer to their wela or children as their heritage.

16.3 Case studies

In understanding the complex relationships between climate change and cultural heritage in the Pacific, we must remember that 'heritage' is living cultures, living languages, our children, genealogies and relationships to land as essential pillars for constructing identity and how Pacific peoples view and relate to the world. The case studies below show some of the ways in which cultural heritage have been impacted by climate change.

16.3.1 Case study 1: Climate impacts on Levuka World Heritage Site, Fiji

Levuka, on the island of Ovalau, was Fiji's first colonial capital, and became a UNESCO World Heritage Site in 2013 after a process that took more than twenty years. Levuka is a small port town that was settled by American and European traders in the early 1800s. With a natural harbour and a central location for ease of trade, it became the first capital of Fiji in 1871.

It is located on the island of Ovalau, a lush, mountainous island, about 100 square metres in size and sixteen kilometres east of Fiji's main island of Viti Levu. Levuka was the site of Fiji's cession to Great Britain in 1874, and served as the economic and political centre of the Fiji group of islands and a major trading port in the South Pacific until 1882, when the capital was relocated to Suva.

Not only does Levuka represent significant events in Fiji's history as a nation-state, it is also an important place in iTaukei (Indigenous Fijian), history, as Fiji's cession to Great Britain occurred amidst internal warfare, slavery, and land dispossession (Derrick, 1968; Nicole, 2010) that continue to influence Indigenous social systems.

In February 2016, tropical cyclone Winston, a category 5 in severity, made landfall in Fiji. The cyclone affected 350,000 people, or 40 percent of the country, and 44 people lost their lives.[14] Cyclone Winston was the most intense tropical cyclone ever recorded in the Southern Hemisphere and the strongest to make landfall in the Pacific (SPC, 2016). Ovalau Island was hit almost directly, as the eye of the storm passed close by. Lives were spared in Levuka town, but at least four villagers lost their lives and hundreds more lost their homes, and all 196 heritage registered properties reported some level of damage. Five buildings were destroyed completely and thirteen buildings saw their roofs destroyed, while others incurred less severe damage. For the town, it is a continuous struggle to maintain their heritage properties, and cyclone Winston exacerbated challenges to preserving the site.

For iTaukei the Levuka World Heritage site means much more than the buildings and their structural preservation, as heritage is found in the vanua – the land and its people, forming the basis of iTaukei cosmology, and extends beyond the physical structures (Harrison, 2005; Young, 2020). The effects of Cyclone Winston on the vanua were devastating, both in the physical and spiritual sense, and caused lasting trauma that was further prolonged as people endured a slow recovery process.

Levuka's location on the sea front in an area prone to cyclones, which are increasing in severity and frequency due to climate change, makes it an extremely fragile heritage site. The geography and topography of the town, as it is surrounded by steep peaks, offers some protection from severe weather, but little protection from sea level rise, sea surge and flooding. The town's seawall is not enough to withstand the bombardment of increasingly stronger storms that are predicted.

14. *https://en.unesco.org/news/post-disaster-needs-assessment-following-cyclone-winston-fiji Retrieved 2/19/2019*

Heritage and disaster risk management

The important questions of risks associated with the climate crisis are the focus of Chapter 5 of this Report. The 2017 World Risk Report identified the Pacific as the region of highest risk, measured over a five-year timeframe. In recent years, the Pacific has faced several disaster events causing significant economic impacts, injury and loss of life. Post-disaster needs assessments indicated significant damages and losses, equivalent to 30% of national GDP in Fiji (2016), and 64% in Vanuatu (2015) for example (SPC, 2022).

The Pacific region has been able to realise some benefits from global action to mainstream cultural heritage in disaster risk reduction and disaster risk management (DRR/DRM). In 2015, the Sendai Framework for Disaster Risk Reduction recognised the role of culture and cultural heritage as components of disaster risk, which was significant for the Pacific in creating policy space and funding rationale for culture and heritage in DRR/DRM. UNESCO implemented initiatives such as the Pacific Training on Disaster Risk Management of Cultural Heritage in Small Island Developing States in 2015 (UNESCO, 2015). There are currently ongoing training workshops organised through UNESCO's Office for Pacific States on Safeguarding ICH in the face of climate change.

In Fiji, given the widespread damage caused by Cyclone Winston in 2016, including to its only World Heritage site, the Fiji government requested an assessment of the culture sector to be included in the UN and World Bank Post Disaster Needs Assessment (PDNA). The PDNA on the culture sector assessed damages and losses in the following domains: i) built heritage and sites; ii) movable cultural properties and collections; iii) intangible cultural heritage; iv) repositories; and iv) cultural goods and industry. In addition, UNESCO made emergency funds available along with technical assistance to carry out a rapid damage assessment of heritage properties at the Levuka World Heritage Site (UNESCO, 2016).

The Pacific Platform for Disaster Risk management, informed by action at the global level and experience on the ground with recent category 4 and 5 cyclones, developed the 'Build Back Better (BBB) and Heritage Safeguarding Strategy for the well-being of community in the Pacific,' and adopted priority actions for heritage safeguarding in the Framework for Resilient Development in the Pacific 2017-2030 (FRDP) and associated action plans (Pacific Platform for Disaster Risk Management, 2016).

Climate crisis and loss

In the following section we discuss notions of loss as a major impact of the climate crisis, with examples from Samoa and the Solomon Islands. Chapter 15 of this report focuses on loss, damage, and resilience. This chapter considers some other perspectives of loss, including as this is expressed through poetry and language, in addition to loss of physical heritage such as lands, burial grounds, and sacred sites and places.

The local languages might draw upon an existing repertoire of words and phrases that can be used to denote disaster, calamitous or catastrophic events (such as volcanic eruptions, earthquakes and so on). Notions of loss may be expressed through lament, through the language of disappearance and diminution. It is also possible that languages and dialects do not, in their existing lexicons, contain sufficient expressions that can express the scale of the disaster that is climate change. In the context of our 'conversational' frame, we also acknowledge that expressions of loss, grief and other emotions through poetry, song and talk, are important ways of articulating Indigenous Pacific responses to the climate crisis, and informs their resilience.

16.3.2 Case study 2: Climate crisis, and loss of community-owned land and the historical imagination, Samoa

As we grapple with the challenges of climate crisis, Epeli Hau'ofa's words in *'Our Sea of Islands'* resonate deeply with the essence of Pacific Island cultures, emphasising resilience, agency, and creative potential within their unique world. He posited that:

> Our sea of islands is not a sea of despair. It is our sea of islands, our own world, which we have created and must continue to create. We can do it, for we have the resources, the physical as well as the spiritual resources (Hau'ofa, 1994, p. 160).

This sentiment aligns powerfully with the exploration of Indigenous knowledge in Samoa, showcasing how Pacific communities draw upon their cultural heritage to navigate and adapt to the challenges posed by the climate crisis.

The current state of our relationship as Pacific societies with our environment presents a poignant dilemma, highlighting the consequences of neglecting the intrinsic connection between humanity and nature. By recognising the sacred bond between acculturated Pacific communities and their environment, we can address the missteps that have led us to the climate crisis we face today. The impact of this crisis is evident in the loss of land and landscapes, underscoring the urgency of re-evaluating our interactions with the natural world.

Despite the challenges we confront, there is room for optimism and renewal through understanding and collaboration. By acknowledging our shared responsibilities and embracing a holistic approach to environmental stewardship, we can pave the way for a more sustainable future.

This calls for a critical examination of existing policy frameworks and a concerted effort to integrate Indigenous wisdom and practices into our strategies for environmental conservation and resilience. In doing so, we honour the wisdom of our ancestors and chart a path towards a more harmonious coexistence with our planet.

Samoa faces significant obstacles in establishing an effective legal framework to protect its cultural heritage sites and resources in the face of this climate crisis. The core challenge lies in the absence of a comprehensive, dedicated cultural heritage legislation (Sciusco & Martinsson-Wallin, 2015; Ford et al., 2019). Existing laws like the Village Fono Act 1990, and PUMA Act 2004 only tangentially address heritage considerations, resulting in a fragmented regulatory landscape. This fragmentation extends to the implementation of current policies aimed at sustainable heritage management, such as the MNRE National Heritage Conservation Policy. Despite their intentions, these policies have been ineffectively enforced, with heritage advisory committees becoming inactive and historic buildings still being demolished.

Compounding these issues is a 'policy conundrum' – a disconnect between government agencies with legislation allowing cultural heritage protection but lacking specific policies or expertise, and agencies like MESC with cultural heritage expertise but no legislative role (Sciusco & Martinsson-Wallin, 2015; Ford et al., 2019). To address this fragmentation, the Samoa Law Reform Commission (SLRC) recommended establishing a centralised Samoan Heritage Authority with dedicated legislation and resources. However, despite parliamentary approval in 2015, no concrete steps have been taken to implement this recommendation. The lack of ratification of international conventions like UNESCO's 2005 Convention on the Protection and Promotion of the Diversity of Cultural Expressions also deprives Samoa of an international framework to guide its heritage protection efforts. Compounding this regulatory complexity, Samoa, like many parts of the Pacific, is highly vulnerable to the impacts of climate change, facing difficulties in adapting to and mitigating its effects, including threats to cultural heritage sites and resources. Addressing such a conundrum requires a coordinated approach that balances environmental preservation with safeguarding Samoa's rich cultural legacy amidst a fragmented legal landscape.

Formulating a national heritage policy in Samoa is a complex endeavour, as acknowledged in the National Heritage Policy 2018-2028 (MESC, 2018). A significant challenge lies in aligning the diverse interests, levels of awareness, and priorities of various stakeholders and rightsholders, necessitating inclusive conversations and community ownership of cultural heritage governance processes. The Palauli Heritage Trails initiative exemplifies this challenge. Three villages in the Palauli district – Fa'ala, Vaito'omuli, and Vailoa – under the Palauli Heritage Trust, collaborated with the National University of Samoa to preserve an archaeological site of ancient star mounds through cultural tourism. While the university provided archaeological and historical expertise, training villagers to manage their heritage site, key local stakeholders, including government ministries, agencies, and non-governmental organisations, did not prioritise and promote

such cultural heritage preservation efforts crucial for project sustainability. This case highlights the need for collaborative efforts between communities, academic institutions, and relevant stakeholders to align priorities and raise awareness about the importance of preserving Samoa's archaeological heritage through sustainable tourism initiatives.

Many cultural heritage projects in Samoa, such as the revival of traditional voyaging, navigation, and maritime skills, as well as the recovery of Samoan instrumental music (https://samoanmusic.wp.st-andrews.ac.uk/), are driven by outside groups or cater to tourist consumption rather than focusing on local sustainability (Ford et al., 2019). While external expertise and resources can be valuable, projects driven primarily by outside agendas without sufficient local engagement, ownership, and contextual understanding carry risks of being unsustainable, misaligned with community needs, and facing regulatory and funding uncertainties in the long run. Another significant challenge is financial constraints, which can impede heritage preservation, awareness programs, and capacity-building initiatives. To ensure cultural heritage is protected and sustainable, scholars recommend investing in long-term planning and implementation strategies, allocating resources based on community needs and interests, and developing partnerships with local and international organisations for successful heritage conservation (Ford et al., 2019). Collaborative approaches that empower local stakeholders as leaders appear crucial for mitigating risks and aligning priorities with community interests.

Understanding and measuring culture's contribution to sustainable development and Samoans' well-being can be challenging. It is important to assess the impact of culture on development, but also to measure the economic value of culture. This can be done by looking at the impact of culture on economic growth, job creation, and tourism. It is also important to consider the cultural benefits such as the preservation of IK, languages, and practices. It is of utmost importance to recognise the interconnectedness between cultural and natural heritages, while preserving the state of the environment and conserving biodiversity at the same time. The main problem now is the lack of cultural and statistical data that can assist in such assessments. Hence, more research needs to be conducted to better understand the cultural value of natural heritage sites. This data can then be used to inform decision-making and land use planning. Furthermore, it is important to create public awareness of the need to protect natural heritage sites.

Highlighting the current policy is significant because it shows the gaps in our approach when addressing cultural heritage and the climate change crisis for Samoa. However, there is an opportunity to work with agencies such as UNESCO and the regional South Pacific Community, to develop partnerships that can help leverage additional funding and resources. Partnerships can also provide access to technical expertise, which can help to ensure that all heritage preservation, awareness programs, and capacity building initiatives are implemented effectively and ethically. Additionally, partnering with local organisations can help to ensure that heritage preservation efforts are tailored to the specific needs of the communities in Samoa.

If cultural heritage preservation efforts are not prioritised, Samoa may not receive the necessary resources and attention compared to other government competing priorities such as infrastructure and healthcare.

Considering the absence of any overarching legislation, the government is not required, for example, to designate or invest heavily in any specific site for cultural preservation. However, there are several sites that should be protected, which include the many stone mounds and fortifications built during the pre-modern era. Archaeological surveys and the use of LiDAR[15] imaging show how the ancient Samoan populations modified their environment to create agricultural systems and other cultural activities (Jackmond et al., 2019). They also include many traditional sites that still serve the Samoan people's cultural and spiritual needs with their rich history. These include the Pulemele'i Star Mound (Meleisea, 1987). Additionally, there are no remaining archaeological sites that testify to the long history of the Samoan people and their close relations to other Pacific cultures. All the remaining sites should be protected and preserved for future generations to learn about Samoa's history and culture, as well as from the climate crisis.

All these sites, whether deep inland or coastal, are on freehold, but mostly customary lands, governed by customary land law, which has been undergoing a sensitive and uneasy fusion between traditional Samoan customary law and the newly introduced legal system since 1903, when the German colonial administration established the Land and Title's Court. This 'uneasy' history has shaped the current Samoan attitude, such as the reluctance of villagers to give up their lands or resources for cultural heritage or development. This reluctance has been seen as a defensive measure to protect Samoan culture and heritage, and to prevent exploitation of their land and resources. It has also provided a strong sense of identity and community for the Samoan people. The complexity of Samoan land issues may also account for the absence of overarching legislation specifically for cultural heritage. This is because it has to do with land, the ele'ele, the life blood of a family, that tangible platform that embeds the intangible traditions and spiritual heritage that is often overlooked by policy makers. In our assessment, the national heritage policy needs to be revisited, because it falls short of clearly identifying strategies that can mitigate climate change impacts on ordinary people and support adaptation and resilience measures. The essence of being Samoan is not highlighted in current law and policy, and therefore we need to reimagine our relationship with the land in the light of climate change.

15. *LiDAR (Light Detection and Ranging) imaging is a remote sensing technique that uses laser light to measure distances and create highly detailed 3D representations of objects and environments. This technology is used in many different fields, such as archaeology, to map and visualise ancient sites and structures. LiDAR's accuracy, 3D mapping capabilities, and ability to penetrate obscurants make it the preferred choice for applications requiring highly detailed and precise 3D data, despite being more expensive than alternative methods.*

Reimagining land and cultural heritage complexity

Land and cultural heritage complexity can be understood through Pacific scholar Upolu Va'ai's relational hermeneutics and 'whole life' philosophy. Va'ai's and others' perspectives on policy development, climate change and cultural heritage are firmly anchored in Pacific Indigenous philosophies and spiritualties (Va'ai, 2017). Many Pacific scholars from different disciplines follow Va'ai's advocacy for a holistic approach that extends beyond climate change and its physical impacts. This approach also importantly considers its spiritual implications. Together with Aisake Casimira and others, these scholars address the spiritual impacts of climate change by advocating for a 'holistic gaze' (Va'ai & Casimira, 2017) This is often overlooked in the dominant climate narratives that are focused mostly on tangible aspects. Va'ai emphasises the importance of IK, and cultural values, as well as the significance of collaboration and collective action in responding to climate change. This emphasis on the interconnectedness of all aspects of life, including land, culture, and heritage encourages us to recognise the importance of preserving and protecting our environment and cultural heritage for future generations. This understanding also urges us to recognise the interdependence of cultures and the environment, and our responsibility as stewards to protect both. Va'ai and Casimira (2017) posit that, 'If ever policies are to reflect Pacific people, then we should be focusing on polices that reflect the whole story of Pacific Indigenous, not just the parts that are easier to capture. There must be a commitment to promoting a deeper understanding of the spiritual and cultural dimensions of climate change in the Pacific region' (Va'ai & Casimira, 2017). Samoan policy makers on cultural heritage need to focus on this complexity. This is because it offers an effective way to understand the history and relationships between people and the land of a place. Thus, we can create a more sustainable and resilient future.

The intrinsic value of land is inextricably linked to a nation's culture and heritage, providing a unique and irreplaceable sense of identity and purpose – a form of 'cultural wealth.' Preserving this cultural heritage is critical for future generations, as it serves as a home for Indigenous peoples, connecting them to their way of life and spiritual relationship with the land. To safeguard this invaluable legacy, a multi-pronged approach is necessary (Redvers et al., 2023). Governments must enact policies and laws that protect cultural heritage, complemented by the establishment of dedicated organizations to support these efforts. Individuals, too, must take responsibility for preservation, fostering a sense of belonging and connection to the nation through the conservation of land, language, and identity. Crucially, these endeavours should be reinforced by education and awareness campaigns, as well as initiatives promoting sustainable cultural tourism. Collaboration between governments and organisations is vital to ensure the protection of cultural heritage for future generations, enhancing the nation's cultural wealth and strengthening the bond between its people and their ancestral lands (Higgins, 2022).

Landforms and landscapes of a Samoan ancient world can be identified as 18 different types. To name a few, these landscapes include Tafalagi (horizon), Aloalo (lagoon), Matafaga (beach), A'ai (village), Atu mauga (mountains), Atu vanu (valleys), Tuasivi (ridge), and Vaopuanea (deep forests). As well as being physical landscapes, these are also cultural landscapes, from which Samoans develop their culture, spirituality, heritage, and history in relation to the environment. Many generations of Samoans grew up in a culture that protected these landscapes. They understood that changing one aspect would lead to loss of history, IK, and language. This was especially true for the forests and the coral reefs, which were important sources of food, medicine, and had cultural significance. The Samoan people developed a strong sense of stewardship for their environment, and it is important for them to understand the importance of preserving it.

All Pacific Island communities have shared a similar fate, with the cataclysmic consequences of imposed Western concepts and ways of thinking in regards to our cultural heritage. One of the many consequences is that we now have a generation struggling to ensure that there are some landforms and landscapes left to offer the next generation, when they ask what we have for them to anchor their life experiences to in the future. Unfortunately, as a Pacific community, we are not doing too well in this as we see the calamitous manifestations of climate change gnawing away at our existence. The enormity of this dilemma is encapsulated in Leilua Seti's lament about cultural and heritage loss due to the current climate crisis. 'Ua amata ona mou atu pine faamau vaaia o le aganuu, ua afaina vaifanua sa maua'a ai le olaga faasamoa ma le aganu'u ona o le suiga o le tau. Ua pei tatou o ni tagata ua tafefea faapulu i le auau.' (The physical signs and symbols of our cultural existence are disappearing fast from the landscapes, the foundation of our cultural practices and language. We are like husks, lost in the waves, Leilua, 2023). Leilua's grief echoes around the many Pacific Island communities who have lost so much due to climate change, and it forces us to consider the ethics of climate change and rethink our moral obligations as communities to mitigate the current challenges and deal with the grave uncertainties and the impacts on future generations.

Loss of sacred grounds

In Samoa, subtle climate change impacts are causing linguistic erosion and eroding Indigenous practices. Honorifics in Samoan society acknowledge an individual's identity, genealogy, and social hierarchy. As coastal erosion forces families to relocate their chiefly residences inland, the language and meaning behind these traditional salutations is lost. As extended families relocate their chiefly residences, future generations will lack physical access to their ancestral homebases – the maota (chiefly home) has shifted elsewhere, which now exist only in the memories of the living. If these stories of their family's former chiefly homes are not passed down to the next generation, this knowledge will be lost to all. Ancient burial sites and sacred passages to the afterlife are also being submerged by rising seas. Families are forced to relocate ancestors' remains, sometimes in ways seen as blasphemous.

Sand mining and sea level rise have reshaped Samoa's shoreline, submerging places like Fagasaili and Mulivai from Solosolo, and the Lapita pottery landing site at Mulifanua. While still sacred to local families, these cultural heritage sites receive no assistance or recognition. Biodiversity loss from climate change also threatens Samoans' livelihoods and traditional practices. Species like the 'ali (flounder), sakula (sea urchin), and palolo (euniced worm) are disappearing, eroding the language and metaphors tied to these environmental markers.

To mitigate these interrelated crises, Samoa needs coordinated government policies and meaningful partnerships that respect local values and traditional knowledge. Preserving tangible heritage requires protecting the natural environment and linguistic diversity it is inextricably linked to. With a 'whole of life' approach, Samoa can adapt to climate change while safeguarding its cultural identity. But all is not lost. If a coordinated effort is made by various government ministries through appropriate laws and policies that are more attuned to our 'whole of life' approach, and which respect our values and partnerships with stakeholders, this will help to mitigate the challenges posed daily by climate change and prevent them from becoming a multitude of interrelated crises. Partnerships have to be meaningful, cost effective and sustainable.

16.3.3 Case study 3: Climate crisis and ontological-theological-ideological and all-worlds loss, Solomon Islands

In some Melanesian communities, manifestations of community loss from the climate crisis are multiple. Using a Mala'ita Solomon Islands example of the off-shore atoll community of Ngongosila, signs of loss are evident everywhere. Drawing from Sanga's (2023) depictions, loss can be seen in the images of dead rocks piled one on top of the other, forming a grey wall around the island which once was surrounded by beautiful and soothing white sandy beaches. Where waving coconut palm trees, shady banyan trees, and abundant fruit trees lined the shores of the island, the Ngongosila of today is littered with unplanned brown sago-leaved houses and unkempt smokey cooking huts. Where once, sea birds came to roost at the end of a hard day of food hunting, today's Ngongosila is no longer attracting any birdlife except for the odd captive parrot pacing up and down all day on a house laundry line. Where tribal shrines were once obvious and left undisturbed, the angry sea has eaten the feared ancestor skulls and has tossed aged bones into the deep. Where private and sacred utensils and associated sacred knowledges were stored in gendered repositories and sites, the new changed environment has eroded the separation, watered away the purity, and rendered the sacred repositories and sites ordinary and secular. Where space and distance were necessary to maintain purity, moral order and cohesion in a multi-worlds theocratic Melanesian mind, today's Ngongosila with its eroded shorelines has forced villages to build dwelling houses in close proximity to each other thereby causing ontological murder to, and desecration of, an ancient ancestral theological heritage and mind.

Climate crisis and grief

If we are to be comforted, what follows loss? For Ngongosila Islanders of Solomon Islands, we grieve over our loss. We voice our laments over the ravished sacred burial grounds. We mourn the dug-up coral reefs which have resulted in the loss of marine life around the island. We weep the consequential and further loss of ancient tribal ontologies, the sacred utensils made ordinary, the dismantled community cohesion, and the contentious-splinter relationships now experienced in the village as people are forced to live closer together in reducing Island space.

In a Mala'ita lament (Sanga, 2014, pp. 123-124), the grief over a diminished life and abandonment is expressed as follows:

'Oi, ote wela 'ae
(O you of youthful understanding).

Molu fā angi nau laona asoā 'I tara'ena
(You have caused my heartache today).

Ku manata 'agu to'ona
(Inciting memories of bygone days).

Na fataia na kō nau kini, na abua babatō gera kini, na bae abu gera kini, ma na ramoa gera kini laona tolo ma na asi.
(The exploits of my ancestors, the sacred utensils which rooted my worlds, the sacred shrines of power and the life-giving spirit of my very existence).

Kō nau kini wane gera rangonia toa, gera adafafia toa, gera ogua toa gera ka aofia fana toa
(The generosity of my ancestors, their stewardship over an integrated world, their cohesive leadership as guardians and hosts).

Kō nau kini gera rigita lana 'aba gera (The autonomy, strength of hand and authority of my ancestors).

Molu ngalia nō fasi nau. Molu fō inomai nau 'I tara'ena. Molu ada siofa agu
(You have robbed me off life today. You have made me an orphan, a destitute in my own world).

'Oi, keleirurūfia lea nau 'ae
(It is in grief that I lament uncontrollably now).

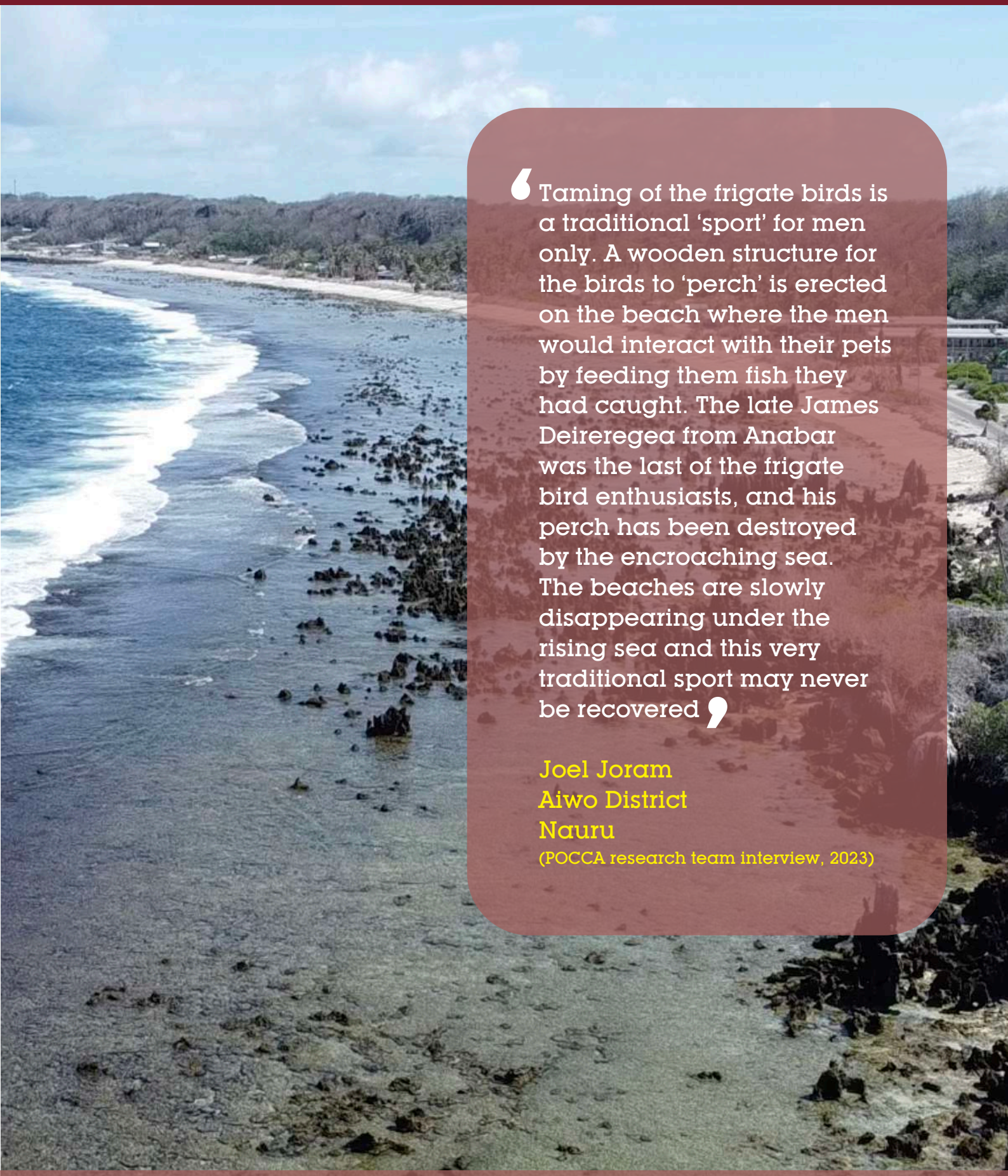
As for any community, grief must be publicly voiced. Doing so produces hope as it is only in the context of loss and grief that hope is credible and authentic. In this Mala'ita Solomon Islands example, comfort arises out of the loss and grief over Ngongosila's ontological and theological loss. Subsequently, hope comes to the people in the form of the occurrence of something new. In this instance, the newness comes in the form of the Indigenous Gula'ala teachings on ethics as contained in the book, Fānanau lā 'I Gula'alā (Sanga, 2014). In introducing the compilation of the Indigenous Gula'alā ethics teachings, Sanga (2014) explained, 'These teachings are gifted to and to be generously shared with all Gula'alā children (p.15)'. He further urged: 'Fathers and mothers are to sit with their children and teach them diligently and daily about these precepts' (p.15).

16.4 Conclusion

The rapidly encroaching impacts of climate change are experienced by Pacific Island peoples in especially acute ways. Not least among the elements of culture to suffer in the context of the climate crisis, is the vitally important cultural heritage. While collectively, laws and policies at global, regional and local levels may provide a fulcrum upon which to pursue measures to protect this heritage, we must also look to other dimensions.

The strength and dynamism of family, local village and other communities, drawing on ancient oral traditions, customary laws and practices, provides a real foundation for sustainable approaches to mitigating the effects of climate change. In this context there may be some hope, by ensuring these community practices are nurtured, maintained and strengthened. This must also embrace the power of expressive and performative culture, in fostering awareness, education, and activism for climate change preparedness. The deep understanding and knowledge that Pacific peoples have, of the intricate inter-connections between the natural, and the cultural worlds is just one aspect that needs to be maintained and foregrounded in pursuing climate change remedies. The resilience of Pacific peoples finds expression in many ways, and these make enormous contributions to building greater awareness of the climate crisis, and to moving forwards towards mitigating the effects of climate change. Artistic and cultural expressions are vital in this regard.

For example, 'We are not drowning, we are fighting', is the Pacific Warrior rallying cry of 350.org. Here, Pacific Island youth and contemporary artists have used cultural expressions to not only draw attention to the impacts of climate change but to show their determination to fight against it and stand up and be seen and demand climate justice– examples of different manifestations of this artistic and cultural movement are multiple and have impacted the global stage.



> “Taming of the frigate birds is a traditional ‘sport’ for men only. A wooden structure for the birds to ‘perch’ is erected on the beach where the men would interact with their pets by feeding them fish they had caught. The late James Deireregea from Anabar was the last of the frigate bird enthusiasts, and his perch has been destroyed by the encroaching sea. The beaches are slowly disappearing under the rising sea and this very traditional sport may never be recovered”
>
> Joel Joram
> Aiwo District
> Nauru
> (POCCA research team interview, 2023)

An aerial view of Nauru shows the mined pinnacles that offer little protection against storm surges (Photo: POCCA Team).

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Chapter 17

To Move or Not to Move: Climate Mobilities in the Pacific

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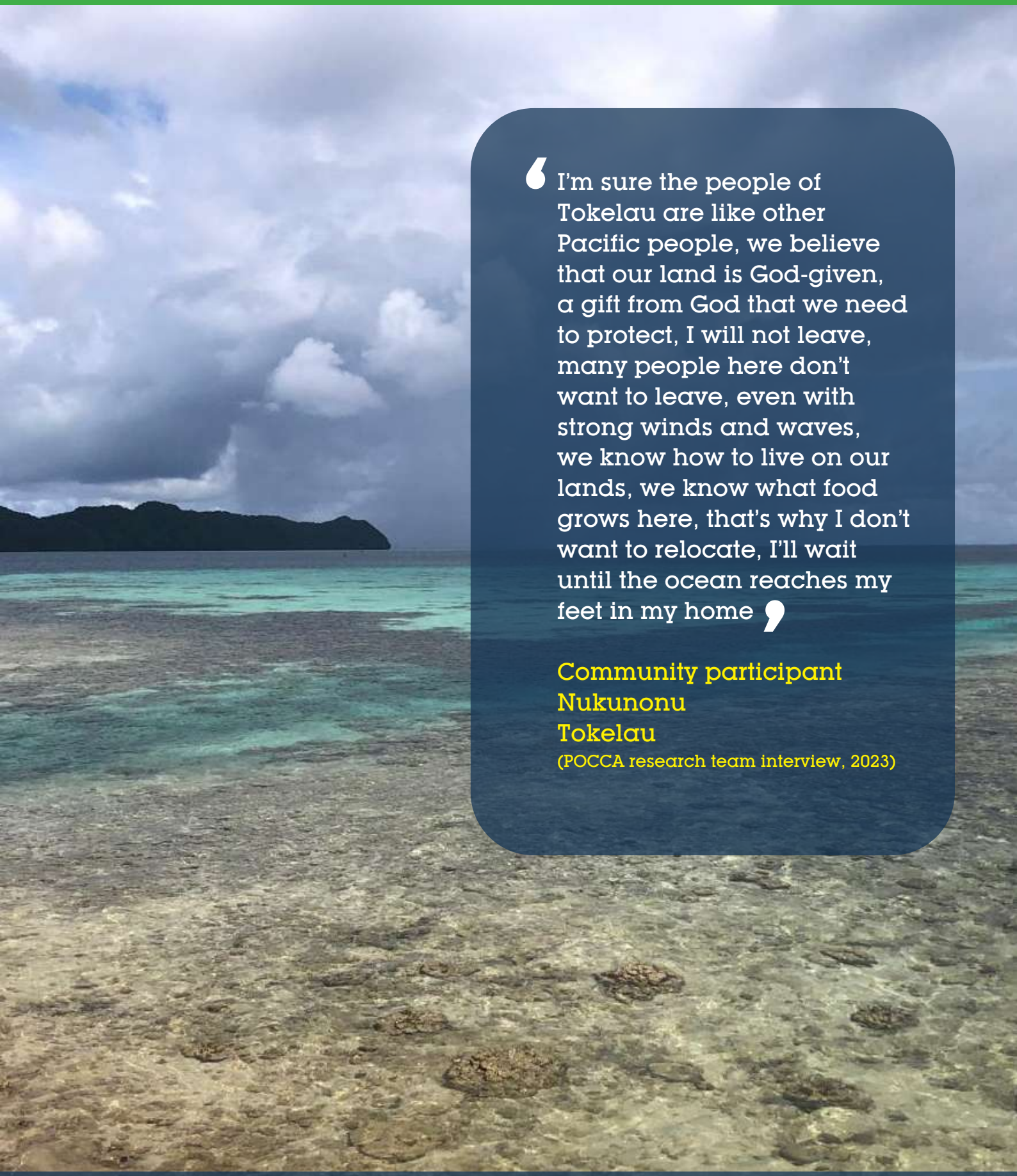


Runways like this in Funafuti, Tuvalu, will play an important role for climate mobility in the Pacific as communities respond to the impacts of climate change (Photo: POCCA team, 2023).

Abstract

Mobility is not new in the Pacific region as Pacific peoples have been moving from island to island across the vast Pacific Ocean for centuries due to are changing climate and other reasons such as conflict or search for new land. Climate mobility is now seen as a coping mechanism to adapt to sea level rise, coastal erosion and increased intensity and frequency of rapid-onset environmental events such as storm surge. The climate crisis has already led to relocation of some Pacific communities to higher grounds and to other islands. Many more are earmarked for relocation. For some small atoll communities, there is nowhere to relocate within the island, so they face a serious dilemma. For some, the future lies with inter-island migration or trans-national movement between Pacific Islands Countries and Territories (PICTs). Some countries such as Fiji have considered this possibility for those from Kiribati and Tuvalu. Another option is migration to countries outside the PICTs such as New Zealand and Australia, or beyond. Pacific communities are amongst those most at risk of being displaced by the increasing frequency and intensity of climate-related extreme weather events. In some cases, displaced communities can return home soon after disasters and in many other cases their homes and land are lost, leaving them displaced for years to come.

This chapter explores the issue of climate mobilities in relation to relocation, migration and displacement of Pacific communities. This is done by exploring some of the legal, political, and economic implications of climate mobility in both original and destination countries. It also looks at the international and national legal instruments, processes, and institutional responsibilities for climate migrants. Relocation as a process (both temporary and permanent, long-term and short-term) is also explored, along with problems associated with land disputes, resource sharing, travelling knowledges and Indigenous culture and sense of place. Relocation can lead to loss of place, cultural roots and customary lands. Related to this is the significance of Pacific perspectives on climate mobilities lens which could contribute to providing useful policy directions based on lessons learnt from communities in the Pacific.



> “I’m sure the people of Tokelau are like other Pacific people, we believe that our land is God-given, a gift from God that we need to protect, I will not leave, many people here don’t want to leave, even with strong winds and waves, we know how to live on our lands, we know what food grows here, that’s why I don’t want to relocate, I’ll wait until the ocean reaches my feet in my home”
>
> Community participant
> Nukunonu
> Tokelau
> (POCCA research team interview, 2023)

Coral bleaching in Tokelau due to increase in ocean temperature (Photo: POCCA team, 2023).

17.1 Introduction

In 1990 the Intergovernmental Panel on Climate Change's (IPCC) first assessment report warned that the 'gravest effects of climate change may be those on human migration' (1992, p. 103). Predicting displacement due to land loss, flooding, and drought, the report also identified challenges to people's general wellbeing should destination locations be inadequately prepared to receive them. Twenty-six years later the IPCC acknowledged that current understandings of how global warming will influence human migration were still 'limited' and demonstrated an 'important knowledge gap' (Hoegh-Guldberg et al., 2018, p. 180). The IPCC Sixth Assessment Report (IPCC, 2022) states that there is 'limited evidence and low agreement' as to the viability of climate mobility as an effective strategy to respond to climate change locally. Indeed, mobility is context specific and in the PICTs, the situations and experiences are diverse and multiple. Thus, it is important to understand how communities see climate mobilities in their own local contexts based on their own worldviews, belief systems and socio-cultural experiences. The idea of casting Pacific peoples as 'victims' of climate change has been criticized for being too disempowering. The slogan by the Pacific Climate Warriors movement, 'We are not drowning but fighting,' speaks to the sense of resilience and power which Pacific artists, scholars and policymakers have been articulating, in line with Epeli Hau'ofa's *Sea of Islands* vision (1994), which challenged the notion that Pacific peoples are marginal and powerless (Fair, 2020).

A locally-specific understanding of how climate change influences people's mobility outcomes in the Pacific is needed alongside how this connects to issues of planned relocation, displacement and migration. The United Nations Framework Convention on Climate Change (UNFCCC) process through the Cancun Adaptation Framework (paragraph 14(f)) defines 'human mobility' in the context of adaptation to climate change and central to this are the notions of planned relocation, displacement and migration. This chapter aims to examine the issue of climate mobility and immobility in the Pacific as a response to climate change and some of the short-term and long-term implications.

As background, it should be noted that Pacific peoples have, for centuries, been great oceanic navigators and travelers and climate-related mobility is not new at all, but the situations today are to some degree different and thus this requires a critical understanding of the current circumstances. To this end, the chapter firstly looks at some international and regional approaches to climate mobility and then examines some of the local Pacific experiences and perspectives given the changing circumstances.

17.2 International regional and national frameworks: Relevance to Pacific climate mobility

17.2.1 International frameworks and relevance

The Pacific Islands Countries and Territories (PICTs) have been part of a number of international frameworks and agreements relating to climate mobility. This is significant because they are at the forefront of the deepening climate impact and together with the geographical realities of small size and isolation, mobility (within islands, between islands or between states) can be an inevitable option for many.

Since COP16 in Cancun in 2010, there have been many developments to address the legal gaps in international, regional and national legal instruments on climate change especially through 'soft law' initiatives. Amongst them is the Nansen Initiative that was established by Switzerland and Norway in 2012 and endorsed by 109 States including the Cook Islands, Fiji, Kiribati, Samoa, and Tuvalu. The Initiative recognises that forced displacement in relation to environmental disasters, such as climate change, has become a reality. This Initiative did not seek to develop new legal standards, such as a separate convention or protocol to the Refugee Convention or the Paris Agreement for displaced persons but instead focused on building consensus among states on the principles that would underline a protection agenda for people displaced by climate change. This led to the launch of the Platform on Disaster Displacement at the May 2016 World Humanitarian Summit to assist the implementation of the Protection Agenda (Philip, 2018). The role of the Platform is to continue the work that commenced with the Nansen Initiative and to implement the recommendations from the Protection Agenda.

The Sydney Declaration on Principles on the Protection of Persons in the context of Sea Level Rise was adopted by the International Law Association in 2018. It builds on the Nansen Initiative's Protection Agenda and uses existing norms relating to protection to then apply to the context of sea level rise. The Declaration sets out several principles that aim to both codify and progressively develop international law in this context. In particular, Principles four and seven refer to the need for cooperation between states on the implications of sea level rise on human mobility.

Also in 2018, the Global Compact for Safe, Orderly and Regular Migration (GCM) was adopted by the UN General Assembly. Objective two of the GCM highlights that there should be a primary focus on enhancing climate adaptation and resilience strategies and sets out the need to develop coherent approaches to address migration and displacement.

Objective five recommends that the availability and flexibility of regular migration pathways should be enhanced to respond to the effects of climate change. The follow-up International Migration Review Forum recommended in May 2022 that a clearer normative framework for those displaced by climate change be developed.

In addition to these initiatives, there are the United Nations' Guiding Principles on Internal Displacement which define 'internally displaced persons' as 'persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalised violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognised State border' (UNCHR 1998). International statelessness law, namely the Convention relating to the Status of Stateless Persons 1954 and the Convention on the Reduction of Statelessness 1961 may also become relevant, although the connections between climate mobility and the existing framework for statelessness are still indistinct. Consideration has been given as to whether the legal framework on statelessness can be part of the solution to the effects of climate change in the region (Foster et al., 2022).

Under the auspice of the UNFCCC, the Task Force on Displacement (TfD) was established in 2015 at COP21, with its mandate later extended at the recommendation by the WIM ExCom in 2018. In its first phase, the TfD developed recommendations for integrated approaches to avert, minimise and address displacement related to the adverse impacts of climate change. The second phase focused on enhancing cooperation and facilitation on human mobility, including the three categories of migration, displacement, and planned relocation. In particular, the TfD is exploring deeper understandings of the human mobility dimensions of climate change. This emphasis on the human mobility dimensions of climate change is significant and will hopefully enable Indigenous Pacific perspectives such as those discussed in this chapter to be included in the TfD's work. In its third plan of action, the TfD is developing three technical guides on non-economic losses in the context of human mobility, on integrating the linkages between human mobility and climate change into national climate change planning processes, and on access to finance addressing the effects of displacement.

The issue of sea level rise in relation to international law is also in the current work programme of the International Law Commission. In April 2022, an issues paper on statehood and the protection of persons affected by sea-level rise was released (ILC, 2022). While the work of the ILC is undoubtedly useful, the analysis is state-centric and does not take account of Indigenous Pacific perspectives.

In an April 2023 report, Ian Fry, the United Nations Special Rapporteur on the promotion and protection of human rights in the context of climate change, recommended the development of an optional protocol to the Convention relating to the Status of Refugees to protect the human rights of persons displaced across international borders due to climate change. While appreciating the strong advocacy of the Special Rapporteur, the report, with its focus on displacement, also fails to take account of Pacific perspectives and experiences with relocation.

As noted by the Pacific Islands Forum in one of its submissions to the ILC, the international frameworks on the protection of persons affected by sea level rise are currently a fragmented network of hard and soft law instruments (Pacific Islands Forum, 2023). While this fragmentation is problematic in many ways, it arguably leaves space for future inclusion of Pacific perspectives on climate mobilities as the international framework continues to evolve.

17.2.2 Testing international refugee law and international human rights law in the Pacific

Another development at the international level has been the question of whether those displaced by climate change may be able to seek protection under the Refugee Convention or international human rights law. One of the leading cases on this issue is that of Mr Teitiota, an I-Kiribati national who sought protection in New Zealand. Mr Teitiota's application for refugee status under the Convention 1951 was unsuccessful as he was unable to establish that he was a refugee in terms of the definition of 'refugee' in the Refugee Convention, which defines a refugee in relation to those escaping 'persecution' by their home state. In particular, Mr Teitiota was unable to satisfy the persecution requirement because, although it might have been possible to establish a risk of 'serious harm' if returned to Kiribati, the requirement of 'failure of state protection' could not be met as Kiribati, the home state, did not fail to protect him. In addition, Mr Teitiota was not able to fit within one of the five 'Convention grounds' on which persecution must be based. The Teitiota case makes it clear that in the absence of targeted discriminatory treatment by the home state, protection under refugee law is not likely for those affected by climate change. Mr Teitiota also sought complementary protection in New Zealand. Complementary protection (known as 'protected person status' in New Zealand) takes place under international human rights law, specifically the Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment or the International Covenant on Civil and Political Rights. The application for protected person status was unsuccessful, although the New Zealand courts acknowledged that future cases might be able to provide protection on this basis.

The case continued to the UN Human Rights Committee in a case against New Zealand under the International Covenant on Civil and Political Rights. This claim did not assert that Mr Teitiota was a refugee, but instead alleged that New Zealand had violated Mr Teitiota's right to life by deporting him to Kiribati where the situation had become 'increasingly unstable and precarious due to sea level rise caused by global warming' such that Kiribati was 'an untenable and violent environment' for Mr Teitiota and his family.

The Human Rights Committee found that New Zealand's deportation of Mr Teitiota to Kiribati did not breach his right to life as there was still scope for mitigation by Kiribati and the international community (HRC Views, 2020). Notably however, two strong minority views would have found a breach by New Zealand. The HRC decision and the earlier New Zealand decisions suggest that future claims on similar grounds may succeed, especially where there is deportation to a state where life is at risk due to the climate crisis.

However, at the current time, it appears difficult to meet the legal criteria for protection under international human rights law. Another shortcoming of using international human rights law, is that it offers, for the most part, individualised justice as it tends to focus on the rights of individuals or families, rather than rights of the wider community or village, which might apply well to the Pacific situation. On the other hand, an advantage of international human rights law is its focus on 'human dignity' given the synergies with Pacific leaders' emphasis on 'migration with dignity,' and 'staying with dignity' (Gharbaoui et al., 2024) and in contrast to the victimhood in competing refugee narratives.

17.2.3 Pacific regional approaches to climate mobility

At the regional level, the Secretariat of the Pacific Regional Environment Programme (SPREP), and host of the Pacific Climate Change Centre, is a key conduit for its members to participate in the UNFCCC and Conference of the Parties processes, the Paris Agreement and other global climate initiatives. SPREP is also the Regional Implementing Entity for the Adaptation Fund and the Green Climate Fund and is able to maximise access and leverage climate finance for Members, as well as advise member countries on planned displacement.

In addition, the 2050 Strategy for the Blue Pacific Continent recognises the importance of ensuring 'the protection and practice of the rights, cultural values and heritage and traditional knowledge of Pacific peoples in global and regional protocols for climate and disaster risk reduction, and mobility including relocation, migration, and displacement. In November 2023, the Pacific Islands Forum adopted the 'Declaration on the Continuity of Statehood and the Protection of Persons in the Face of Climate-Change Related Sea-Level Rise'. This Declaration does not mention mobility specifically, but does declare that:

> Members of the Pacific Islands Forum, individually and collectively, bear an important responsibility for ensuring protection of our people, and are committed to protecting such persons affected by climate change-related sea-level rise, including with respect to human rights duties, political status, culture, cultural heritage, identity and dignity, and meeting essential needs (PIFS, 2023).

At the same time as adopting this Declaration, the Pacific Islands Forum Leaders adopted the Pacific Regional Framework on Climate Mobility. The Framework aims to:

> Guide Pacific Islands Forum governments, communities, non-state actors and partners in ensuring rights based and people-centred movement in the context of climate change, including staying in place, planned relocation, migration, and displacement through a proactive, inclusive and collaborative regional approach that reflects common Pacific interests in a culturally appropriate manner, while respecting national sovereignty and diversity (PIFS, 2023).

One of the unique aspects of the Framework is that it is upfront in recognising the right of our Pacific peoples to stay in their homes as a fundamental priority. In effect, the Framework adds a fourth category – 'staying in place' - to the standard three approaches to climate mobility (relocation, migration and displacement). The next step is for this approach to be reflected in international and national frameworks.

17.2.4 Some country approaches

At the national level, global mapping has identified 36 documented cases of planned relocation in the Pacific region out of a global total of 308 (Bower & Weerasinghe, 2021). This figure does not really reflect the magnitude of the issue as there are numerous other cases that have not been enumerated. But Pacific governments are starting to systematically address climate mobilities as a priority issue.

For example, in 2018, Fiji adopted the national Planned Relocation Guidelines and in 2020 created the Standard Operating Procedures for Planned Relocations (SOP). This is a comprehensive plan to tackle relocation of communities impacted or likely to be impacted in future by the climate crisis. The SOP has undergone a series of revisions as part of the collaboration between the Fiji Government, the German Government's development agency (GIZ) and international stakeholders involved in community consultation (Ligaiula, 2022). The role of international stakeholders in coordinating community consultations within the SOP process merits further investigation as studies have shown that the role of international stakeholders within the relocation process can be problematic (Gharbaoui, 2021).

Building on the Vanuatu People's Plan 2030 and the Vanuatu Climate Change and Disaster Risk Reduction Policy 2016-2030, Vanuatu adopted a National Policy on Climate Change and Disaster-Induced Displacement in 2018. This Policy incorporates the views of many different stakeholders including wide-ranging consultations with displacement-affected communities (Vanuatu NDMO, 2018). Guiding principles include respect for custom, protection of traditional knowledge and human rights and dignity (Vanuatu NDMO, 2018). The Policy includes provisions on recognising planned relocation as a measure of last resort and includes safeguards to protect human rights and minimise impoverishment and other harms. It notes the importance of traditional knowledge and aims to 'protect the cultural identity and spiritual resources of communities' including by recording communal connections to land, drawing on traditional knowledge in planning adaptation initiatives and preserving knowledge about agriculture, climate, biodiversity, music, dance and culture (Vanuatu NDMO, 2018). The Policy also mainstreams displacement and human mobility considerations into relevant government action at all levels. The Policy led to projects in 2021 on the development of standard operating procedures on planned relocation and strengthening the use of traditional knowledge in displacement management (UNHCR et al., 2021).

The project on improving preparedness for displacement aims to explore cultural approaches to crisis management. In particular, the project is exploring what elements of the community's kastom and culture assist in integrating, adapting and coping with new environments and shared living arrangements between both displaced and host communities. Similar projects to those in Vanuatu are being undertaken in other parts of the Pacific.

A very topical and controversial development in the Pacific region has been the Australia-Tuvalu Falepili Union. The Falepili Union is the world's first bilateral agreement on climate mobility. This was signed by the leaders of the two countries in November 2023, with a follow-up memorandum signed by the foreign ministers of each country in May 2024. While not yet ratified, both states are committed to ratification in due course. The Falepili Union provides a 'special human mobility pathway' for Tuvaluan citizens to live, study and work in Australia and access education, health, income and family support on arrival.

While not specified in the Union itself, up to 280 Tuvaluan citizens could migrate to Australia each year. Falepili visa holders will be eligible to apply for Australian citizenship on the same basis as other permanent residents. In exchange, Tuvalu agrees to cooperate with Australia for security and stability. Tuvalu is required to 'mutually agree with Australia' any security and defence related arrangements with other countries. Australia will also, at Tuvalu's request provide assistance in response to a major natural disaster, a public health emergency and military aggression.
Responses to the Falepili Union have been mixed. In Tuvalu itself, there has been concern from citizens as to the impact of the arrangement on Tuvalu's sovereignty and demands for a referendum on the agreement. Some commentators have celebrated the arrangement (McAdam, 2023), while others have expressed concerns about its neo-colonial and imperial undertones. The trade-offs for Tuvalu's sovereignty and security make its viability as a model of climate mobility justice questionable (Gharbaoui, 2023). In terms of climate mobility specifically, the Union does recognise 'the desire of Tuvalu's people to continue to live in their territory,' 'Tuvalu's deep, ancestral connections to land and sea' and that the parties will work together to help Tuvaluan citizens 'stay in their homes with safety and dignity' (Part 2). This language echoes the themes discussed in this chapter and so takes some account of Pacific perspectives on climate mobility. However, the Union is silent on other important Pacific perspectives on mobility including the maintenance of Indigenous culture and knowledge for those Tuvaluans who migrate, the ongoing importance of identity, belonging and spirituality, the role of the Tuvaluan diaspora and its connections with communities at home, and future governance arrangements for Tuvaluan communities in Australia. In particular, as one commentator points out, given that Tuvalu's population is 11,000, with 280 citizens able to move each year, within just one generation, nearly all of Tuvalu's citizens could have migrated to Australia. It could also lead to loss of Tuvalu's sovereignty because one of the conditions is that Australia must have a say in the country's national security, defence and matters pertaining to military aggression (Ratuva, 2023).

Like other PICTs in free-association with the United States of America (USA) and New Zealand, Tuvalu under the Falepili Union is required to 'mutually agree with Australia' on any security and defence related arrangements with other countries, and Australia will also, at Tuvalu's request provide assistance in response to a major natural disaster, a public health emergency and military aggression. Free Association arrangements, especially between the USA and PICTs, were instruments for 'strategic denial' (against the Soviet Union), where the USA retained a 'veto' right over the PICT's national security, military and defence relations, in exchange for continuing budgetary support and aid and of course visa free travel to the US. The Falepili Union has a similar arrangement which means that Tuvalu no longer has the independent sovereign right to decide on its national security and defence as it wishes. In the bigger geostrategic scheme of things, this is designed to deny China strategic access to Tuvalu.

A similar proposal was made in 1960s by Australia to relocate the population of Nauru to Curtis Island (off the coast of Queensland). That proposal came about in the aftermath of the environmental devastation faced by Nauru following phosphate mining. However, in that situation, the people of Nauru refused to move because they did not want to lose their cultural identity and also because Australia would not relinquish sovereignty over Curtis Island (McAdam, 2017). Pacific peoples need to be mindful of these lessons from the past in finding solutions for the future.

17.3 Framing climate change and human mobility from an Indigenous perspective

Popular framing of mobility in the literature commonly refers to three types of movement in relation to climate change: migration, displacement and planned relocation. This threefold category has become the reference on climate mobility for scholars, scientists and policymakers and it emerged as part of UNFCCC from the text of the COP16 Cancun Adaptation Framework aiming to strengthen action on adaptation in developing countries through international cooperation (Warner, 2012). However, climate mobility is broader, deeper and more nuanced than this. In order to adequately capture the historical and varied experiences of many Pacific Islanders and communities and develop relevant strategies, it is crucial to develop a holistic and longitudinal approach. A holistic and longitudinal approach enables us to demonstrate the circular nature and flexibility of islander movement. This includes the enduring 'walkabout' nature and 'voyaging' spirit of Pacific Islanders. Pacific Islanders, it must be recognised, have been traversing the largest ocean on the planet for centuries. In past centuries, Pacific people used boats to sail between islands and the 'foot-mobile' to travel from coastal areas to the inland parts of their islands. Now they use a variety of ways including cars and airplanes, to visit families overseas, and seek further educational and employment opportunities.

It is also important to take a holistic and longitudinal approach to demonstrate the interconnectedness of Islanders with islands, continents, ocean and land as we make connections with the past, present and future.

The majority of Pacific people still maintain a sense of belonging to their kin and to the ocean and land as one. As an illustration, the placenta is often buried below or next to a tree to signify connection with ancestral land or fonua (Tongan), vanua (Fijian), whenua (M□ori) and fanua (Samoa). In many Pacific Island communities, land is still customarily owned but there are variations of this across the Pacific (Farran, 2011). The traditional land ownership systems and social connections have been crucial in facilitating mobility within and between islands.

Framing climate mobility from an Indigenous standpoint allows reflection on the cultural and social needs of communities while understanding the dynamic context under which current and future policies are being planned in the region. It is also important to consider the issues of climate mobility politics in the context of sovereign decisions, proactive engagement in international climate negotiations and recognition of community agency. It is also necessary to critically consider the expressions of resilience as opposed to the externally imposed narrative of 'vulnerability' and 'climate victim' and associated consequences such as being caught up in a vicious circle of aid dependency. Voluntary immobility (refusal to move or preference to stay) is increasingly presented by communities as a form of resistance to climate mobility politics as attachment to land and the option to stay remain a priority for local Indigenous communities.

17.3.1 Mobility and circular migration

Pacific Indigenous ways of knowing and understanding mobility and Pacific peoples' actual experiences of mobility, offer knowledge that is crucial to current and future climate change adaptation (CA) and Disaster Risk Reduction (DRR). Mobility, from a Pacific Indigenous perspective is not simply relocation nor a planned process of movement. Rather, mobility is often viewed as a circular movement (Chapman, 1985a; 1985b) which is complex, long and multidimensional. Mobility is also viewed as part and parcel of an integrated suite of adaptive strategies Pacific Islanders depend on for survival (Latai-Niusulu, 2017). Understanding the factors and processes associated with historical and current Pacific Island mobility could offer lessons for future climate change mobility schemes.

Moving as a community is not new in the Pacific and relocation has been used for generations to face the challenges caused by extreme environmental conditions. Pacific communities and people have always been mobile, not only within their islands but across the Pacific region and beyond. These movements continue today despite the current challenges of climate change and COVID 19. While many may leave their home villages and islands, many continue to maintain connections with the places and people they leave behind (Hau'ofa, 1993; Lilomaiava-Doktor, 2015). Pacific Island mobility, whether forced or voluntary, has been influenced by various environmental, political, and socio-economic factors.

Recent mobility within and outside islands such as Samoa (see case study 2) has been influenced by volcanic eruptions in the 1900s, cyclones in the 1990s and the 2009 tsunami. Peoples' movements in this case have been relatively smooth and sustainable because most (if not all) Samoans have access to customary land. Since the 1990s, many people have started to establish alternative residences inland while still maintaining their homes on the coast (Latai-Niusulu, 2017). Current presences of other Pacific ethnic community groups on Pacific islands such as Fiji and Samoa are also evidence of how historical movements, some of which were forced during colonial rule, continue today. Tuvaluan communities on Kioa Island in Fiji and in Elise Fou in Samoa still maintain ties with their home islands (Tapu-Qiliho, 2019).

Today, community-led relocation is still a major form of human mobility within many countries in the Pacific and community-based relocation mechanisms and state-based political frameworks on planned relocation are well advanced in the region compared to other parts of the world adversely affected by climate change. Lessons learnt from climate-induced relocation in the Pacific can inform policies on the making in other regions that are facing the same challenges (Gharbaoui, 2021). However, even in the Pacific, there is still much to learn about their effectiveness and governance. Some of the major gaps to inform evidence-based policy on relocation include lack of comparative and longitudinal research on what happens to communities that are relocated, the need for more multidisciplinary and transdisciplinary research to understand the complexity of the relocation process and using more community-based methodologies such as Participatory Action Research allowing for knowledge co-production (Ferris, 2023).

This highlights the need for projects such as POCCA to be replicated and funded in future to ensure community voices are reflected in the design of methodologies to capture the complexity of mobility responses to the climate crisis and developing meaningful solutions to address it (Gharbaoui, 2023b).

Explorations of relocations due to the effects of climate change need to take a long-term perspective to capture the role of local level governance and community dynamics in the process (Gharbaoui, 2021). Campbell (2008) has been influential in progressing historical perspective on climate change and human mobility in the Pacific. The typology developed by Campbell is still used today to locate the central role of customary land in planned relocation in the Pacific including:

a. local relocation within customary lands,

b. proximate relocation beyond customary lands,

c. relocation within national boundaries but at some distance from Traditional Lands, and

d. international relocation.

These categories have inspired several authors in their work and have helped frame conception of relocation we use today in addressing climate-induced relocation in the Pacific.

We also direct the reader to a number of other studies of Pacific experiences of relocation and mobility that are currently being undertaken at the University of Auckland, University of Waikato and Mana Pacific (Burson et al., 2024).

17.3.2 Historical and contemporary cases of mobility between countries

The Banaba community (from Kiribati) on Rabi Island in Fiji (Teaiwa, 2015; Tapu-Qiliho 2017; McAdam, 2016) and the various communities of Solomon Islands descent in many Pacific islands, including Fiji and Samoa, are examples of historic cases of mobility in the Pacific, although the reasons for the different cases differed. The Banaba community were displaced from Ocean Island (Banaba) in Kiribati after the British mined the island for phosphate to island of Rabi in Fiji. The new generation has little control over their movements or place of settlement. Most of these communities today exist as peripheral minority groups within their host island nations, leading to many migrants in some of these communities facing ongoing struggles with their identities and sense of belonging. For example, those who reside permanently on Rabi Island in Fiji (see case study 1) due to resettlement and relocation have predominantly been written about with reference to their socio-economic and socio-cultural realities as peripheral and marginalised communities in country (Silverman, 1962; 1971; Teaiwa, 1997; Teaiwa, 2000; Tapu-Qiliho, 2017). Indeed, once settled the experiences of migrants are often overlooked in mobility discourse. However, as migration continues to be used as an adaptive strategy, the nature and experiences of diasporas, as receiving communities maintaining connections to people and places left behind, also contributes to the wider picture of migration as circular movement. The study on immigrant Samoans in Fiji, which looks at the identity journeys of Samoans through a historical lens is an excellent documentation of identity in migration (Tuimalealiifano, 1990; Tapu-Qiliho, 2017).

New Zealand's migration schemes in the 1950s and 1960s established many Pacific communities in New Zealand and later Australia. Recent schemes (2000s) by New Zealand and Australia, such as the Pacific Quota and Recognised Seasonal Employer Schemes have influenced the mobility of Pacific peoples in more recent decades. These schemes have facilitated the movement and development of young Pacific Island families in places like New Zealand. A recent report on the status of Pacific peoples who migrated under the Pacific Quota Scheme notes that most Pacific migrants were doing well in the areas of social connectivity, safety and developing a sense of belonging in their new home, New Zealand (Kantar, 2019). Many of those migrants in the sample identified the wellbeing of their children as an important focus of their early settlement in New Zealand. Of the parents spoken to, their priority was making sure their children were settling well into their childcare or school, becoming familiar with the everyday routines and rituals of education that differed from back home (e.g., a more casual and interactive learning environment), and making some progress towards reading, writing and speak English (Kantar, 2019).

For many migrants interviewed, being able to send money to family back in their home country to improve their quality of life was another important aspect of the Quota Scheme. Across the migrant interviews, there were many examples of migrants sending remittances home in the first few months of earning wages (Kantar, 2019).

Assessments of the impact of the New Zealand Recognised Seasonal Employer (RSE) have been mixed. The RSE scheme and the equivalent Australian Seasonal Work Programme (SWP) and Pacific Labour Scheme (PLS) facilitate temporary labour mobility from selected Pacific countries to meet short-term labour needs in Australia and New Zealand. Research conducted for the New Zealand Ministry of Business, Innovation and Employment (MBIE) concluded that the impacts of the RSE scheme are highly context-driven and vary across sectors/crops within the horticulture and viticulture industries across New Zealand host communities, and within and between participating Pacific countries and their communities (Nunn et al., 2020). For Pacific countries and communities, positive impacts include remittances back to the home state which diversify household incomes and also contribute to meeting basic needs when livelihoods are less productive due to extreme weather events or longer-term climate trends (Nunn et al., 2020). On the other hand, negative impacts include RSE worker wellbeing and financial returns, unequal distribution of RSE benefits (between RSE workers, between men and women, between different Pacific countries, and between different villages within Pacific countries), and loss of workers and parents in the home Pacific state for long periods (Nunn et al., 2020).

While tourism was paralyzed by the COVID 19 border closure, the demand for temporary and comparatively cheap labor in Australia and New Zealand continued unabated in Samoa and elsewhere. Ways have been found to facilitate seasonal worker mobility, and remittances continue to flow in. After more than fifty years of global economic influence since Samoa become an independent state, most Samoans today, whether rural or urban, see their horizons for living as including the wider environments of New Zealand, Australia and the United States (Fatupaito et al., 2021).

These schemes are an indirect, but crucial, aspect of climate change adaptation in Samoa and elsewhere. For example, many Samoan families have been able to finance the clearance and building of their homes inland due to remittances from family members working overseas.

17.3.3 'Staying with dignity': Framing immobility from a Pacific standpoint

'Immobility' has often been ignored in understanding patterns of future Pacific climate mobility (Black et al., 2011a; Adey 2006; Zickgraf, 2018; Farbotoko, 2018; Gharbaoui, 2017; 2018; 2020). 'Trapped populations' referring to involuntary immobility and populations who wish to remain in situ are emerging categories that have been neglected by the climate mobility narratives (Farbotoko, 2018; 2019; Zickgraf, 2019; Gharbaoui, 2017; 2020). Seen from a migration studies perspective, the notion of 'moving with dignity' articulated by Kiribati's former President Anote Tong and frequently advocated by international agencies in the Pacific context, can be interpreted as a significant approach to understanding mobility patterns.

This approach is not usually recognised by theories of migration that increasingly point toward multi-faceted cause-and-effect relations between individual agencies and structural factors (Andrijasevic et al., 2005; Mezzarda, 2004; 2007; Moulier Boutang, 2007; Tsianios, 2007). From a Pacific studies perspective, this approach neglects voluntary immobility as an important coping mechanism used to strengthen cultural and spiritual connections to land.

This understanding is important to the future development of international, regional and national frameworks and policies discussed above. For example, while the notion of legal statelessness is used to refer to those who have been uprooted from their homeland, little is said about cultural statelessness. Internal and external migration, displacement and planned relocation may result in cultural statelessness from a Pacific perspective – a worldview not recognised in the current legal and policy framework (Wilkinson & Kingi, 2021). This 'cultural citizenship', expressed through fonua is not accounted for in current policy on climate mobility, meaning that such responses are incomplete (Wilkinson & Kingi, 2021).

By mobilising Indigenous epistemologies and addressing the structural challenges in decolonising climate change, voluntary immobility can also be framed by Pacific Island people as a form of resistance to the contested narratives around inevitable scenarios of customary land loss (Farbotoko, 2021). At the same time, it is critical to understand complex dynamics around involuntary immobility and observe the consequences of community stress when those who wish to move are forced to remain in the context of relocation (Gharbaoui 2016a; 2016b; 2017; 2020).

The concept of 'staying with dignity' (Gharbaoui et al., 2024) suggests redefining current notions of 'immobility' in regions such as the Pacific where the notion of connection to land and ocean is locally specific and nuanced based on the unique cultural system in place. Gharbaoui et al. (2024) suggest that climate (im)mobilities cannot be understood meaningfully within the current overarching adaptation framework defined by IPCC as:

In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects (IPCC, 2022)

The idea relating to 'moving and staying with dignity' needs to be understood in a continuum across the mobility and immobility spectrum as one cannot be understood without the other.

17.4 Case Studies

In this section, we explore the lessons learned from our three case studies of relocation. We begin with the forced displacement and relocation of the Banaban people from Banaba to Rabi Island, Fiji in 1945. This historical example of forced relocation across borders illustrates the dangers of an externally imposed forced approach and the challenges that persist many years after the relocation. We then look at two more recent case studies of internal relocation – from Samoa and Tonga (ʻAtaata) to illustrate current Pacific perspectives on climate mobilities.

17.4.1 Case study 1: Banaba (Ocean Island)

> We sweat and cry salt water, so we know that the ocean is really in our blood.
> (The late Associate Prof Teresia Teaiwa)

The story of Banaba represents a dual tragedy of climate change and mining. The impact of climate change on the island over the years, in the form of droughts, coastal erosion and sea-level rise, was worsened by phosphate mining which devastated the island and eventually forced people to relocate to Fiji. While the environment of their new home on Rabi Island provided some hope, they could not escape the ever-persistent threat of climate change which has threatened their homes, gardens, seawalls and coastal land. Even for those who remain on Banaba, mining has exacerbated the effects of climate change and has led to frequent droughts which has had terrible consequences in terms of food and water security, as well as health.

In 1900, Ocean Island was annexed by the British as part of its Gilbert and Ellice Islands colony. Following the discovery of phosphate, the Island was leased on a 999-year lease and intensively mined, firstly by the Pacific Phosphate Company and then the British Phosphate Commission (BPC). By 1979 when most of the phosphate deposits were depleted and mining came to an end, Banaba resembled a moonscape, a 'forest of pinnacles' (Teaiwa, 2015), largely denuded of vegetation and almost incapable of supporting human life. Its rich phosphate resources – it's very land - had been used to the substantial benefit of agricultural development in Australia, New Zealand and beyond. But Te aba, the link between land and people, was devastated by mining (Teaiwa, 2015).

During World War Two, Banaba was occupied by Japanese forces from 1942-1945, with many Banabans either being relocated to other parts of the Pacific (Nauru, Kosrae and Tarawa), or being subject to harsh treatment by the Japanese, with many dying from starvation or torture. After the end of World War Two, rather than being repatriated to Banaba, the British colonial government, against the wishes of Banabans, gathered up the Banabans from their scattered locations, and resettled them on Rabi Island (Fiji) in December 1945.

Many Banabans remain living on Rabi Island, although others have migrated elsewhere in Fiji and beyond to Australia and New Zealand. A small number of Banabans have returned to Banaba as caretakers of the island. Attempts to revive a traditional economy in Banaba have mostly been unsuccessful. Banaba is administered by the Rabi Island Council in Fiji, although it is formally a part of Kiribati. The Constitution of Kiribati 1979 also provides for two elected members of the Maneaba ni Maungatabu (Parliament) to safeguard Banabans' interests – one from the electoral district of Banaba itself and one representing the Banaban community in Rabi. These two Banaban representatives have a right of veto over amendments to the constitutional safeguards for Banabans. These unique governance arrangements have caused some discord and tension because of the perceived special treatment accorded to Banabans, and because the veto has been used to prevent Kiribati government initiatives on Banaba (McAdam, 2016).

Since November 2021, successive droughts in Kiribati have left 300 Banabans on Banaba extremely vulnerable to major health issues as they are particularly exposed to contaminated water and fear starvation. Taboree Biremon, a Banaba resident explains:

> Skin disease and diarrhea is widespread, especially in children, because we've had no choice but to drink contaminated water or saltwater {...}. The (children) are not OK because they don't understand. They want food they can't receive. We just feel so sad about it but there's nothing we can do (Komai, 2021).

Some key lessons learnt from the Banaba experience

Ever since relocation, Banabans have had two homelands – 'one where they live and one which lives in their memory' (Shennan & Tekenimatang, 2005). The connections to Banaba remain deep and vibrant - more than four generations since the 1945 relocation to Rabi Island and more than 1,500 km from Banaba, the Banaban sense of place, history and identity is strong.

As a case study of mobility caused by colonial and climate change devastation of homeland, Banaban displacement illustrates the significant challenges in achieving justice and reparation from the Global North. In the 1970s, the Banabans fought a long and costly battle for compensation from the United Kingdom and the BPC for environmental damage to Banaba and for their displacement. The case of Tito v Waddell (1977) resulted in a declaration that the British Crown had not acted honourably, but it was ultimately unsuccessful in delivering any financial or environmental reparation to the Banaban people. Subsequent arbitration saw the BPC offer £780,000, and the British Government set up a £6.5 million trust fund for the Banabans. Physical rehabilitation of Banaba is still required. Ironically, because it is a high island, if other parts of Kiribati (which are mostly low atolls) become inundated due to sea level rise, the island of Banaba may be the only part of Kiribati left above water.

Banabans say the drought since 2021 has given a sense of urgency to find a long-term solution and Banaban leaders are seeking support of Australian and New Zealand governments to return to their ancestral traditional methods of survival consisting in capturing and storing water as was done for centuries. The climate crisis, exacerbated by the impact of mining, is worsening and Banabans are increasingly vulnerable (Komai, 2021).

The Banaban displacement also illustrates the challenges of developing appropriate governance arrangements following relocation. The Rabi Island Council is responsible for administering both the affairs of Banabans on Rabi Island and for Banaba itself. However, there are also two Banaban representatives in the Kiribati Maneaba ni Maungatabu. There are therefore some tensions in the relationship between the Rabi Island Council and both the Kiribati and Fiji governments. As a small minority in both Fiji and Kiribati, ensuring ongoing visibility and robust political voice for Banabans is challenging.





Figure 17.1: *Banaba, before (picture below) and after (picture above) mining. Source: https://teara.govt.nz/en/photograph/24245/banaba-before-and-after-mining. Photo Credit: Alexander Turnbull Library, Colville Collection; Reference: PAColl-6044-15; PAColl-6044-01; Photographs by Lilian Arundel; Permission of the Alexander Turnbull Library, National Library of New Zealand, Te Puna Mātauranga o Aotearoa, must be obtained before any re-use of this image.*

17.4.2 Case study 2: Micro-mobility and circular migration as climate change adaptation in Samoa

Faa-aigalua (micro-mobility) (Latai-Niusulu, 2017; Latai-Niusulu et al., 2023) and malaga (circular migration or journeyings) (Chapman & Prothero, 1985; Lilomaiava, 2009; Lilomaiava, 2015) characterize the historical and current mobility of Samoan individuals, households and villages. Faa-aigalua refers to the way Samoans shift back and forth between two houses, families or residential locations, flexibly and spontaneously, not only within their village but also across villages.

This movement is enabled by Samoan bi-lineal access to customary or family-owned land via their mother or father's lineage. In recent times, other Samoan households have also been able to purchase privately owned land parcels from the government and various churches. In many cases, a single Samoan household would have more than one land parcel upon which they have either built a residence or are using for cultivation. Today, many families are building alternative residences in the inland parts of customarily owned villages, on what used to be their plantation lands or on privately owned parcels of lands they have purchased.

This flexibility of movement of villages on customary owned lands is also evident and at times, the government and churches have facilitated this process. Many Samoan villages were located inland before pre-European times and relocated to the coast in the 1800s (Davidson, 1962). The volcanic eruption in Savai'i in the early 1900s led to the relocation of two villages from this island to the main island of Upolu. This was facilitated by the German colonial government. Some inland relocation was first evident in the 1950s through until the 1970s. This pattern of movement extended nationwide after Cyclones Ofa and Val destroyed many coastal villages and infrastructure in the 1990s. The 2009 tsunami led to the urgent inland relocation of many villages on the southeastern coast of Upolu.

Long term, incremental relocation is evident in many Samoan villages as seen in the case of Sa'anapu (see Figure 17.2). Sa'anapu's population has increased from 739 in 1961 (Samoa Bureau of Statistics, 2016) to 1,305 in 2011 (Samoa Bureau of Statistics, 2011) and the majority of Sa'anapu's inhabitants lived on the coast before the 1990s. However, now only a few families remain, as most have shifted inland, since the 1950s, to live in their plantation lands. The coastal part, commonly known as Sa'anapu- tai, is characterised by a few small houses, the Congregational Christian Church, that is currently being rebuilt, and an abandoned tourist business. All are closely located on a narrow strip of land separating the sea and the Sataoa-Sa'anapu Mangrove Forest Conservation Area (see Figure 17.3). A barrier reef is located offshore.

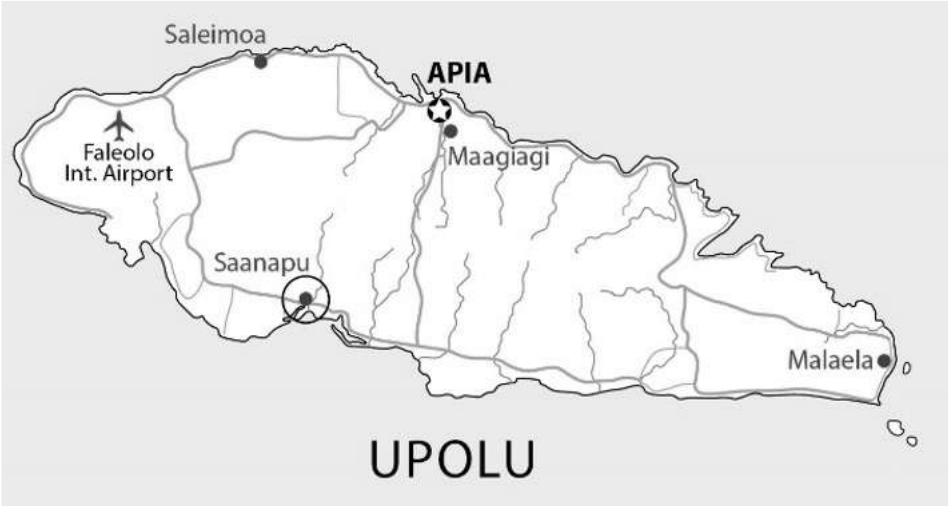


Figure 17.2 The village of Sa'anapu is located on the southern coast of Upolu Island, Samoa (Latai-Niusulu, 2017)

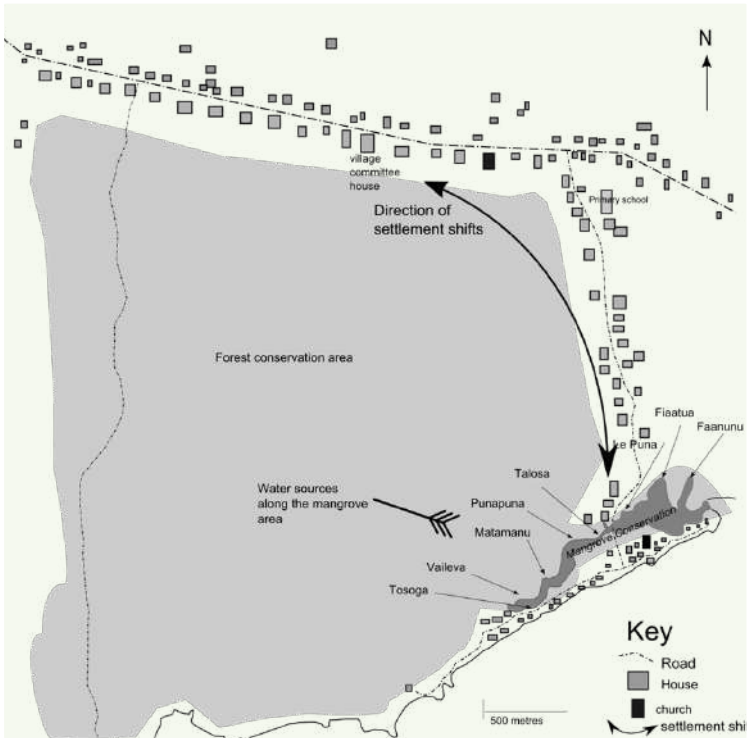


Figure 17.3 Incremental spread inland of Sa'anapu village is marked by the two-headed arrow (Latai- Niusulu, 2017).

The inland part of the village is now called Sa'anapu-uta. As stated earlier, the relocation started in the 1950s when the South coast road was completed. The trend accelerated after the 1990s cyclones which destroyed much of the village (Ward & Ashcroft, 1998). A few families shifted more recently after the 2009 tsunami. In 2011, 143 people lived in the coastal part of the village, while 1162 people lived inland (Samoa Bureau of Statistics, 2011). In 2021, only 122 remained on the coast while 1260 lived inland (Samoa Bureau of Statistics, 2022).

Communal ownership of lands has also enabled a smooth transition for many, from their coastal lands to inland areas which were mainly used for plantations. Remittances from family members working overseas and in Apia have enabled most to build houses, while others provided food by working the land and fishing. Village, church groups and government have also provided support when necessary. An elderly woman described how both she and her husband shifted inland in the 1970s because they wanted to develop their plantation in order to better support their family. There was already a lack of space in the coastal part of the village as there were too many people living there, but with very little land.

The term malaga (Lilomaiava, 2009; Lilomaiava, 2017; Muliaina, 2017) refers to the circularity of Pacific Island, and specifically Samoan, inter-island or external movements where those who leave always connect back to their places of origin. The existence of settler communities of Tuvaluan (Tapu-Qiliho, 2017), Niuean, Tokelauan and Melanesian descent in Samoa is evident of historical malaga and connections, between islands, and within Oceania. Samoans who have left the islands continue to visit the islands or send remittances which have been crucial to the development and mobility of their families back home.

Some key lessons learnt from micro and circular mobility in Samoa

Mobility is a continuous process that occurs at various scales. There is evidence that people are moving inland in many parts of Samoa as a result of climate change and other environmental challenges.

- Mobility mainly occurs at the household level in Samoa as demonstrated by the experience of Sa'anapu. Availability of customary lands and bilineal access to customary lands in Samoa facilitate this continuous movement of people inland to avoid the impacts of cyclones and other natural events. Assistance provided by the Samoan government and overseas funding agencies such as in terms of infrastructural development (inland access roads, tapped water supply and electricity) has been important in facilitating the movement of people inland.

- Families that remain on the coast also have land inland which they use to cultivate food crops.

- There is also evidence of movements outside the village as people buy private lands and move there. Access to education and paid employment are key enablers.

- Some families leave the country to live in neighboring New Zealand and Australia. In these cases, the role of families already living in New Zealand and migration and work schemes developed by New Zealand and Australia are key factors which have enabled these movements.



> “Young people alone are the ones who relocate specifically to New Zealand in search of employment. Elderly people are set against relocating; they cherish their home and the location they were born in, and they believe that staying in their own country brings them greater happiness than leaving it”
>
> Teniku Iefuka
> Funafuti
> Tuvalu
> (POCCA research team interview, 2023)

POCCA Community consultation in Funafala, Tuvalu, to discuss lived experiences of climate change (Photo: POCCA team 2023).

17.4.3 Case study 3: ‘Ata’ataa Si’i (Smaller ‘Ata’ataa), Tonga

The tragic story of Ata’ataa shows how battering by waves and other impacts of climate change can be worsened by sudden onset of a mega disaster, in this case tsunami. Total inundation of islands by the ocean and mass relocation of all inhabitants as a result of climate change, has been a common occurrence in the Pacific for years.

‘Ata’ataa is a tiny island in Tonga that lies off the western tip of the main island of Tongatapu. From the air it looks like a frying pan with a crooked handle, protruding south-south-westwards. It is about 20 to 40 minutes by open punt from the capital, Nuku’alofa. At the last national Census in 2021 (before the volcanic eruption and resulting ‘Peau-Kula’ (Red Wave) it had a population of 124 (60 male and 64 female) living in 30 households, 23 of which were headed by males and seven by females. Sixty-seven of the residents were over the age of 21, 16 over the age of 60, seven over 70 and three over 75 years. Thirty-eight of the residents were between the ages of five and 14 (primary school age) and nine were below the age of four.

The majority of the residents built their homes on their ‘town allotments’ in the narrow panhandle, which was the low lying and flat part of the island and used the higher and expansive part of island, where their ‘tax allotments’ are located, to grow crops and to raise pigs and chickens and a limited number of cattle. On the southern tip of the panhandle was located the Royal Sunset Island Resort, which provided employment opportunities for the locals and allowed tourists and visitors to enjoy the serenity and the beautiful beaches of Ataatā Island. The Resort was also the market for the locals’ crops and their harvest from the surrounding seas. There were no roads and therefore no cars. There was however a carefully kept walkway from the Royal Sunset Island Resort, running through the village to the higher end of the island. There was a local Government Primary School and two churches – the Free Wesleyan Church of Tonga, and the Free Church of Tonga – both of the Methodist tradition, but which had split over a century ago, for political and cultural reasons.

Land in Tonga is divided into four types of estates. The first is ‘Crown land’, which is Government Estates held by the Government and administered by the Minister of Lands. The second is ‘tofi’as’ which is hereditary estates held by nobles and matapules (talking chiefs). The third is ‘royal estates’ and the fourth is ‘royal family estates’ held by the royal family. Less than 3% of the county’s land area fall into the third and fourth estates. There is no such thing as ‘freehold land’ in Tonga. On top of that, land cannot be alienated. Furthermore, communally owned or customary land does not exist. Land ownership in Tonga is individualised and the interest of the holder is only a life interest and the prescribed rule of succession is that the landholder passes it on to his oldest legitimate male heir. This ensures that the land remains in Tongan hands.

According to Tonga’s Constitution, every male Tongan subject is entitled to receive a grant of two pieces of land by the time they are 16 years of age. The first is a grant not exceeding 3.3387 hectares as a ‘tax allotment’ (‘api ‘uta) where he can cultivate crops and rear cattle, pigs and chickens. The second grant of land is an area not exceeding 0.1618 hectares in a village/town as a ‘town allotment’ (‘api kolo) where he can build his family home.

Note that women do not have the same constitutional entitlement. Note also that because of increased population and limited (and diminishing) land area, the size of new town allotments in Nuku'alofa today is reduced to 0.1011 hectares.

The island of Ata'ataa belongs to the hereditary estate of HRH Prince Ata, the second and youngest of His Majesty King Tupou VI's three children. The other component of his estate is the village of Kolovai on the western end of the island of Tongatapu. HRH Prince Ata has complied with the constitution and granted the male population living on the island of 'Ataata, 'tax allotments' and 'town allotments', which they have registered. Land ownership is strictly limited to one 'tax allotment' and one 'town allotment' per male over the age of 16.

At around 5pm on 15 January 2022, there was series of volcanic eruptions from the partially submerged Hunga Tonga-Hunga Ha'apai volcano that had been quietly spewing clouds of volcanic smoke and ash into the atmosphere for over 6 months. In fact, residents of Ata'ataa had a clear view of the smoking volcano from their homes and had become accustomed to it. The explosions (which were heard even in Fiji) were something else!

Twenty minutes after the last explosion the first tsunami (Peau Kula) estimated at 17 metres tall hit the island, quickly followed at short intervals by three more. All of the homes located on the panhandle were destroyed, including the Royal Sunset Island Resort. No one was killed on 'Ataata that day. The residents were grateful that the volcanic eruption and tsunami had not happened at night. Otherwise, many people would have been killed.

The few homes that survived were located on the elevated part of the island. These few houses provided shelter for the women and children of the island from the volcanic ash that immediately rained down on Ata'ataa (and the whole of Tonga) soon after the tsunami struck, and quickly blotted out the setting sun. The men and boys had to make do with whatever shelter they could find under the trees or makeshift shelters they could quickly assemble in the dark from the tsunami debris.

Somehow, they managed to get everyone to the elevated ground. It was a Saturday afternoon, and the norm is for families to prepare food for the umu (earth oven) for a family lunch after the Sunday church services. But the Sunday after was totally different. One of the family members revealed:

> We gathered our people in our houses and at first stood outside and looked down with great horror and shock at the destruction done to the village. Trees and houses alike were taken away easily by the force of the waves. The fourth wave was devastating and the largest, raking almost everything into the sea. We went into the house and in desperation, try to discuss and we shed tears together, emptying our sorrows, the tears turn into light conversations and laughter, reminiscing even some of the funny moments as well. Then we had songs and prayers thanking the Lord that we survived. The men prepared umu and everyone enjoyed a great meal together; maybe that's how our ancestors look after each other in the challenging environment of the Pacific. We do things together and even grief and share our load together. The next day we began rebuilding, and life is back to normal in the sense of building life together as in communal collective work (Participant, March 2023).

As a result of the disaster, the Government and the estate holder decided that the island's entire population was to be evacuated and relocated to Tongatapu. The majority were initially housed in a church hall in the Nuku'alofa suburb of Kapeta and were sustained by the Kapeta community, relatives, as well as the Government. Some of the evacuees moved in with relatives in different villages on Tongatapu. The Government's plan, with the estate holder's approval, was to construct a new village for the evacuees on the estate holder's second estate on Kolovai. But the site chosen was located next to the village of Masilamea, (which is Crown land) and was used by the people of Kolovai for growing crops, although it had not been subdivided into individual tax allotments. It was convenient that the estate holder had vacant land available. If that had not been so, the Government would have had to seek alternative land for the 'Ata'ataa evacuees from Crown land or other hereditary estate holders, and that process would have definitely been more expensive financially as well as more cumbersome, and moving into a new permanent home would have taken much, much longer than the eleven months it took.

There were mixed reactions amongst the 'Ata'ataa residents to the forced relocation. A few of the families whose houses were completely obliterated by the tsunami were willing to move as the state would build new houses for them, taking into consideration the resources and finances needed to construct new houses. But there were families whose houses were also destroyed who were still willing to rebuild another family house on Ata'ataa island at their own expense. Then there were those families who would have liked to stay on the island no matter what, but their allegiance to the state was still strong and therefore they gave in to the idea of relocating to the mainland.

One such resident said;

> Our heart is here where our ancestors are buried and where our memories of growing up and memories of life exist. We cried with heavy hearts while discussing the issue of moving as the concept is easy to think about and life goes on from an outsider's view. For us it's more than just the new life ahead that we need to look into but our connection and history that we have to leave behind. Just heart wrenching and unbearable, yet we have nothing else but to listen to the government and the leadership of the day (Community participant 1, March 2023).

The majority of the evacuees were eventually relocated into their newly constructed homes and newly created village 'Ata'ataa Sii in December 2022. The houses were beautiful and comfortable, and all of the same model and the evacuees were happy. But soon they realised they had some issues. The main challenge was that the families were given 'town allotments' but no 'tax allotment' or even space to grow food to sustain their families. Keep in mind that on the island they had the sea and land to sustain them, and most did not require formal employment as a consequence. They used to harvest their crops and sea resources and sell them to the Royal Sunset Island Resort or at the Nukualofa market, but now they needed to look for alternative means of livelihood. Their new village is not adjacent to the ocean. The women could no longer forage when the tide goes out and the fishermen could no longer cast their nets or spearfish. People became homesick. And some families are still waiting (in the homes of relatives) for their houses to be built. And their new village lacks community spaces like community halls, playgrounds for children and a church.

The Government's priority was to ensure that people were safe from any other tsunami as the volcano is still active as well as storms and cyclones. They also stated that more houses would be built in the future, and work is still underway for securing more land for the people of 'Ata'ataa (within and outside of the estate holder's estate) to use for farming and other purposes. To overcome the constitutional limitation of one 'town allotment' per male citizen over 16 years, the Government allowed the evacuees to register their new 'town allotment' on 'Ata'ataa Si'i under the head of the household's male children. This enables the head of household to retain his title over his 'tax' and 'town allotments' on 'Ataata. The Government has also allowed the evacuees to travel back and stay on the island for a day if they need to, but especially to harvest the root crops they have left behind and feed their pigs and chickens. Fishermen are also allowed to stay a night to get fish and sell them at the Nuku'alofa market in the morning. Villagers who have boats and those who can buy fuel always visit the island to get food and visit their animals. But this marginalises others who do not have the capacity to do so. One of the villagers who regularly travels back to the island stated;

> We not only miss our life on the island, the island has everything we need. I travel every week to the island and at times, I take my family with me, it brings back memories and allows that connection of place for children. We still clean up our house and clean the surrounding area as well, we also cook and eat on the island it's more like a picnic spot for us. But a different kind of picnic, it's something that we always look forward to as a family and an opportunity to visit our people buried on the island. Yes, we moved to the mainland, but we have to visit our island, it's part of who we are (Community participant 2, March 2023).

Another family who does not have the ability to regularly visit the island got a different and interesting approach to settling on their new island but remaining connected. Their elderly mother passed away in the newly relocated village after a few months, and their family came up with a drastic decision. This is what she shared;

> We are connected to Atatā island and it's our home. When mom passed away we know we are not able to carry out the ceremony on the island. Then we discussed as a family and decided that we needed to get dad who was buried on 'Ata'ataa island and bury them together at 'Ata'ataa siī. We cannot bury mom here and leave dad on the island we need to let them rest together. This means that our connection to our new village is stronger than before since both our parents are here with us. Life may be rough now, but once we get land for planting crops, it will be a little easier (Community participant 3, March 2023).

Some key lessons learnt from this case study:

a. The effects of years of impact by climate change through constant battering by waves and cyclones can suddenly be magnified by other natural disasters such as tsunami. This can lead to total devastation of island and mass relocation. Relocation can be a short-term solution but as we have seen in the case of "Ata'ataa, problems of land tenure, access to sea and land resources people are used to can be a challenge.

b. The evacuees had new homes built for them and new 'town allotments' to call their own. But they do not, as yet, have access to land on which they can grow crops and raise animals for domestic consumption.

c. The evacuees have new homes in 'Ata'ataa Sii, but as yet, the new village lacks community spaces like community halls, playgrounds for children and a church. Note that in 'Ata'ataa, the evacuees had built two community halls and two church buildings at their own expense. What they need at the new village is land allocated for the halls, churches and playground.

d. The evacuees were self-sufficient on 'Ataata. They were surrounded by the ocean and had access to land for farming for sustenance, and had the Royal Sunset Island Resort as an employer. Ata'ataa Si'i is not adjacent to the sea. There are no tax allotments. There is no ready employer. People are homesick.



Figure 17.4: Newly built houses on 'Ata'ataa Sii for those relocated from Ataata Island.

17.5 Policy implications

In this final part of the chapter, we set out policy recommendations which attempt to capture Pacific perspectives on climate mobilities.

Our key policy recommendations are:

- Pacific ways of knowing and Pacific peoples' varied experiences of mobility must be central in the development of strategies and policies relating to future mobilities and immobilities of Pacific communities.

- Bottom-up approaches where people are directly involved in the planning of relocation schemes will be more sustainable. In particular, the voices and perspectives of Pacific elders, women, future generations and people with disabilities must be included. Forced or top-down relocation schemes without input from the local level are not sustainable.

- The diversity of climate mobilities and immobilities need to be understood in a continuum through a complementary human-rights based and values-based approach where the role of the community is central to consider, especially when dealing with 'moving or staying with dignity.'

- Key dimensions of policies for climate mobility in the Pacific should include: People's sense of belonging and spiritual connection to both ocean and land; the realities of two or more homelands for many Pacific peoples; the experiences of circular mobility and micro-mobilities as adaptation practice for many Pacific peoples; continuing connection and access to customary land/fonua/vanua/whenua and resources; the phenomenon of 'travelling knowledges', i.e., knowledge that is mobile along with the people; the role of the diaspora in facilitating inter-island movement; and future governance arrangements for communities that move.

- Future climate mobility schemes must learn from and draw on existing mobility schemes in the region, such as the Pacific Quota Scheme and RSE Scheme, taking care to avoid remedying one harm by replacing it with another.

- Mobility schemes must consider strategies for supporting those who move to maintain their spirituality, identity and sense of belonging to both ocean and land.

17.6 Conclusion

As we have observed in this chapter, forced mobilities resulting from climate change impacts will lead to growing challenges threatening Pacific Islands' security through issues such as land and food security, state-sovereignty, and culture preservation. Evidence-based policy often overlooks Indigenous knowledge and national statistical offices often lack clear guidance from policymakers on information that is required on mobility. Policymakers, labour experts and statisticians are often required to work together to set the parameters of the type of data that is required for evidence-based policy-making on climate mobility. The lack of consistency across definitional and statistical concepts on climate mobility made it difficult for data to be compared. This has led the scientific community and policy makers to follow international standards in order to define such concepts that are still mostly referred to under framing of the Cancun Agreement paragraph 14.

The chapter critically engages with the current framing on climate mobility and argues for a more nuanced terminology that would be more appropriate to Indigenous representations of mobilities and immobilities. Reframing climate mobility from the community standpoint would allow the capture of current dynamics at play in the region alongside climate mobility politics. For example, more consideration of the possibilities of relocation drawing on historic and recent Pacific experiences of relocation is needed, alongside the more readily referred to outcomes of migration and displacement. It will also provide conceptual tools to adequately plan for future adaptation to the climate crisis in the region, in a way that is meaningful for the Pacific peoples. Current framing and narrative used on climate mobility by policy makers and scholars derive from Global North and Western worldview through mechanisms such as UNFCCC that may not be appropriate to the local context of the Pacific communities. This chapter aimed to capture community stories in order to redefine climate mobility from an Indigenous standpoint in complementarity with international conventions and practices. Promoting the integration of Indigenous knowledge and customary governance mechanisms very early in mobility processes such as relocation is critical to ensure the various forms of (im)mobility as adaptation response to the climate crisis are tailored to the local context and reflect the varied experiences and knowledges of Pacific peoples.

Current literature and research makes it clear that only through bottom-up approaches, where communities are directly involved in decision making, can the intricacies of culture, history and what makes for successful relocation, be understood, and supported. This must happen now as international developments in migration law and adaptation processes attempt to address human mobility and climate change lack Pacific narratives and deep understanding of Indigenous knowledge. Customary land and the dynamics of immobility deserve further attention as the socio-cultural components of land attachment in form how loss and damages are truly assessed by people in the Pacific. Addressing relocation in a continuum within the mobility spectrum including both mobility and immobility outcomes recognising the importance of attachment to customary land, loss of connection to land (whenua, banua, fenua) and other factors shaping mobility responses from an Indigenous standpoint can be a model for Pacific countries to use for their NDCs and UNFCCC global stocktake contributions on loss and damages.



> If you look around Niue, there's not many people left, the young ones have moved overseas, even though their homes are not affected yet, they still move to support their families back here in Niue, but they always come back, I lived in NZ for years but my heart is in Niue so I came back and re-live the way I was taught when I was young. I want my grandchildren to know Niue, but maybe one day there will be no more Niue, for now I'm staying right here

Community participant
Niue
POCCA team interview
(POCCA research team interview, 2023)

POCCA Community consultation in Niue, to discuss lived experiences of climate change (Photo: POCCA team, 2023).

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Chapter 18

Climate Finance and Carbon Markets: Implications on Local Communities in the Pacific

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Photo of the Nauru solar panel installation project as part of its efforts to reduce carbon emissions, with plans to utilise them in the near future (Photo: POCCA team, 2023).

Abstract

Financial resources are important in mobilising strategies towards climate change. Thus, climate finance is now seen as an important component of mitigation and adaptation in the campaign to address the slow onset and dramatic impacts of the climate crisis. However, there are debates around the political, economic and logistical aspects of climate finance and how impactful it is in addressing the needs of local communities at the forefront of climate-related disasters. This is because of the focus on funding for long term mitigation strategies rather than immediate adaptation and rehabilitation approaches. The study shows that while Pacific Islands Countries and Territories (PICTs) have benefitted from climate finance in certain sectors, they are faced with issues relating to accessing the different categories of climate finance because of the complexity of the processes involved. The article also examines the amount of climate finance disbursed in the Pacific and other issues relating to process, equity and timeliness. There is a view that climate finance should also help enhance the resilience and adaptive capacity of local rural communities as well rather than just focus solely on large energy projects which often benefit urban populations as well as private contractors. The chapter also looks at the controversial carbon trading scheme and how local Pacific communities have been involved in providing carbon credit through environmental conservation and the extent of monetary benefits to local villagers. In the bigger political economy rubric, the sale of carbon credits to big international corporations through middle operators, raises questions of climate ethics, equity and justice.

Glossary of key terms

Climate finance:	Refers to various forms of funding—local, national, international—which are sourced from public, private and other sources—which are aimed at addressing climate change mitigation and adaptation.
Carbon trading:	This refers to the buying and selling of carbon credits to offset the greenhouse gas emission by companies and other entities.



> “Agriculture is the backbone of communities’ economy, culture, and livelihood, but the people face many challenges. They had been paying a lot for commercial chemical fertilisers as the government had spent a lot buying them overseas, especially in Indonesia and Australia. Once people use chemical fertilisers, the soil will need more chemical fertilisers after every harvest, which means paying for more. It is not good for our people who are already struggling on top of the climate crisis”

Community participant
Ermera community
Timor Leiste
(POCCA research team interview, 2023)

Picture of a home garden in Ermera, Timor Leste utilising sustainable means to adapt to extreme heat (Photo by the POCCA team, 2023).

18.1 Introduction

Climate finance and carbon markets are seen as important components of global response to the impending climate crisis but there are also questions to be asked about their impact on and benefits for local Pacific communities. They are shrouded in complex political, economic and cultural issues which need to be unpacked and understood (Nantongo et al., 2019; Nel, 2015; Schmidt, 2014). The questions which guide the analysis in this chapter are: What are some challenges of climate finance and carbon markets in the Pacific? What are some implications of these on local Pacific communities and Indigenous knowledge? What are some potential areas where local communities can directly engage with carbon finance and carbon markets in ways which are just, equitable, empowering and sustainable?

It is important to clarify at the outset, what the terms climate finance and carbon markets imply in this chapter in the absence of a globally agreed definition. Climate finance refers to the funding directed at emission reduction in the form of mitigation or adaptation initiatives (Brown et al., 2010). Carbon markets refers to trading in carbon credits by governments, corporations and other groups to meet their emission targets (World Bank, 2021). These brief definitions will be unpacked and dealt with in detail later.

The Pacific Island Countries and Territories (PICTs) are at the forefront of the global campaign for climate action as well as a leading voice in amplifying the existential threats of the climate crisis and calling for the urgent scaling-up of financial resources for climate actions particularly for adaptation and resilience. Addressing the climate crisis is considered to be a priority for the Pacific region, as reflected in regional agreements such as the Boe Declaration on Regional Security (2018), the Blue Pacific's Call for Urgent Global Climate Change Action (2019), Kainaki II Declaration (2019) and the 2050 Strategy for the Blue Pacific Continent.

The UN Framework Convention on Climate Change (Paris Agreement) references the principle of 'Common but Differentiated Responsibilities and Respective Capabilities (CDRRC), which has proved to be a major obstacle in negotiating mitigation efforts between large industrialised countries (Annex 1 Parties) and PICTs (Chen 2021; Pauw et al., 2014). The impact of climate change on PICTs is much more disproportionate, relative to the amount of greenhouse gases they emit; yet no progress has been made thus far to adequately adjust for UNFCCC's principled anachronism. The climate crisis has brought to the fore the stark realities of pre-existing global inequities.

For PICTs, the twin challenges of lack of financial resources and the unrelenting impact of the climate crisis have opened up new windows for seeking multiple ways of strengthening their adaptation, mitigation and resilience programs. Because of their heavy reliance on development aid and the increasing importance of climate change in state policies, climate finance is often seen by PICTs as an important input into both their climate policies and their development priorities.

At the local community level, the need for resources to support adaptation and resilience to climate change has never been greater. Given the communities' cultural relationship with the environment, the role of Indigenous knowledge and innovation to sustain their resilience needs support.

While climate finance and carbon markets are often associated with the formal market mechanisms, the challenge is how they can operate in the context of local Indigenous knowledge, community practices and socio-cultural institutions without being exploitative and extractive but empowering to local communities? To approach this question, we need to consider the active role of human agency in making choices in relation to what best serves community needs. Critical to this approach is the central role of Pacific agency in engaging both climate finance and cultural capital and how this can be of value to local communities. The questions that need asking are: How can climate finance and carbon markets enhance Indigenous innovation and community resilience? How can Indigenous innovation reshape the way climate finance is conceptualised and applied in the Pacific?

The chapter is divided into two major parts. The first examines the issue of climate finance and implications on Pacific communities and the second part looks at the Pacific carbon markets and some of the ongoing challenges. Included in the study are the voices of local people collected from the field research and some recommendations for options on future climate strategies based on participation of local communities and privileging Indigenous innovation and knowledge in climate adaptation, mitigation and building resilience.

18.2 Climate finance

18.2.1 Climate finance: Contested narratives

There are various ways to define climate finance but by-and-large these can be categorised into narrow and the broad perspectives (Samuwai, 2021). A narrow definition tends to view climate finance in relation to transboundary financial flows from developed to developing countries (based on Article 4 of the 1992 UNFCCC). This interpretation is linked to the principle of 'common but differentiated responsibilities' (CBDR) which refers to the idea that the polluters, who are mostly industrialised Global North countries, are obliged to provide financial resources to reduce greenhouse gas (GHG) emissions which they have been responsible for.

Another narrow definition refers only to 'new and additional' component of finance flows in the form of official development assistance (ODA) (Brown et al., 2010; Kharas, 2015; Stadelmann et al., 2014; UNCTAD, 2015). For instance, the Fast-Start Finance, as stipulated in the 2010 Cancun Agreement, adopted this narrow view of climate finance.

Within this definition, around US$30 billion were allocated for the 2010-2012 period. Under this definition, while climate finance follows the normal ODA protocol and disbursement process, it is at the same time tagged as unique in that it is 'new and additional'. However, the question of what qualifies as 'new and additional' ' is still blurred and debatable.

On the other hand, the broader interpretation of climate finance is framed by UNFCCC as 'local, national or transnational financing, which may be drawn from public, private and alternative sources of financing—that seeks to support mitigation and adaptation actions that will address climate change' (UNFCCC, 2018).

This definition is broad and encompassing enough to cover any financial flows (from any source) which is for the purpose of reducing GHG emissions or/and help societies adapt to climate change impacts. In other words, climate finance is the totality of flows directed to mitigation and adaptation projections (Buchner et al., 2017; Falconer, 2014; Stadelmann et al., 2014). Along the same line, the 2015 Paris Agreement also interpreted climate finance as 'financial resources provided to assist developing countries with respect to both mitigation and adaptation' (UNFCCC, 2015, p. 13).

While affirming the obligation of Global North countries to assist Global South countries, the 2015 Paris Agreement, also called for, and encouraged, sourcing of climate finance from other avenues including the private sector as well as 'financially abled' Global South countries.

It is important to note that the definitions are politically framed, and they may have implications on the different parties involved, and this may explain the lack of consensus. It may imply attributing rights and duties of considerable significance to different parties thus there is an element of political sensitivity involved in framing a definition. Some high emitting countries would rather prefer that the term remains ambiguous and broad to allow them more flexibility to define the concept in a manner that will serve their interests and avoid their obligations. Thus, it is highly unlikely that a unanimous definition will be achieved soon considering the heterogeneity of global political interests (UNCTAD, 2015).

For Pacific PICTs being able to take advantage of different types of funding under the broad climate finance definition may be to their advantage. However, there are challenges we shall examine later.

18.2.2 Challenges of global climate funding

The climate finance strategy is characterised by a top-down approach in relation to allocation and disbursement and the local recipient communities, including the most vulnerable, in the Global South are often at the lowest strata of the 'food chain.' The proliferation of different climate funds such as the Global Environment Fund (GEF, which has been in existence since the establishment of the UNFCCC in 1994), the Adaptation Fund (which was established in 2001 during COP7), the Green Climate Fund (GCF, which came into force in 2010 during COP16), Special Climate Change Fund (SCCF) and even the Least Developed Countries Fund (LDCF), has not made access and implementation of projects easier. In fact, their requirements are in certain ways parallel to normal market funding mechanisms. Accredited financial institutions such as the World Bank (WB), International Monetary Fund (IMF), Asian Development Bank (ADB), amongst others act as middle dealers responsible for the disbursement of the funds to countries. Often, these financial institutions will add some loan components to the disbursed funds while private companies also benefit through contracting (Navarro, 2022).

The setting up of these 'vertical' funds and the pledge by the rich countries to transfer the so-called US$100 billion climate finance goal annually by 2020 to Global South countries has been a disappointment. Many countries such as the United States of America have not been able to fulfill what they pledged and overall, there has been a significant shortfall in the amount pledged compared to the amount received (Schmidt, 2014). Furthermore, there is no agreement between countries as to how the amount is to be classified and accounted for—should it be just grant, or should it also include loan and multilateral contribution? The contested definitions and perceptions of climate finance, the diverse interests of stakeholders and other factors account for some of the challenges mentioned earlier (Brown et al., 2010).

A further complication arises when we consider how funding is allocated to implementation of projects. For instance, a lion's share of climate finance has been spent on promoting clean energy (mitigation) through the application of renewable-energy technology, energy efficiency and sustainable transportation. The sustainable energy industry is a lucrative area of profit-making for energy corporations who generate private gain using public money and on the back of the planet's misery. The 'profit' incentive of investing in mitigation projects overshadows funding of adaptation programs, which are in fact more urgently needed in Global South countries faced with the destructive impacts climate change crisis. Some adaptation projects at community level include such things as coastal protection, rainwater harvesting, climate-proofing infrastructure (such as roads and community evacuation centres) and automated weather systems (McGregor, 2015). The same unequal funding challenges can be seen in the agricultural, forest and land-related activities, a sector which contributes to about 25% of all greenhouse gas emission. Only about US$96 billion was spent in 2016 in this sector (McGregor, 2015).

Another issue is the lack of defined standards when it comes to donors reporting their contributions. Reporting by some donors is based on the OECD Rio Marker, which has a self-reporting system of three categories of scores, which are quite subjective in nature. The 'principal' score refers to projects where the explicitly stated purpose is climate change mitigation or adaptation. The 'significant' score is when climate change may not be explicitly articulated but still constitute an important component of the project. The 'not targeted' projects are those which either do not include climate change as a project goal or have 'extremely limited' and 'superficial' links to climate change (OECD, 1993). Donors are able to make subjective interpretations and construct narratives of their contribution to control the messaging in terms of what they see as 'principal' or 'significant' finance.

18.2.3 Climate financing and Indigenous peoples

The role of Indigenous peoples in the climate space is often seen through the prism of international instruments such as the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). The GCF's Indigenous Peoples Policy (IPP) for instance extensively borrows from the UNDRIP and as such it tends to provide a 'protective' and rather static view of Indigenousness. The document talks about involvement of Indigenous communities in providing consent, consultation, implementation, monitoring and redressing of grievances (Green Climate Fund, n.d.).

However, the GCF document tries to tick all the boxes relating to Indigenous inclusivity, empowerment and participation. For instance it stipulates that 'Indigenous peoples often have identities and aspirations that are distinct from mainstream groups in national societies and are disadvantaged by traditional models of mitigation, adaptation and development (Green Climate Fund, n.d.,p. 1).

While this has an appearance of empathy at first glance, there is also an undercurrent of deficit thinking which echoes the social Darwinian colonial narrative of Indigenous peoples at the lower end of human development. In implicit ways, this theme seems to flow through the climate finance process where transfer of money, technology and intellectual resources from the economically rich and culturally 'advanced' societies to poor and culturally 'disadvantaged') societies is seen as an inevitable part of progress (Stadelmann et al., 2014).

Indigenous communities have always been seen by colonialists, mainstream developmentalists and neoliberal economists as barriers to economic progress (Lyons & Westoby, 2014). Either they had to be eradicated, removed from their land to make resources available for exploitation or deal with them in a more benevolent way by absorbing them into the design and implementation of projects to make them feel important, provide consent, and buy their loyalty with some monetary reward to keep them subdued and satisfied (Carbon Brief, 2017). Unfortunately, there is no prescribed direct GCF funding aimed at strengthening Indigenous innovation, adaptation, and resilience to climate crisis. There is only provision for Indigenous communities to be involved in mainstream projects but at the lower level of engagement to provide consent and legitimacy as well as to avoid potential conflict which might threaten the project.

The question of intra-Indigenous disparity and exploitation is not addressed by the GCF IPP, especially for countries such as many of those in the Pacific, which are mostly Indigenous in terms of demography and control of state power. In Climate projects which directly impact on land, culture, settlements and wellbeing of poor rural people has, in some cases, triggered tension.

Because they are not direct investors in the climate projects, Indigenous communities can be used as means of legitimising and facilitating foreign capital investment in the areas of sustainable energy (both renewable energy such as hydropower, and energy efficiency), carbon markets, sustainable transportation, water technology and other forms of climate-related infrastructures (Navarro, 2022). This has potential to create more dependency and exacerbate inequality and deepen power disparity (Samuwai & Hill, 2019).

18.2.4 How much climate finance has the Pacific received?

Because of the definitional challenges and nebulous nature of the term climate finance, together with the subjective and diverse methods of estimates, it is not so easy to accurately determine how much climate finance has been received by PICTs, although one can say that current trends indicate that there has been an increase. An IMF assessment indicates that US$3.3 billion of climate finance has been committed to the Pacific between 2014 and 2019. Of these US$ 1.5 billion is channelled to adaptation, US$ 1 billion to mitigation and the remaining to cross cutting initiatives (IMF, 2021). The OECD has also revealed that out of the US$83.3 billion of global climate finance mobilised so far, only 1% of this finance was channelled to the Pacific (OECD, 2022).

Due to their very small populations, the PICTs are regarded as the highest recipients of climate finance on a per capita basis (PCB). However, critics of the PCB methodology argue that it does not reflect the countries' realities because of the disproportionate impact of climate crisis they experience (Dirix, et al., 2012). For instance, the PICTs, unlike Caribbean states, are scattered across 15 per cent of the globe's surface and are some of the remotest countries from major global markets. As a consequence of their geographical location, mobilising climate finance can be logistically and financially challenging (Samuwai & Hill, 2019). Thus, while the PICTs might be portrayed as 'receiving more,' the cost of delivering climate finance on a PCB basis is also more (Samuwai & Hill, 2019). Furthermore, the limited capacity of the governments and the incompatibility of their systems to the donor requirements mean that both oversight and implementation support by GCF accredited agencies, GEF implementing agencies, and respective regional agencies are needed. These come at a cost in the form of administration, management and direct implementation support.

The range of climate finance providers to the PICTs as listed below are diverse and the amount provided from 2010 to 2019 are shown in Figure 18.1.

- Australia: For climate change and resilience (DFAT, n.d.);

- World Bank: For climate change and disaster resilience, sustainable energy, climate-resilient water supply and climate-resilient transport (World Bank Group, 2022);
- European Union: For climate change adaptation, sustainable energy, and climate change resilience through nature-based solutions) (European Union, n.d., 2016; SPC, 2015);
- Japan: For climate change and disaster resilience and sustainable energy (Pacific Islands Forum, 2024; UNDP, 2023);
- Green Climate Fund (GCF, n.d.) (for adaptation and mitigation covering specific areas in health, food and water security, livelihoods and communities, energy generation and access, transport, infrastructure and built environment, ecosystems and ecosystems services, buildings, cities, industries and appliances, and forests and land use);
- Asian Development Bank: For adaptation and resilience, climate-resilient water supply, sustainable energy (ADB, 2024);
- New Zealand: For public sector strengthening and institutional effectiveness, information for decision-making, innovative financing tools, resilient ecosystems, water security, climate change related human mobility, and actions for reducing GHG emissions (New Zealand MFAT, n.d.)'
- Global Environment Facility: For climate change, biodiversity and land degradation (GEF, 2024);
- Germany (Delegation of the European Union to the Pacific, 2023, for climate actions including sustainable energy);
- Climate Investment Funds (CIF, 2024, for resilience, coastal protection, COVID-19 climate-resilient pathways, sustainable energy).
- The USAID (USAID, n.d., climate change adaptation, climate readiness, sustainable energy, and addressing emerging areas such as climate change and governance, and climate resilient health systems).

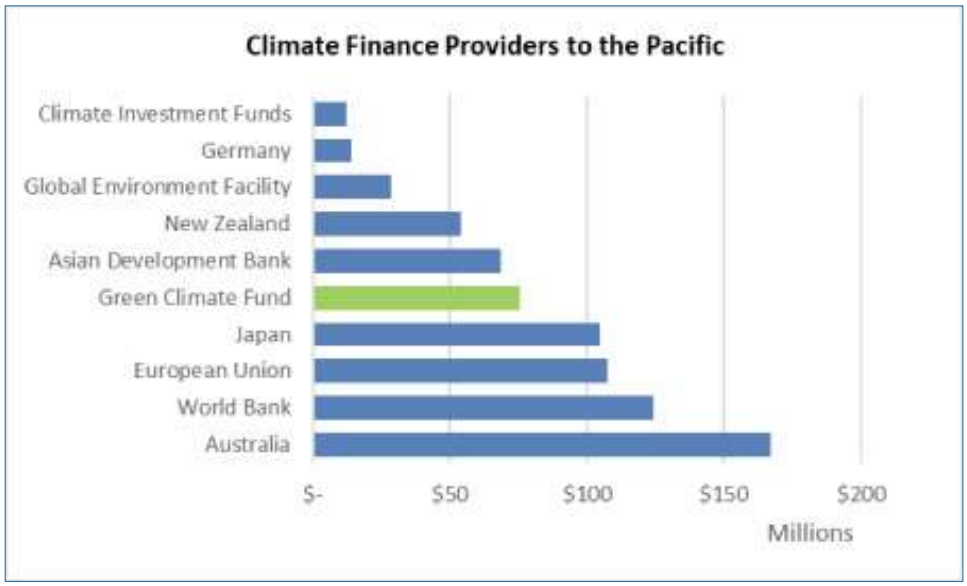


Figure 18.1: *Climate finance providers to the Pacific, 2010 to 2019. Source: OECD database.*

Adaptation finance accounts for the majority of climate finance to PICTs given their 'frontline' status in relation to climate change impacts (Samuwai, 2021). It is estimated that domestically, adaptation related expenditures varied considerably from country to country in the order of 41 to 90.5% of PICTs recurrent budget expenditure (SPC, 2019). See Figure 18.2 for details.

Figure 18.3 shows the distribution of climate finance in terms of principal and significant disbursement. It shows that the most common type of climate finance is in relation to significant projects, that is projects, which only partially address climate issues and less than 50% in most cases constitute principal finance, which is explicitly for the primary goal of addressing climate crisis.

Figure 18.4 shows climate finance as percentage of ODA to the PICTs from 2010 to 2019. It shows that only 5% of the amount is for principal and 19% for significant climate finance. In contrast, 76% is for other forms of ODA.

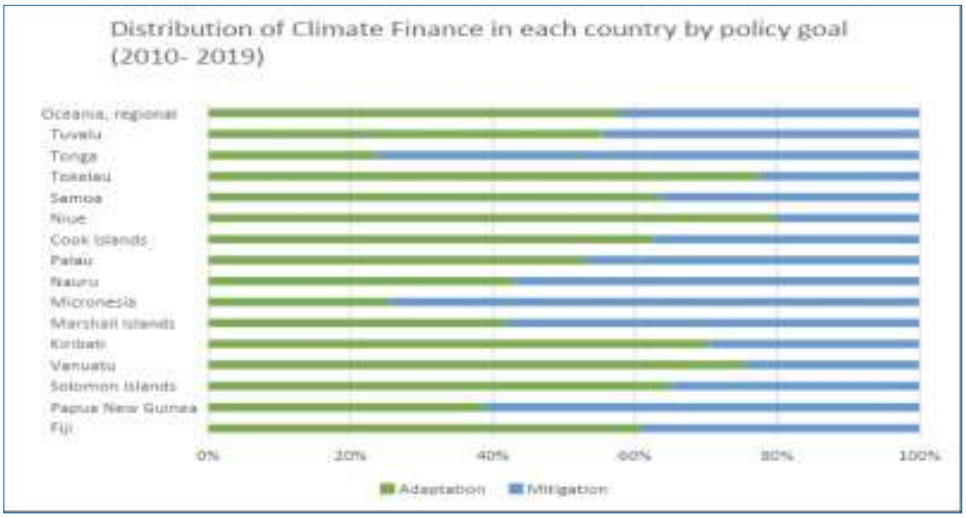


Figure 18.2: *Distribution of climate finance by country in terms of policy goals in terms of adaptation and mitigation (2010-2019). Source: UNDP, IMF and other sources.*

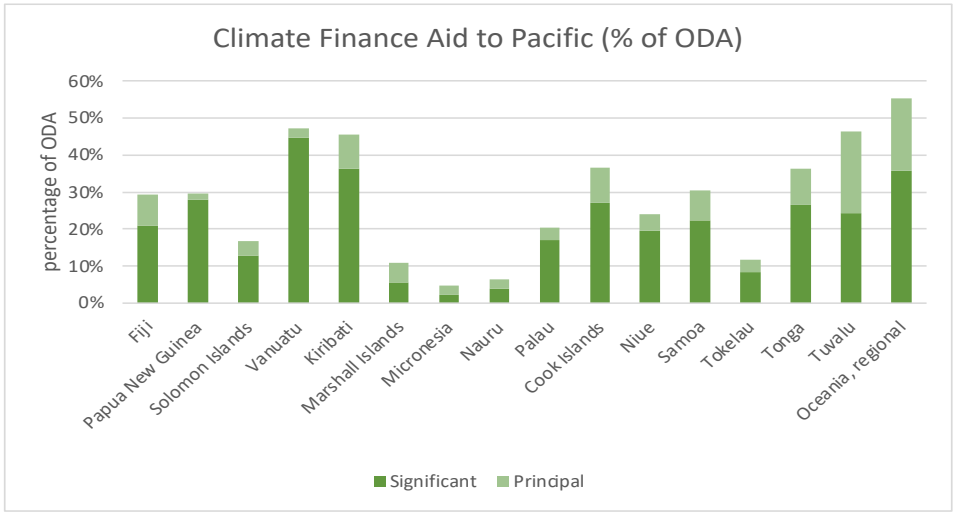


Figure 18.3: *Climate finance to the Pacific as percentage of ODA. Source: UNDP and other sources (2010 - 2019).*

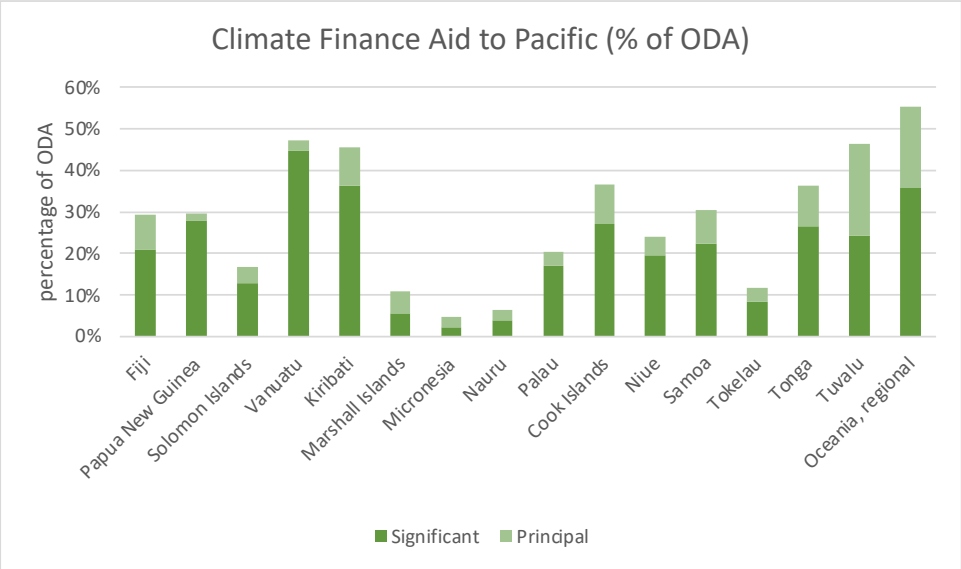


***Figure 18.4**: Climate finance to PICs compared to total ODA (2010-2019). Source: UNDP and other sources.*

Furthermore, climate finance to PICTs are largely short-term and project-based in nature. This modality has been criticised for stifling long-term capacity building in the Pacific, as projects are in some cases managed by costly, external consultants rather than local experts, thus increasing administration costs (Samuwai & Hills, 2018). There have been some promising good practices such as New Zealand's flexible climate finance system. However, in some cases, where local expertise exists, local and regional personnel are also used to manage some of the projects. Other ongoing challenges include lack of flexibility, sustainability, susceptibility to donor influence and lack of country ownership (Barnett & Campbell, 2010; Pasisi et al., 2013). Recent assessments by PIFS indicate that 98 % of climate finance in the region is delivered through projects and 2% in general/sector budget support and technical assistance (Taloiburi, 2021).

At the macro-level, tracking these climate finance flows to the PICTs is complex given the multilayer development architecture that exists in the region. Climate finance flow is not linear but tend to go through a number of 'intermediary' agencies and organisations before reaching recipient countries. One of the consequences of this is loss of money through hefty management which are directly deducted from the total disbursed amount by donors. Management fees can range up to 8% in some cases (that's around eight cents for every dollar). At the micro level, there have been attempts to track project funding internally through the setting up of the Monitoring, Reporting and Verification (MRV) tool as in Vanuatu with funding from the NDC Support Programme. Some PICTs have also undertaken Climate, Public Expenditure and Institutional Review (CPEIRs) since mid-2010s.

18.2.5 Accessing climate finance: The challenges

Accessing climate finance has always been a continuous challenge for PICTs (Fry, 2007; Maclellan, 2011; Smith & Hemstock, 2012; Pasisi et al., 2013; PIFS, 2017). Given their special and unique circumstances, PICTs are highly dependent on external climate finance. Their inability to effectively access external climate finance exacerbates their risk to climate change, which is an existential threat to many (Fry, 2007; Maclellan, 2012; Smith & Hemstock, 2012; Atteridge & Canales, 2017; Robie & Chand, 2017).

PICTs have made ambitious commitments to achieving the Pacific Agreement goals through the UNFCCC process and access to climate finance is critical in this regard. Fulfilling these commitments is not only critical in maintaining the 'privileged' position of the PICTs as the moral compass of the UNFCCC efforts (Dornan & Shah, 2016), but also in achieving PICTs sustainable development goals, as these commitments are intrinsically linked (Goundar et al., 2017).

The difficulty faced by PICTs in effectively accessing climate finance is influenced by both internal and external factors. Internally, PICTs suffer from lack of resources and capacity to effectively navigate the international climate change architecture (Fry, 2007; Barnett & Campbell, 2010; Pasisi et al., 2013; USAID, 2016). Furthermore, they also lack the institutional capacities needed to effectively absorb large inflows of external finance (Barnett & Campbell, 2010; The Commonwealth, 2013; Hemstock et al., 2016; Hemstock et al., 2017). These challenges are amplified by other factors such as very small and undiversified economies, insularity and remoteness, proneness to natural disasters, high degree of environmental degradation and natural resource depletion, and high dependence on external assistance (Briguglio, 1995; Nurse et al., 2014; The World Bank, 2017d).

Externally, the biggest challenge that hinders access to climate finance by PICTs is the fragmented and complex nature of the international climate finance architecture (Pickering et al., 2015; Buchner et al., 2017). Sources of external climate finance are numerous, and accessing these sources not only requires adherence to robust gender, social and fiduciary safeguards and standards, but also specialised technical knowledge (The Commonwealth, 2013; Buchner et al., 2017). In addition, there is lack of incompatibility between the climate finance requirements and recipient capacity, in terms of systems of finance, procurement, human resources and programming, that would ensure compatibility with donor requirements. Thus, due to this, PICTs can be disadvantaged when competing with larger and more affluent developing countries in accessing external climate finance (Caravani et al., 2016). The reality is that, despite the rhetoric of equity access, the climate finance 'playing field' is largely uneven and if often to the detriment of small PICTs.

In response, PICTs have been urging donors to facilitate access-modalities that will provide ease of access to climate finance; access-modalities that are less burdensome and take into consideration the special circumstances of PICTs. Access is a part of the equation, which also includes having the right systems in place to ensure funds are appropriately utilised and acquitted accurately and timely.

Accurately estimating the financial cost of climate change in the Pacific is a challenge given the uncertainty of future risks associated with climate change. Attempts have been made in relation to indicative costings and climate projections in various scenarios by such initiatives as the Nationally Determined Contribution (NDC) Roadmaps, Low Emission Climate Resilient Development Strategies (LECRDS) and National Adaptation Plans (NAPs) in the individual PICTs. But finding a regional aggregate is still quite challenging given the different methodologies and baseline information being used by individual countries.

In addition, things are made more complex by the fact that climate change impacts are being exacerbated by other factors and thus attributing things like physical damages to climate change alone can be tricky. Based on the best available estimate, there is still a significant shortfall in the current level of climate financing to the Pacific. In an attempt to quantify the cost of adaptation in the Pacific, the World Bank has posited two possible scenarios: in a best case scenario, the Pacific will require up to US$234 million per year by 2020 and US$285 million per year by 2040; while in a worst case scenario the costs would likely to be around US$796 million per year by 2020 and US$1.044 billion per year by 2040 (World Bank, n.d.). Indicative mitigation costs from PICTs NDC also highlight that the level of mitigation financing is not sufficient. Current estimates by the IMF have indicated that the average annual climate finance gap for the region to be US$1 billion (IMF, 2020).

In the two sections which follow, we examine in more detail two types of climate finance, the Green Climate Fund (GCF) and the Global Environment Facility (GEF).



> Fine mat weaving is a form of economy for the women in various villages in Tonga. This is our base of operation since we know weaving and the skills, and we also have the pandanus plants here with us. Our families who live overseas are our main market. This has been going on for a very long time, but now we also realise that this activity is also under threat by the impact of climate. The pandanus plants are struggling to grow due to fluctuating weather patterns

Community participant
Tongatapu
Tonga
(POCCA research team interview, 2023)

Pandanus leaves that a community from Tongatapu, Tonga, use for weaving mats but today the pandanus plants are struggling to grow due to saltwater intrusion and extreme weather patterns (Photo: POCCA team, 2023).

18.2.6 The Green Climate Fund (GCF) in the Pacific

The GCF makes up the world's largest portion of multilateral climate finance (for mitigation and adaptation) for Global South countries. Since the inception of GCF, PICTs have accessed only US$622 million of the US$20 billion made available by GCF funding modalities. The majority of these projects were focused on adaptation and are implemented through international financial institutions (IFIs) and multilateral development agencies.

Table 18.5 below provides a summary of the PICTs projects prioritised though GCF. Fiji was the first Pacific recipient in 2015 with US$31 million through ADB accreditation for an urban water supply and wastewater management project in the greater Suva area. Tuvalu with the accreditation of UNDP received US$36 million for its coastal adaptation project and Vanuatu (through SPREP accreditation) received US$23 million for climate information services for resilient development planning. The other included a regional project grant of US$17 million for renewable energy investment programme which covered Cook Islands, Republic of Marshall Islands, FSM, Nauru, Papua New Guinea, Samoa and Tonga. All these were through the ADB accreditation process. Samoa's US$58 million grant, accredited through UNDP. By far the largest was US$86 million for the Tina River Hydropower Development project in US$86 million for the Solomon Islands, which was accredited through the World Bank.

Nauru's US$27 million, accredited through the ADB, was for sustainable and climate resilient connectivity while the Republic of Marshall Islands received US$25 million, through World Bank accreditation, for its Pacific Resilience Project Phase II. Tonga's US$30 million (ADB accredited) was for its renewable energy project under the Pacific island's renewable energy programme and Kiribati (US$29 million), also ADB accredited, was for the purpose of developing the South Tarawa water supply project.

Table 18.5: GCF funding for PICTs (2021). Source: UNDP and other sources.

Projects	Country	Entity	Sector	Theme	Size	Total GCF Financing
Pacific Islands Renewable Energy Investment Program	Cook Islands	ADB	Public	Cross Cutting	Small	$2,428,571.43
Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean		UNEP	Public	Adaptation	Small	$9,480,634.80
Climate change adaptation solutions for Local Authorities in the Federated States of Micronesia	FSM	SPC	Public	Adaptation	Small	$16,591,556.00
Climate resilient food security for farming households across the Federated States of Micronesia (FSM)		Micronesia Conservation Trust	Public	Adaptation	Micro	$8,583,350.00
Pacific Islands Renewable Energy Investment Program		ADB	Public	Cross Cutting	Small	$2,428,571.43
Fiji Urban Water Supply and Wastewater Management Project	Fiji	ADB	Public	Adaptation	Large	$31,040,000.00
Fiji Agrophotovoltaic Project in Ovalau		FDB	Public	Mitigation	Small	$5,000,000.00
Global Subnational Climate Fund (SnCF Global) – Technical Assistance (TA) Facility		IUCN	Public	Mitigation	Large	$3,560,000.00
Global Subnational Climate Fund (SnCF Global) – Equity		Pegasus Capital Advisors	Public	Mitigation	Large	$6,000,000.00
Global Fund for Coral Reefs Investment Window		Pegasus Capital Advisors	Public	Adaptation	Large	$5,000,000.00
South Tarawa Water Supply Project	Kiribati	ADB	Public	Cross Cutting	Medium	$28,631,020.00

Projects	Country	Entity	Sector	Theme	Size	Total GCF Financing
Pacific Resilience Project Phase II for RMI	RMI	World Bank	Public	Adaptation	Small	$25,000,000.00
Addressing Climate Vulnerability in the Water Sector (ACWA) in the Marshall Islands		UNDP	Public	Adaptation	Small	$18,631,216.00
Pacific Islands Renewable Energy Investment Program		ADB	Public	Cross Cutting	Small	$2,428,571.43
Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean		UNEP	Public	Adaptation	Small	$9,480,634.80
Pacific Islands Renewable Energy Investment Program	Nauru	ADB	Public	Cross Cutting	Small	$2,428,571.43
Sustainable and Climate Resilient Connectivity for Nauru		ADB	Public	Cross Cutting	Medium	$26,910,000.00
Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean	Niue	UNEP	Public	Adaptation	Small	$9,480,634.80
Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean	Palau	UNEP	Public	Adaptation	Small	$9,480,634.80
Pacific Islands Renewable Energy Investment Program	PNG	ADB	Public	Cross Cutting	Small	$2,428,571.43

Projects	Country	Entity	Sector	Theme	Size	Total GCF Financing
Pacific Islands Renewable Energy Investment Program	Samoa	ADB	Public	Cross Cutting	Medium	$57,718,000.00
Integrated Flood Management to Enhance Climate Resilience of the Vaisigano River Catchment in Samoa		UNDP	Public	Adaptation	Medium	$86,000,000.00
Tina River Hydropower Development Project	Solomon Islands	World Bank	Public	Cross Cutting	Medium	$86,000,000.00
Pacific Islands Renewable Energy Investment Program	Tonga	ADB	Public	Cross Cutting	Small	$2,428,571.43
Tonga Renewable Energy Project under the Pacific Islands Renewable Energy Investment Program		ADB	Public	Mitigation	Small	$29,900,000.00
Tuvalu Coastal Adaptation Project (TCAP)	Tuvalu	UNDP	Public	Adaptation	Small	$36,010,000.00
Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean		UNDP	Public	Adaptation	Small	$9,480,634.80
Climate Information Services for Resilient Development Planning in Vanuatu (Van-CIS-RDP)	Vanuatu	SPREP	Public	Adaptation	Small	$22,953,000.00
Vanuatu community-based climate resilience project (VCCRP)		SCA	Public	Adaptation	Small	$26,182,878.00
Enhancing Adaptation and Community Resilience by Improving Water Security in Vanuatu		SPC	Public	Adaptation	Small	$23,325,033.00

The Marshall Islands, through UNDP, received US$19 million for under the Addressing Climate Vulnerability in the Water Sector (ACWA) project and a regional project involving Cook Islands, Republic of Marshall Islands, Niue, Palau and Tuvalu on Enhancing Climate Information and Knowledge Services for resilience (UN Environmental Program accredited) attracted US$47 million funding. FSM received US$17 million through the Pacific Community (SPC) for climate change solutions for local authorities while Vanuatu's US$26 million (SPC accredited) was for community-based climate resilience projects. The first private (non-public) project funding was for an agrophotovoltaic project in Ovalau Fiji (US$5 million) which was accredited through the Fiji Development Bank. The latest GCF funding for the Pacific (at the time of writing this document) was for a US$22.7 million for Tonga for a coastal adaptation project implemented by UNDP, which took almost 7-years to finalise prior to board approval in July, 2024.

A significant amount of climate finances is in the form of loans, and this added more debt burden on the countries concerned. An OECD report states:

> As in all previous years, loans accounted for over 70% of public climate finance provided (71% or USD 48.6 billion in 2020, including both concessional and non-concessional loans). The share of grants was stable compared to 2019 (26% or USD 17.9 billion). Public equity investments continued to be very limited (OECD online library, 2022)

As the case of the Tina hydro power station in the Solomon Islands shows, things are complicated by the complex layers and processes and the numerous funders and contractors involved. The Tina hydro power (total cost US$240.5 million) is a public-private partnership consisting of six financing organisations providing both loan and grant: these are Green Climate Fund, the World Bank, the Asian Development Bank (in partnership with the Economic Development Cooperation Fund of Korea, managed by Korean Export Import Bank or KEXIM), Abu Dhabi Fund for Arab Economic Development and the Government of Australia through the Australia Pacific Islands partnership. The Solomon Islands Ministry of Mines, Energy and Rural Electrification formed an independent local project team with the help of international experts, which worked closely with the Tina Hydro Limited, the holding company, which owns and operates the infrastructure. The Hyundai Engineering Company (HEC) from South Korea was engaged as the main contractor under the ADB-KEXIM agreement for public-private partnership agreement in the Asia Pacific (ADB, 2021; JHD, 2019). This situation led to a complex system of governance, which led to tension, distrust and withdrawal of participation by some stakeholders. The project remains unfinished as frustration by the Solomon Island Government and landowners continues and meanwhile, debt to the ADB (US$18 million), World Bank, KEXIM Bank and other lenders have to be repaid (Personal communication with a former project manager).

By 2021, of the 216 GCF approved projects only 20 were for the PICTs and of these, 15 were country specific and five are multi-country programmes. Of the 15 country-specific projects, 10 were for adaptation, one for mitigation and four were cross cutting in nature involving both mitigation and adaptation as well as knowledge management. The programs covered in the GCF span a range of areas such as water supply, information services, renewable energy, flood management, connectivity, local authority adaptation, local community resilience, agrophotovoltaic and food security. In many ways, these reflect the diversity of needs and different priorities of countries but one of the common factors is the need to mobilise external resources to strengthen the limited national capacity to deal with the ongoing climate crisis (GCF, 2024). Most of the projects are site-specific and are not necessarily nation-wide, although some have the claim to have nation-wide coverage.

This means that the beneficiaries are localised, and this raises the issue of adaptation and mitigation inequity. The question of which section of the community should be prioritised can become a political one and may in some cases reflect on the interests of the local stakeholders. For instance, the Fiji water supply project is focused on the greater Suva metropolitan area, which already has a functioning water supply system, although in need of repairs. There are, however, other parts of rural and semi-rural Fiji, which do not have adequate water supply systems. The issue of equity needs addressing in the GCF to avoid exacerbation of pre-existing inequities in resources and opportunities. While some funding is funnelled towards community climate projects as in Vanuatu, none is specifically earmarked for developing, deepening and strengthening Indigenous innovation, knowledge and resilience.

Other initiatives have been developed as part of the GCF and this includes the sovereign green bond, which Fiji took up in 2017 (Banga, 2019). Green bonds have been hailed as an innovative funding mechanism that mobilises the much-needed finance to fund initiatives that have a net positive impact on the environment. The first green bond was issued in 2007 as a response to growing public awareness of climate change (Dupont, et al., 2015). Since then, institutions such as the World Bank have raised US$13 billion through the issuance of more than 150 green bonds in 20 different currencies for retail and institutional investors around the world (Ehlers & Packer, 2017). Fiji recently announced that it will launch its first blue bond at COP26 which will raise US$50 million for investments and deliver a sustainable blue economy, create employment and protect Fiji's ocean resources (UNDP, 2021).

18.2.7 Rethinking the role of GCF in the Pacific

PICTs continue to face challenges in terms of accessing and benefitting from GCF. The first is the slow disbursement of funds due to complex and stringent fiduciary standards and safeguards. For example, a Tonga project that UNDP has been supporting has not gone past the design phase for almost four years. There are several other examples, where projects dating back to 2015 (FP035) have only received 15% of the approved funds. Only US$3 billion of the US$12 billion worth of GCF funds had been allocated and disbursed by 2022 (GCF, 2024).

The second challenge is that although PICTs receive the most amount of climate funding per capita out of all LDCs, they still have to be competitive in their funding proposals. GCF has recently been pledged an additional US$9 billion and the availability of funds has prompted LDCs to 'mobilise significant national resources' to expedite their ability to gain GCF accreditation so that they can have direct access to this new resource. This competition puts PICTs at a disadvantage when vying for additional GCF funds, as they, by virtue of their remoteness and tiny populations, have significantly lower administrative capacity than many other LDCs.

The third challenge is the failure of GCF to account for administrative capacities of PICTs which are significantly lower than GCF assumption. The GCF sets a high bar for the administrative capacities of entities trying to access finance from them. PICTs are faced with institutional, structural, and human resource constraints such as population size and geographical location, which are not easy to overcome. This disadvantages them in applying for and maintaining National Accredited Entity (NAE) or Regional Accredited Entity (RAE) status with the GCF.

The fourth challenge relates to the complexity of obtaining accreditation PICTs do not find it easy to submit the application forms for accreditation because of lack of relevant human resources. The rigid requirements can be stifling and makes it difficult for PICTs for access funds thus resulting in inconsistent access to GCF funding. On average, PICTs 1-3 years to achieve NAE status. These include having the application reviewed by both the GCF Secretariat and the GCF Board, which are notorious for inflating waiting times. Also, applications cost significant fees, as much as US$25,000, depending on the type of accreditation one applies for. Accreditation is renewed every 5-years.

Lastly, the increased reliance on International Accreditation Institutions (IAEs), is costly, inefficient and leads to the loss of significant funds as mentioned earlier. To date, only 7% of RAEs and NAEs are from the PICTs, a rather low number compared to Asia and Africa.

18.2.8 Global Environment Facility (GEF) funding in the Pacific

Fourteen PICTs[1] are recipients of GEF support that is designed for achieving global environmental benefits and the fulfilment of commitments under the main Rio environmental conventions such as the UN Framework Convention on Climate Change (UNFCCC), Convention on Biological Diversity (CBD), and UN Convention to Combat Desertification (UNCCD). These are organised around five focal areas – biodiversity loss, chemicals and waste, climate change, international waters (GEF, 2024) and land degradation. Piloted between 1991 to 1994, growth towards funding replenishments for the GEF has been exponential and is currently at its 8th funding cycle (GEF-8, GEF, 2024).

As shown in Figure 18.6, funding contributions to the GEF and funding made available have increased five times since the pilot phase from US$1 billion to US$5.33 billion in GEF-8.

The scope of results, analyses and discussions contained in this sub-section are limited to the most recent five funding cycles (GEF-4 to GEF-8) with emphasis on climate change (CC), biodiversity (BD) and land degradation (LD) focal areas. During these cycles, GEF funding was largely programmed through national implementation modalities. Therefore, the timelines of results are from 2006 to 2022 and the analyses are based on country-specific allocation and utilisation data available on the GEF website. The analyses and discussions are based on both documented evidence and lived/worked experiences. Reference here (GEF, 2024).

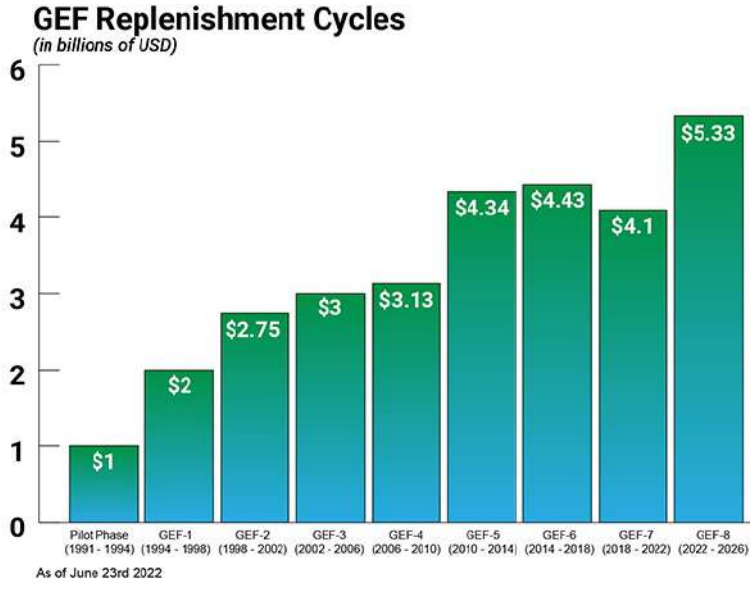


Figure 18.6: The GEF replenishment cycles as of June 2022. Source: Funding | GEF (thegef.org).

1. Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu.

There are varying interests, capabilities, and capacities of governments for mobilising and managing GEF funding through the implementation of development projects. More importantly, the analyses and discussions posit that the optimum approach for each GEF cycle is achieved when the total allocations and utilisations reach equilibrium. The conditions and catalysts for achieving such equilibrium are critical to funding optimisation, which needs further exploring and application to accelerate efforts for mobilising and utilising resources from GEF-8. In the recent five funding cycles (GEF-4 to GEF-8), the 14 PICTs have been allocated approximately US$525m for addressing the focal areas of climate change (CC), biodiversity (BD), and land degradation (LD) (GEF, 2024).

As illustrated in Figure 18.7, a 15-26% reduction in funding allocation occurred during GEF-5 (approx. US$82m), GEF-6 (approx. US$93m) and GEF-7 (approx. US$93m) as compared to GEF-4 (approx. US$110m). However, the utilisations were at their best during GEF-5 (approx. US$81m), GEF-6 (approx. US$93m) and GEF-7 (approx. S$93m) in contrast to GEF-4 (approx. US$54m). The optimum conditions during these three cycles need further exploring and adapting in order to achieve funding optimisation for GEF-8.

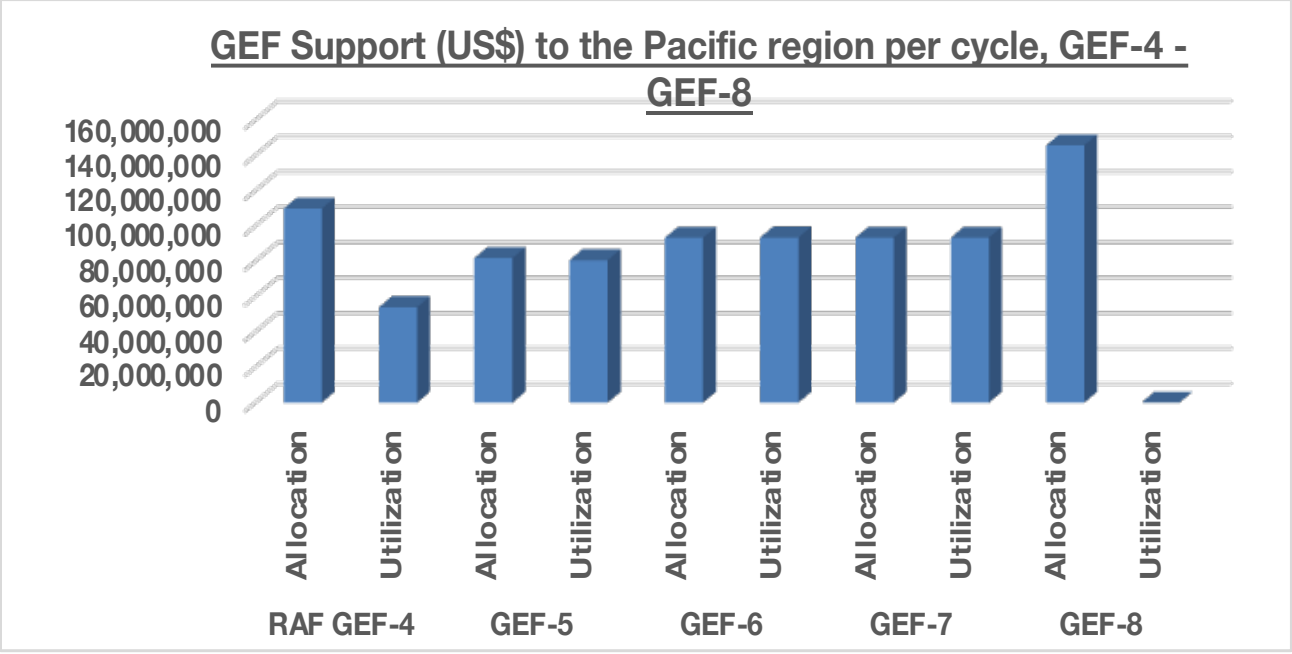


Figure 18.7: GEF support to the Pacific region per cycle, GEF-4 to GEF-8. Based on an analysis of country-specific allocation and utilisation data (Source: Recipient Countries | GEF (thegef.org). Timeframe: 2006-2022.

Figure 18.8 shows that funding distribution has been the highest for Papua New Guinea with a total allocation of approximately US$99m, while the remaining 13 countries have allocations of less than US$50m ranging from US$27m (for Nauru) to US$45m (for the Solomon Islands).

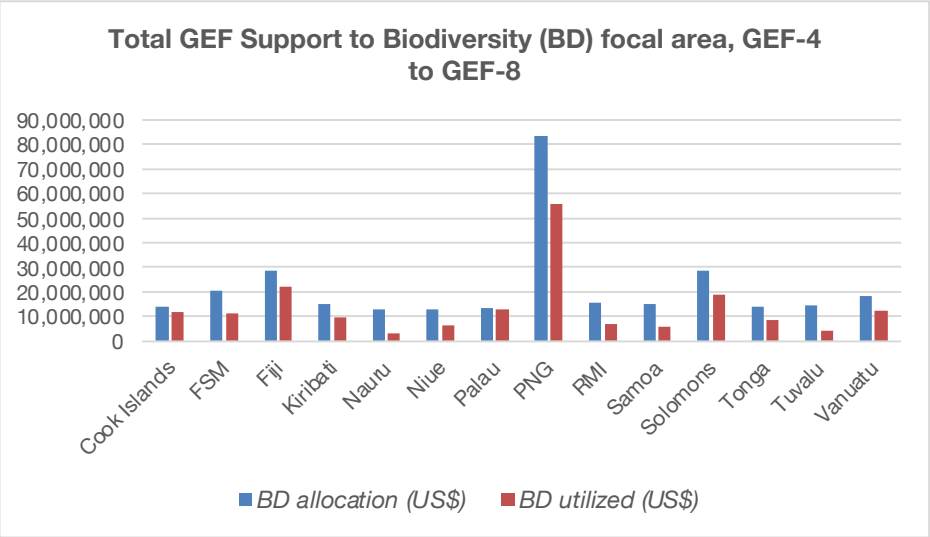


Figure 18.8: *Total GEF support to 14 Pacific Island Countries, GEF-4 to GEF-8. Based on an analysis of country-specific allocation and utilisation data (Source: Recipient Countries | GEF (thegef.org). Timeframe: 2006-2022.*

18.2.9 Allocation by focal areas: Biodiversity, climate change and land degradation

As illustrated in Figure 18.9, approximately 60% of the total allocation for GEF is for biodiversity conservation (US$307m), which is distributed according to land mass and population size. The highest allocation is for Papua New Guinea at US$83m, while the lowest allocations are recorded for Nauru and Niue at US$12m each. As for the utilisation rates, the highest was for Palau and the Cook Islands at 93% and 84% utilisation and the lowest was for Nauru and Tuvalu at 26% and 31% respectively.

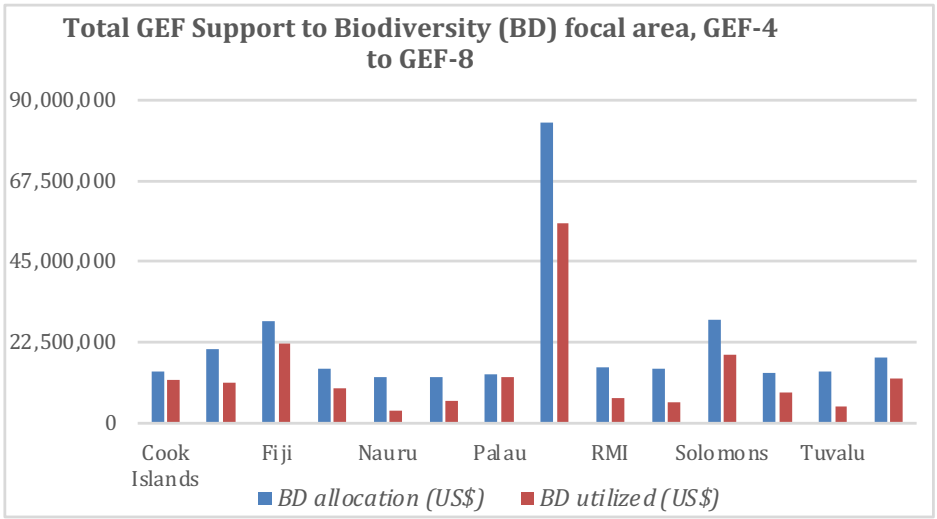


Figure 18.9: *Total GEF support to Biodiversity focal area, GEF-4 to GEF-8. Based on an analysis of country-specific allocation and utilisation data. Source: Recipient GEF (thegef.org).*



> The big one is the scarcity of land. It's really the big one. That's why the government is having this long-term project called HGI- High Ground Initiative. They're relocating all the major infrastructure up on top also because of sea level rise and because the scarcity of land. I think that the scarcity of land is really, really big, and even the people are realising that inevitably, they have to move

Tyrone Dieye
Eco
Nauru
(POCCA research team interview, 2023)

A destroyed seawall in Menen, Nauru, after being subjected to strong waves for years (Photo: POCCA team, 2023).

As illustrated in Figure 18.10, 30% of the total allocation is for climate change (US$151m) with a contrasting distribution pattern where despite varying degrees of land mass and population, the allocation was almost consistent across all countries. Funds allocated are within the range of approximately US$10m to US$12m. Utilisation rates were high for Samoa and Tuvalu at 74%, followed by Kiribati at 70%, and the least was for the FSM and Cook Islands at 33% and 35% respectively.

As shown in Figure 18.11, the least of the total GEF allocation (10%) is for land degradation focal area (approx. US$55m) with a consistent distribution across all countries despite varying degrees of land mass and population. Funds allocated are within the range of US$3m to US$4m. Utilisation rates was highest out of all three focal areas and the highest was in FSM at 183%, Samoa at 136%, Papua New Guinea at 112%, Vanuatu at 110%, Tuvalu at 102% and RMI at 95% (GEF, 2024).

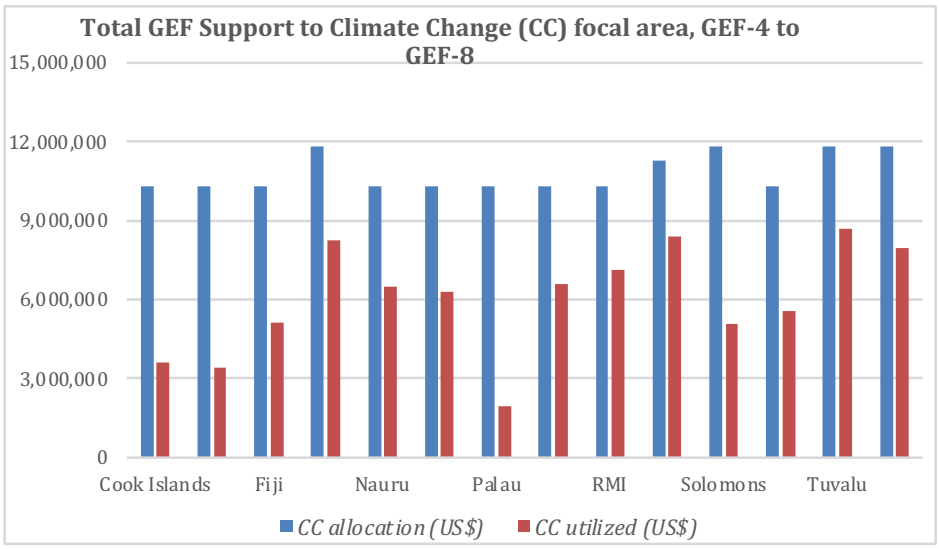


Figure 18.10: Total GEF support to Climate Change focal area, GEF-4 to GEF-8. Based on an analysis of country-specific allocation and utilisation data (Source: Recipient Countries | GEF (thegef.org).

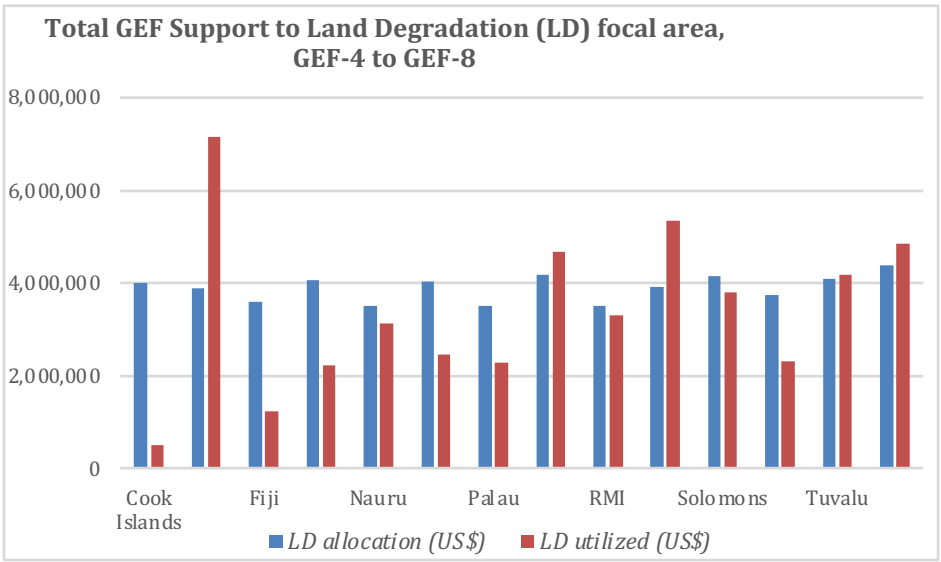


Figure 18.11: Total GEF support to Land Degradation focal area, GEF-4 to GEF-8. Based on an analysis of country-specific allocation and utilisation data (Source: Recipient Countries.

Overall, approximately US$322m has been utilised to-date representing only 61% of the total funding allocation from 2006 to 2022 covering GEF-4 to GEF-8 cycles. Part of the remaining 39% is from the under-utilised allocations of GEF-4 (and GEF-5 for a few countries) while the majority of unutilised funds is from GEF-8 as none of the countries have utilised any focal area allocation. Of the approximately US$322m utilised to-date, 59% was for biodiversity conservation (US$190m), while 26% for climate change (US$85m), and 15% for land degradation (US$47m). The utilisation rate for land degradation was highest at 87%, followed by biodiversity conservation at 62%, and the least was recorded for climate change at 56% (GEF, 2024). This trend seems to imply a higher demand for projects under the focal area of land degradation than for biodiversity and climate change. Furthermore, it implies that the design and implementation of land degradation projects are more contextualised and easily implemented compared to those for biodiversity conservation and climate change. At country specific levels, this high delivery for land degradation is observed for most countries, while the preference for biodiversity conservation was noted for some, and climate change was noted for one country. The details are shown in Table 18.2.

Country	Total allocation (US$)	Total utilised (US$)	% total utilised	BD allocation (US$)	BD utilised (US$)	% BD utilised	CC allocation (US$)	CC utilised (US$)	CC utilised (US$)	LD allocation (US$)	LD utilised (US$)	% LD utilised
Cook Islands	28,409,796	16,012,111	56%	14,109,796	11,916,778	84%	10,300,000	3,596,332	35%	4,000,000	500,000	13%
FSM	35,857,164	21,707,957	61%	20,723,658	11,143,953	54%	10,300,000	3,410,000	33%	3,900,000	7,154,004	183%
Fiji	42,969,682	28,338,241	66%	28,430,412	21,998,973	77%	10,300,000	5,099,999	50%	3,590,000	1,239,269	35%
Kiribati	32,067,955	20,013,323	62%	15,207,955	9,506,971	63%	11,800,000	8,264,000	70%	4,060,000	2,242,352	55%
Nauru	27,100,000	13,000,207	48%	12,800,000	3,362,020	26%	10,300,000	6,500,367	63%	3,500,000	3,137,820	90%
Niue	28,451,361	14,989,299	53%	12,800,000	6,211,482	49%	10,300,000	6,301,728	61%	4,050,000	2,476,089	61%
Palau	28,007,607	16,914,704	60%	13,707,607	12,694,137	93%	10,300,000	1,921,000	19%	3,500,000	2,299,569	66%
PNG	99,309,685	67,093,693	68%	83,621,413	55,843,900	67%	10,300,000	6,570,000	64%	4,170,000	4,679,793	112%
RMI	29,921,039	17,427,888	58%	15,621,039	6,967,875	45%	10,300,000	7,146,114	69%	3,500,000	3,313,899	95%
RMI	29,921,039	17,427,888	58%	15,621,039	6,967,875	45%	10,300,000	7,146,114	69%	3,500,000	3,313,899	95%
Samoa	31,277,282	19,616,041	63%	14,898,564	5,842,427	39%	11,300,000	8,413,615	74%	3,930,000	5,359,999	136%
Solomon Islands	45,509,240	27,929,951	61%	28,559,240	19,034,346	67%	11,800,000	5,092,975	43%	4,150,000	3,802,630	92%
Tonga	28,912,730	16,366,043	57%	13,974,746	8,494,150	61%	10,300,000	5,549,333	54%	3,750,000	2,322,560	62%
Tuvalu	31,190,000	17,345,405	56%	14,300,000	4,455,040	31%	11,800,000	8,700,364	74%	4,090,000	4,190,001	102%
Vanuatu	35,532,873	25,129,178	71%	18,342,863	12,341,522	67%	11,800,000	7,942,856	67%	4,390,000	4,844,800	110%
TOTAL	524,516,414	321,884,041	61%	307,097,293	189,813,574	62%	151,200,000	84,508,683	56%	54,580,000	47,562,785	87%
				59%	59%		29%	26%		10%	15%	

Table 18.2: *Total amount of GEF funding allocation and utilisation by Pacific Island Countries from 2006 to 2022 (GEF-4 to GEF-8 cycles) (GEF, 2024).*

Key: BD - Biodiversity, CC - Climate Change, LD - Land Degradation.

18.2.10 Results of GEF support to climate change (GEF-4 to GEF-7)

Of the approximately US$151m allocated for climate change focal area, around US$85m has been utilised by all 14 countries to date. Funds have been spent on climate change enabling activities (such as the National Communications and Biennial Update Reports to the UNFCCC), renewable energy and energy efficiency projects, and forestry-related carbon sequestration projects (GEF, 2022).

As a result of GEF support to date, all 14 countries have fulfilled their reporting obligations to the UNFCCC. Through these nationally owned reporting processes, countries have been empowered to undertake climate modelling and scenario-based vulnerability and adaptation assessments, established GHG inventories for mitigation analyses, etc. all of which formed useful baselines for developing country-specific policies (such as NDCs, NAPs, LECRDS, and Energy Roadmaps) as well as specific sector-based climate change adaptation and mitigation projects (GEF, 2024).

Countries have also been empowered to undertake policy reviews and assessments of their energy balance scenarios, strengthen legal and regulatory instruments to support renewable energy and energy efficiency dissemination, financing and marketing, improved awareness and uptake of renewable energy and energy efficiency technologies at both national and community levels.

The Pacific region has successfully completed a global test case and programmatic initiative involving multiple countries with support from GEF implementing agencies and regional executing agencies to support and address national priorities and development needs while delivering global environmental benefits. In this instance, country allocations from the three focal areas (biodiversity, climate change, and land degradation) were combined into single country-specific projects while regional support was sourced from the GEF International Waters focal area under the 'Ridge-to-Reef' (R2R) umbrella. Through this approach, countries were supported with enhancing their ecosystem goods and services (provisioning, regulating, supporting and cultural) through integrated approaches to land, water, forest, biodiversity and coastal resource management that would ultimately contribute to poverty reduction, sustainable livelihoods and climate resilience. The R2R project's 'innovative aspects such as the operationalisation of R2R approaches and the establishment of a regional community of practice for these approaches' have been highlighted in a global case study (Tengberg & Valencia, 2018). Furthermore, the regional R2R approaches directly resulted in optimum conditions for funding utilisation in GEF-5. Hence, the regional R2R approaches are a pioneer to demonstrating funding optimisation for GEF funding cycles in the Pacific.

18.2.11 Some challenges and lessons learned

While under-utilisation was observed across all countries in GEF-4, this was successfully addressed in the succeeding cycles (GEF-5, GEF-6 and GEF-7) through regional and sub-regional programming and implementation approaches.

Compared to other multilateral funding, funding from GEF is grant-based and does not require recipient countries to take out loans in order to access GEF funds. The only requirement is the provision of parallel and in-kind co-financing, which are available from national, bilateral, and other non-GEF multilateral funding sources. For such arrangements, the condition is that the co-financing is financing the project baselines while GEF funds provides incremental financing. Therefore, it can be considered as less burdensome as it does not add to the debt burden of recipient countries.

Despite some success, there is still perceived inappropriateness in the funding allocation for the climate change focal area. Firstly, the total climate change allocations for LDCs (US$11.3m per LDC) exceeds those for non-LDCs (US$10.3m per non-LDC). This is even though the majority of LDCs have a smaller number of populations and therefore, the demand for energy (in particular electricity) is much less than non-LDCs. For these countries, the nature and extent of climate change mitigation interventions (such as renewable energy technology, energy efficiency measures, and afforestation) are much less than for the bigger non-LDCs (GEF, 2024).

Secondly, the climate change allocation ranging from US$1m to US$3.3m for each recipient country has remained constant throughout the cycles. The usability of these allocations is restricted and limited to 'soft-type' of activities such as policies for barrier removal (e.g., regulatory, institutional, or financial), knowledge management, and a limited number of 'hard-type' activities or demonstration of pilot initiatives. This is despite the articulation of multi-million-dollar financing needs for hardware in respective policy documents (e.g., enhanced NDCs and Roadmaps, and NDC Investment Plans), as required under the Paris Agreement. As such, this restriction is already limiting the capabilities of recipient countries to utilise their respective GEF climate change allocations and to meaningfully contribute to the intent of the Paris Agreement to strengthen the global response to the threat of climate change by maintaining the increase in global average air temperature between 1.5 to 2 degrees Celsius (GEF, 2024).

These perceived blind spots pose critical questions around the inaccuracies in forecasting funding allocations and the basis on which allocations are made. It also highlights the supply-driven nature of GEF and for failing to address the growing demand from countries as they aspire to transitioning to clean energy. Most importantly, it speaks of the perceived uncoordinated way of the financial mechanism of UNFCCC and its failure to provide recipient countries with the financial resources required to execute their commitments under the Paris Agreement.

In addition, the bureaucratic processes involved in conceptualising, formulating and developing GEF funded projects have proved cumbersome and frustrating for some recipient countries. A recent case was when a climate change project implementation was stalled due to incompatible and very rigid processes.

In this instance, three implementing partners of a least developed country in the Pacific were denied access to funding advances as their systems and procedures were deemed risky, based on micro-assessments of approaches to cash transfers. Instead of discontinuing the issuance of financial advances, support should have been provided for rectifying the systems and procedures, while continuing with project implementation. As a consequence, the project staff lost employment, working relationships between parties deteriorated, and the recipient country significantly delayed its decision on an important project that sought to address the climate crisis (although non-GEF). This is a case of particular concern where the focus of human development has been negated and shifted away from human-centeredness to systems-rigidity.

In another classical example, additional layers of screening and reviewing processes have been established by a GEF agency in response to a global GEF review that highlighted the need to strengthen firewalls and reduce the risks of funding misappropriation, and to improve the overall project management and implementation. Despite good intentions, these additional layers were not socialised with the recipient countries and the resulting effect was a widened disparity between recipient countries and the GEF agency. Such a policy change within the GEF agency required buy-in from recipient countries that could only be made possible through a series of consultation with the GEF political and operational focal points. This human-centeredness approach was not considered nor pursued and therefore, brought into question the genuineness of 'human development'. Failing to address the rigidity of systems within the GEF agency could mean that GEF-8 funding resources may not be easily mobilised and accessible by the PICTs unless they opt for another GEF agency. Therefore, they could risk losing out on much-needed grant for addressing the climate crisis.

18.2.12 GEF policies implications on local and Indigenous communities

Several challenges remain in relation to GEF and relationship with Indigenous communities. GEF documents on climate change are still full of jargons and hardly translated from English to local languages of the Pacific making them less culturally sensitive. Policy, programming and operational guidelines must be discussed thoroughly with GEF operational and political focal points throughout each GEF cycle (at the beginning, at midpoint, and towards the end). Budget allocations for local participation and consultancies are still relatively small, which constitute half of the amount allocated to international participation and consultancies. This is the same as budget allocations for project management are still small (ranging between 5 to 10% of the total project budgets) making it inappropriate to attract and retain qualified project staff (GEF, 2024).

Furthermore, GEF budget allocations for monitoring and evaluation are small and are often less than US$50,000 per project evaluation. In addition, monitoring costs are hardly sufficient, in particular where in-person participation is required at least twice in a year. Budgets must ensure allocation of funds to cover insurance for renewable energy and energy efficiency technologies, as well as for climate early warning systems, etc. Project governance (project board, steering committees, technical advisory groups) require more funding support especially where in-person participant is required (GEF, 2024).

The rights of Indigenous people to free, prior informed consent with regards to development planning and decision-making must be respected through project design, implementation, and closure, and allocated more time and resources to ensure inclusiveness and wide coverage.

In relation to this, GEF agency bureaucracies must be reviewed at each GEF cycle, and any additional requirement must be thoroughly discussed with GEF operational and political focal points.

18.2.13 Some policy implications of climate finance in the Pacific

The climate finance space is busy and dynamic with multiple stakeholders (including donors, development partners and other intermediaries) competing for customer influence, impact and legitimacy. The competition can be unsettling and create confusion and unease amongst local governments and stakeholders who in some cases may be expected by the competing donors to make political choices and take sides. However, there have been cases where donors have cooperated when they could see the need for it and how it could serve their interests. Sometimes local stakeholders are forced to prioritise their engagement in accordance with their budgetary needs or what they see as of greater political value to their constituencies.

Some donors have simply rebranded their normal aid programme as being climate-related as a way of ticking the global good citizenship box as well as contribute to their climate finance and emission reduction pledge in a roundabout way. Technically, this can be construed as a form of 'cheating' to serve a political agenda but then in the context of a very nebulous climate finance space, drawing neat lines between different types of climate finance and donor intents is a major challenge.

The cumbersome and complex nature of the project designs often does not take into consideration the local technical capacities, socio-cultural environment, community structures and cultural norms. Because of lack of local expertise, expatriates and foreign consultants are often hired to manage projects as well as design, install, implement, and operate the climate projects.

Because some of the climate mitigation ideas and techniques are new, PICTs have sometimes been used to pilot some new approaches. The idea of piloting new projects has both a positive feel (in terms of being a pioneer) and a negative connotation (being a guinea pig) by donors and development partners.

Despite the existence of local expertise, in many cases, foreign experts with limited or no experience or expertise in the Pacific are hired to carry out climate project designs, feasibility studies, project implementation and project evaluation.

On the surface, climate finance can be deceptively generous, but the reality is that a significant portion of it is in the form of loan, apart from the actual grant component. The GCF finance for utilities is often in the form of loans. The co-financing principle ensures that partners such as ADB will provide loans. This adds more debt burden to Pacific economies, which are already shackled with excessive debt.

Co-financing and public-private partnership also provide the platform for transfer of public money to private hands, which enable corporations to profit from the climate finance. For instance, ADB's agreement with the Economic Development Cooperation Fund of Korea (managed by Korean Export Import Bank - EXIM) enables companies such as the Hyundai Engineering Company to be involved in the Asia-Pacific climate projects. This capture of climate finance by corporate polluters is unethical and a classic example of 'greenwashing' and indeed cause for concern.

A major area of concern is the tension between the 'ticking the box' development strategy by donors and the actual impact on the ground in terms of emission reduction. There are questions to be raised about the long-term commitment of donors to the future sustainability of climate projects, especially when donors are more focused on the project lifespan (usually around five years or so) from inception to implementation. There are usually no maintenance or sustainability provisions in case of cyclone damage to projects. Donors, development partners and contractors are interested in setting up the projects and leave the rest of the responsibilities to the national and local stakeholders. One of the ironies is that although many Pacific countries are susceptible to cyclones and other calamities, there has not been any insurance cover for climate projects. Recently, development partners have introduced the concept of 'de-risking' in sustainable energy projects, however, this is yet to be applied in the Pacific.

The lack of expertise and knowledge to enable local stakeholders to comprehend and monitor the extent to which climate-related projects have contributed to GHG emission reductions in the long term is a major constraint. The monitoring of GHG emission reductions is a way of ensuring that the climate finance has worked and achieved its purpose.

Although the GCF policy on Indigenous people talks about engagement with communities, climate projects are often state-driven and issues such as bureaucratic processes, government development priorities and philosophies, local elite interests and political patronage often get in the way of people-to-people relationships and connection with grassroots local Indigenous communities. Local elites and businesses can sometimes profit from contracts at the cost of local communities.

In the Pacific, the complex intertwined issues of land and culture are often overshadowed by the political will to implement climate projects. Climate projects are often underpinned by political, bureaucratic, technical and economic forces which usually dismiss local cultures, including communal landownership, as barriers to development. This thinking has increasingly become more prominent as the neoliberal ethos and the participation of private capital in climate finance become more pronounced. This has sometimes led to conflict and disruptions at the local level because of marginalisation of Indigenous knowledge and innovation and disempowerment of marginalised communities.

18.3 Carbon trading in the Pacific

18.3.1 A Pacific carbon market?

A carbon markets is not as well-established in the Pacific Islands as in countries such as Australia and New Zealand. But some of the issues relating to compliance, verification and benefit sharing are common.

One of the challenges with the carbon markets is that it consists of multiple players (states, multilateral agencies, donors, local communities and corporations) which often have divergent interests (Fair Supply, 2021). The commodification of carbon emissions which allows market forces to determine the price of carbon has increasingly overshadowed the original intention of reducing GHG emissions. Local communities, governments and donors drawn into the neoliberal workings of the carbon markets are either knowingly or unknowingly guided by different interests and motivations (International Climate Initiative, 2015). Local communities are more concerned with their livelihood, governments maybe concerned about their international obligations and the support of their local electoral constituencies while corporations are fundamentally interested in trading for profit (Nantongo et al., 2019). In a rather intriguing way, the rationale behind the commodification of carbon ensures that corporate polluters can be compensated (and encouraged to minimise emission) and non-polluters such as local village communities can generate some income (McGregor, 2015). A rather exploitative neo-colonial division of labour. The World Bank estimates that carbon trading programs cover about 21.5% of global GHG emissions (World Bank, 2021).

In some parts of the PICTs, carbon trading has been taking place for several years, but in a limited way. Carbon trading is marketed as being good for biodiversity and local community socio-economic development but the situation is far more complex than these because there are diverse layers of engagement involving deeper issues of inequality, land grabbing, restricted access to land by landowners, amongst others. By and large it involves an artificial economic system consisting of two related processes—carbon credits and carbon offsets. Carbon credits refer to permits or certificates usually issued by governments to enable a company or any other entity to generate a specifically determined quantity of carbon—a system referred to as a 'compliance carbon markets'. Other terms used for carbon trading are 'cap and trade' schemes or Emissions Trading Schemes (ETS). These all involve setting a 'cap' on the quantity of carbon emissions released annually. Governments provide companies with permits, which are termed 'credits' or 'certificates' if they operate in high emissions sectors. Companies can sell their credits if they are unable to use up all their remaining permits and they may also buy extra credits if they have exhausted all their credits (World Bank, 2021). They can also trade on credits with other countries to enable them to meet their emission targets. The ability to sell unused carbon credits creates an incentive for companies to lower their carbon emissions. The corporate sector in the Pacific is not well-developed and this aspect of carbon trading is not yet common.

However, carbon offsets are more common in the Pacific. This involves trading of carbon on the 'voluntary carbon markets' where entities may want to 'offset' their emissions but not actually reduce their carbon footprints. The idea is to lower their net carbon emissions by purchasing credits from carbon offset projects such as planting trees, renewable energy projects, or directly capturing emissions from the atmosphere.

This tantamount to a creative accounting exercise involving the marketisation of carbon. The 'value' of one carbon credit is calculated at one metric ton of carbon or carbon-equivalent (Secretariat of the Pacific Community, 2013). Calculation of carbon offset credits is unreliable and problematic, because of the lack of a standard international verification system. In addition, carbon offsets are used by many corporations to greenwash their carbon emitting activities (International Climate Initiative, 2015).

18.3.2 Carbon pricing in the Pacific

One way of reducing GHG emission is to use market mechanisms to pass on the cost of pollution to emitters. This is sometimes seen as a way of ensuring that imposition of carbon levy or tax can be both punitive and an incentive to ensure behavioural change away from activities and operations which emit GHG into the atmosphere (Parry, 2021; Colenbrander et al., 2018; Ravikumar, 2015; Schmidt, 2014; Strand, 2019b). Reduction of GHG emission and carbon pricing can either be carried out voluntarily by companies or mandated by governments at the national, regional or international levels. The carbon price is usually expressed as: Price per ton of carbon ($/tCO2e) (World Bank, 2021).

Carbon pricing is a new concept in the Pacific and in 2022, a study was carried out by the Pacific Islands Forum Secretariat regarding the feasibility of a unified regional climate pricing policy (Finau & Ratuva, 2022). The report suggests that as carbon pricing is bound to become increasingly mainstreamed into development strategies of the Pacific countries, there is a need for more research, data and analysis to ensure that 'carbon pricing policies are beneficial to the local population, non-punitive, equitable, sustainable and effective in terms of achieving the carbon emission reduction targets of the individual PIF countries' (Finau & Ratuva, 2022, p. 2).

It is important to note that several challenges need to be dealt with as the PICTs move towards formulating carbon pricing policies. These include diversity of existing carbon pricing policies amongst the PICTs; differences in the political and economic interests of PICTs; the competing interests of commercial and other stakeholders and their influence on the regional climate policies; ensuring equity in the carbon pricing system at the national and regional levels; negotiating the gap between national and regional interests; and designing a carbon pricing system which ensures accountability, transparency, due diligence and long-term sustainability (Finau & Ratuva, 2021).

Countries in the region are not all on the same boat when it comes to framing and implementing climate policies. Some already have carbon pricing legislations (e.g., Australia and New Zealand) while some are already working on theirs (e.g., Fiji) and at the other extreme are those who do not have any process in place. This is where regional cooperation can become useful to ensure that those which have the resources to frame their policies and legislations can provide support for those who do not. As seen in Figure 18.12 there is a wide diversity in carbon tax policies and carbon project implementation in different parts of the world.

If a carbon tax is implemented in one country but not in another, the country implementing the carbon tax would be less attractive for investments. Thus, for the Pacific, the important questions are: Should there be a regional carbon tax? And if so, should all Pacific PICs administer the same regional carbon tax, or should it vary for each country?

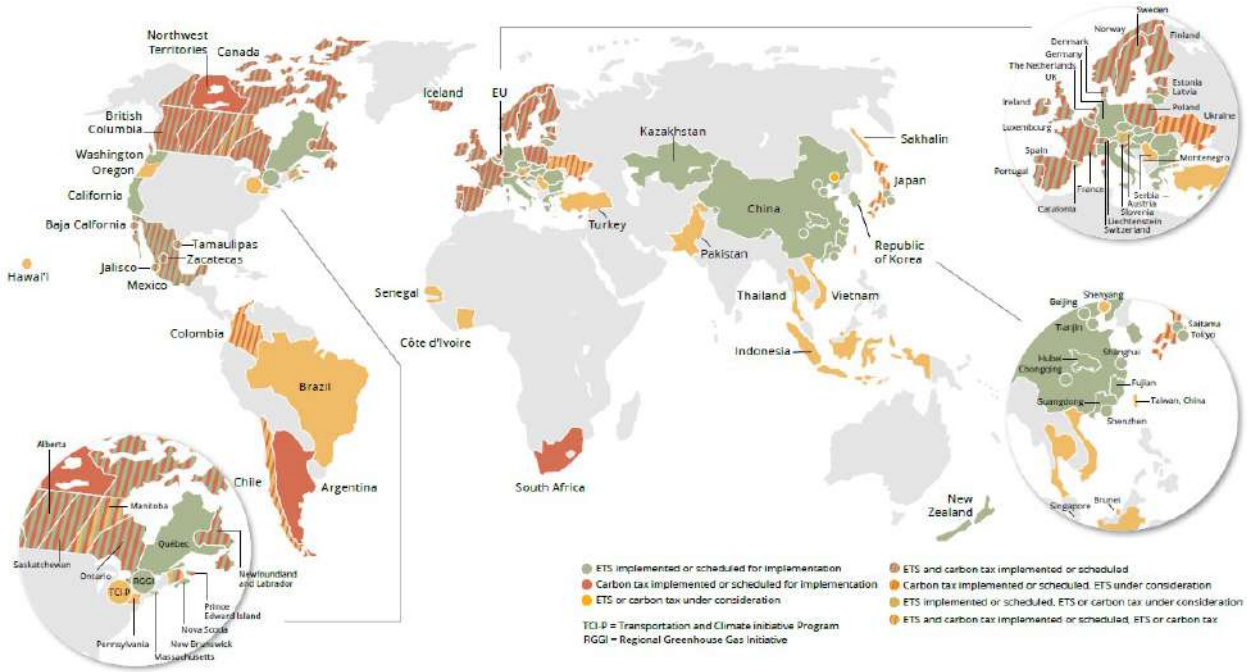


Figure 18.12: *ETSs and Carbon taxes around the world (Source: World Bank 2021).*

How can the biggest regional polluters (such as the shipping industry) be incentivised to reduce emission?

Some Pacific communities have been able to build up their carbon credits for sale through REDD+. REDD+ is an initiative of the UNFCCC to reduce, measure and report greenhouse gas emissions in forests (Secretariat of the Pacific Community, 2013). The initiative has been operating in Fiji, Papua New Guinea, Solomon Islands and Vanuatu. These are PICTs with substantial tropical forest coverage.

REDD+ projects operate at the local, national, regional and international levels and in Fiji, projects were set up in Drawa (Vanua Levu) and Emalu / Draubuta Village (Viti Levu). As in Vanuatu and Solomon Islands, the projects were run by Nakau, an Australian-based carbon-trading company (Lalabalavu et al., 2015). Other foreign players such as the German Agency for International Cooperation (GIZ) and World Bank have been heavily involved in training and funding activities such as developing National Forest Inventory (NFI) to create a forest database for carbon trading in collaboration with regional partners such as SPC. Some private companies have taken advantage of the situation for quick profit while some like EKO are committed to long term sustainability community wellbeing (McGregor, 2015).The Pacific Islands Regional Policy Framework for REDD+, endorsed by the Pacific Ministers for Agriculture and Forestry in Nadi, Fiji, 2012 was 'designed to provide policy options to guide REDD+ programme development at regional and national levels, and to provide a rationale for financial support for the sustainable management and use of forest and tree resources'(Secretariat of the Pacific Community, 2013). Amongst the principles of the framework are ensuring benefits for both big and small PICTs as well as 'contribute to poverty alleviation and enhance livelihoods of Pacific Islands communities' (Secretariat of the Pacific Community, 2013, p. 7).

There have been stories of success and disappointment as we shall see later as in the cases of Solomon Islands and Fiji.

The potential for the carbon offset market to provide revenue for Indigenous communities has increasingly been recognised. This is a multipronged project which involves protection of natural resources such as trees, generation of income from carbon credit and improving the wellbeing of communities. It involves a number of stakeholders playing specialised but complementary roles. Research by Lyons et al. (2019) which explored the implications of a carbon-offset project on the ground in the Solomon Islands showed that REDD+ related projects have produced some benefits for the communities involved because of the way it has been organised and run. This provides an alternative to logging which has led to excessive environmental destruction due to unrestricted access to Indigenous forests by Asian logging companies which used payment of bribe money to politicians and those in authority.

Two of the pioneers of carbon-offset projects in the Pacific are Nakau, an Australian-based company and EKO, which is New Zealand-based. Nakau is the commercial arm of 'Live & Learn', a community sustainability network. Funding for the carbon-offset projects is through such sources as EU, GIZ, ADB and MFAT and once fully operational, they can generate income from carbon credit sales. Under the Plan Vivo guidelines, 60% of the proceeds go to landowners and the rest go to the administration of the project, including fees for the managing company. Different operations have different financial structures. EKO's approach is based on reinvestment of carbon credit sales income into community development projects because of the limited lifespan of 30 years for the carbon-offset projects (Personal communication with Sean Weaver, head of EKO).

Nakau runs a carbon-offset project in Choiseul Province in the Solomon Islands, and this is managed by the Natural Resource Development Foundation's (NDRF) Forest for Life. Although the project is not strictly under REDD+, it is run along the same principles. Over the last five years, NDRF had introduced a number of community projects such as beekeeping, kava plantation, a savings club for women, an educational facility for community education and a bed and breakfast accommodation service to support the training programs. As one local leader proudly explained: 'our livelihood projects have a direct impact on people's lives, compare that to millions of dollars of government money where we don't see anything' (Quoted in Lysons et al., p. 9). Because of the administrative disconnect between local communities and central state authority, REDD-type projects tend to be run independently by civil society organisations. In some cases, there is a strong distrust of government, a sentiment expressed in the words of a local community leader, 'we don't trust anyone, we don't trust government, or a company, we only trust ourselves' (Lyons et al., 2019, p 7).

While the carbon offset concept has brought some benefits to the local communities in the form of direct participation in conservation, benefit-sharing, monetary reward and local skills development, it has the potential to lead to exploitative and extractive practices including 'carbon colonialism' which has been common in various parts of Asia, Africa and Latin America. In some cases, Indigenous communities have been evicted from their land and denied access to their natural resources to make way for carbon offset projects. New land is opened up through land grabs for carbon trading and capital accumulation at the cost of local Indigenous communities. This reinforces existing unequal power structures and neo-colonial economic exploitation.

The issues of equity, fairness and justice come to the fore when dealing with Indigenous land and resources extraction. To what extent are the landowners directly involved in the process and has the benefit-sharing model genuinely empowered them economically? Or have financial benefits merely trickled down in tokenistic forms? Perhaps the issue of carbon rights, the idea of connecting land rights to carbon extracted from forests, is also applicable here (Ravikumar, 2015). But the question again is, who is to hold carbon rights and the ability to sell and benefit from carbon—the government or the landowners? (Karsenty et al., 2014).

In the broader scheme of things, carbon trading does not limit carbon emission at all but instead encourages polluting corporations and states to continue with their unscrupulous, predatory and extractive behaviour which destroys our planet while relying on the false carbon economy to normalise and sanitise their destructive practices.

18.3.3 Case study community carbon trading: Drawa forest project (Fiji)

One of Fiji's first REDD+ projects started in Drawa, located in central Vanua Levu, within the provinces of Cakaudrove and Macuata. Drawa is a mountainous terrain covered with Indigenous and secondary forests. Similar to the carbon offset project in Choiseul Province in the Solomon Islands the programme operator is Nakau Programme Pty Ltd, an Australian company that also manages the Drawa Forest Conservation Project in collaboration with Live and Learn Fiji (Lalabalavu et al., 2015).

The Drawa initiative came through a long-term commitment that took almost 20 years of negotiations for the villagers to make their land available for the carbon offset project. They surrendered their right to log timber on 1,549.29 hectares of land for the chance to engage in rainforest carbon credits. Eight Mataqali (land-owning units), namely, Navunicau, Nadugumoimoi, Bakibaki, Nakalounivuaka, Vatucuca, Koroni, Tonikula, and Nakase, along with the koro (villages) of Vatuvonu, Keka, Lutukina, Batiri and Nayarailagi, are all part of the project. It is owned by Drawa Block Forest Communities Cooperative Limited, a registered entity comprising all the mataqali and villages. As shown in Figure 18.13, the community carbon trading scheme involves several financial processes managed by Nakau. Nakau negotiates and facilitates the sale of carbon credits to buyers, typically large corporations aiming to offset their emissions. The Payment for Environmental Services and Performance (PES) is based on the carbon price per tonne, which fluctuates according to national standards and market demand. Revenue from PES sales are deposited into a project trust account and allocated primarily to the project owners, the Drawa Block Forest Community Cooperative Ltd, which receives at least 60% of the sales value. The remaining funds are used to cover the operating expenses of the project coordinator, including fees, service charges, and regulatory costs, managed by Nakau and Live and Learn. Each household involved earns an annual income of about FJ$300.

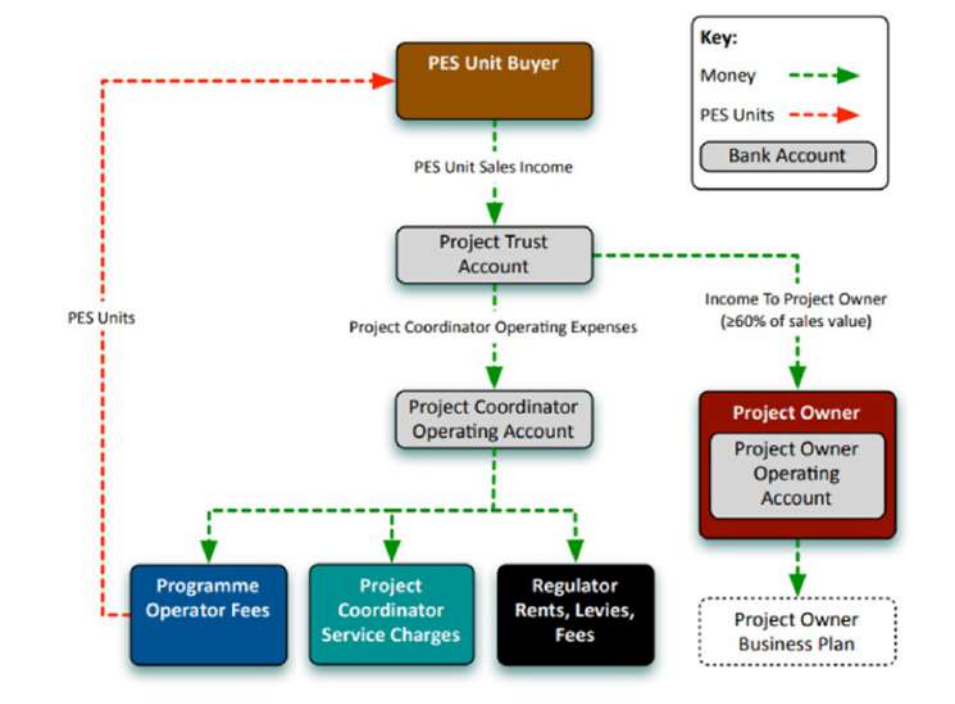


Figure 18.13: Diagram of the Nakau carbon markets operation and financial flows. Source (Lalabalavu et al., 2015, p. 102).

Drawa community voices

The scheme has had positive environmental and social benefits for local communities. The forest protects the Drawa people (Figure 18.14) and those living downstream in the catchment from cyclones, floods, and droughts. Other neighbouring villages that conduct logging or other extractive forms of income now must live with environmental destruction. Veniana Talebula shared her experience on the impact of agriculture and the preservation of forests on their river system:

> When you bathe in the small river, you will feel the difference, especially with the temperature. On the one side, it feels warmer since the upstream land is used for agriculture, and the forest is removed to cater to the farms. The other creek is always cold and fresh from the carbon trade reserve area (Personal communication, August 2022).



Figure 18.14: The river at Drawa Village connecting the two creeks (left) and an intercropped garden near the river (right).

The project benefits families through income, well-being and community development projects. Money from the initiative is distributed to the eight mataqali twice a year, but this is insufficient to support all the individuals, given the hundreds of people involved. Therefore, some funds are reinvested into community development schemes including beehives managed by village women and youth farms growing kava, taro, and yams for consumption, cultural responsibilities, and income (Figure 18.15).

Seremaia Lotawa, a local forest ranger, shared that:

> We only know about logging apart from farming for livelihood. Then, we were introduced to carbon trading, where experts conduct their calculations. It is an excellent idea as we keep receiving some income, and our forest still stands (Personal communication, August 2022).



Figure 18.15: *Youths from Drawa village are trained as forest rangers to take recordings and continual monitoring of the forest reserve. Picture: Nakau, Senitiki Talebula.*

Some challenges at Drawa

The community generally supports the Drawa Forest Project and takes pride in it as one of Fiji's pioneering initiatives. However, there are challenges. Nakau Pty Ltd has calculated that the forest's carbon credit project will only last for thirty years, raising concerns about the project's intergenerational sustainability and long-term benefits for the community. This deadline has caused anxiety among the people, as expressed by Sera Tagi, a Drawa villager.

> During a series of workshops, we were told that the project would run for thirty years due to some standards. Since the money from the project was insufficient, we invested in beehives and farms to support the whole village, and during flooding, we also lost our beehives and farms (Personal communication, August 2022).

The other challenge is the insufficient six-monthly income for the communities. Sometimes, people share the income and distribute it individually into their accounts by the iTaukei Land Trust Board individual lease allocation to support their families. The amount people received has been questioned:

> Families will receive around FJ$300 (after every six months), and that's not enough to buy stationeries for my five children. If we consider the current inflation, that is really bad news. Lucky, we live in the village and do not pay bills (Personal communication, Veniana Yagasiri, September 2022).

The field researcher was also at Drawa village when the Nakau Pty Ltd and Live and Learn talked to villagers. In this meeting, the organisations claimed that the villagers needed to pay for the land leased under reserve (they leased their customary land). This is despite the agreement and the Nakau financial model illustrated above, which says that this was supposed to be covered by Nakau under operating costs. This caused some consternation and distrust during the meeting as reflected in this statement by a villager:

> We agreed to reserve our forest and promised to get some money, which was insufficient. Later, this great initiative somehow became a barrier to accessing resources from the forest as our needs keep increasing (Personal communication, Peni Maisiri, August 2022).

While the project is novel and innovative in the involvement of local communities, the trickle-down process embedded in this model is typical of mainstream development orthodoxy where Indigenous landowners receive the crumbs from the table; the price of carbon is beyond community's control as the REDD+ initiative calculates the price. At a regional and global level, the project is operated by Nakau Pty Ltd and coordinated locally by Live and Learn. Attempts should be made to empower local landowners through capacity building to ensure they are direct participants in the carbon sinking and trade initiatives rather than passive recipients of climate dollars at the mercy of external profiteers.

Criticisms of community carbon trading

While some Indigenous communities may have benefitted from carbon trading through community development and wellbeing projects as we have seen in the Solomon Islands and Fiji, the long-term sustainability of these activities is in question, given the one-generational 30-year span of projects and consistency in income generation.

At the broader structural and ideological levels, things may not be quite rosy as carbon markets may not be very effective in reducing emission in any meaningful way. It has been criticised as a gamming exercise to benefit polluters which have failed to decrease emissions. The marketisation of carbon has led to a culture of profit making which mimics the corporate world where fraud, creative accounting and lack of environmental integrity have become operational norms. It has also reinforced global economic racism through environmental prejudice, human rights compromise and undermining of healthy and sustainable food systems and communities. There are no safeguards in the market to protect the rights of Indigenous communities. Market forces have reordered the priorities where profit supersedes the moral goal of planetary sustainability and the wellbeing of humanity.

18.4 Policy implications for community carbon trading

Local communities must be part of the climate-based projects at the planning, implementation and review stages rather than just the final implementation stage. This is to ensure that they are well informed, provide free and prior consent, feel empowered as well as enable them to have sovereignty and power over their land and resources and the benefits derived from these.

Given the increasing interest in the Pacific carbon markets, it will be timely to set up a regional climate forum for landowners and communities to provide a strong and representative platform for their interests and voices. The collective regional forum should advise and carry out ongoing consultations with national governments, regional bodies and international bilateral and multilateral donors.

18.5 Conclusion

As we have examined in this chapter, patterns of global climate finance are not tailored to PICTs needs, and that the current level of climate financing efforts fall short in putting the global climate change pathway towards the 1.5°C target, which is the redline for PICTs. The scholarship around climate finance effectiveness reveals that the majority of global climate finance is sourced from the private sector rather than public finance being raised through debt instruments, while grants only account for 5% of total climate finance available. Further, access to adaptation finance is extremely competitive, with the Pacific only accessing up to 4.5% of the finance channelled to the Asia-Pacific region, primarily through grants from bilateral and multilateral donors. Indeed, domestic private sector investments towards infrastructure initiatives are limited, and the analysis of principal and significant climate adaptation funding sources reveals that most projects were within the renewable energy sector for climate-change related projects.

It is important to highlight that climate finance architecture of PICTs is complex due to the multiple stakeholders involved at regional and national levels. Currently, most climate finance for infrastructure development projects is typically delivered through small and often-uncoordinated institutions, which increases the burden on already limited in-country capacity. These challenges are exacerbated by PICTs smallness, undiversified economies, remoteness, underdeveloped private sector, and the high dependence on donor finance. Despite these caveats, PICTs are emerging as pioneers in establishing innovative financial mechanisms to source climate finance such as the setting up of the Pacific Resilience Facility (Pacific Islands Forum, 2021). However, even the establishment of this facility will be heavily dependent on external sources for initial resourcing and sustainability.

Governments of PICTs must grapple with the financial, economic and social costs of climate change from sea level rise, natural disasters and climate-related displacement and relocation. These costs involve investment in infrastructure that mitigates and adapts to the impact of climate change. Such infrastructural investments include sea walls and climate resilient homes. This requires significant capital, so far primarily being sourced from international debt. Analysis of the domestic budgets of PICTs reveals significant yet limited increase in infrastructure development, particularly in years after major disaster events. The impact of COVID-19 has necessitated the need for many PICs to borrow more to recover from the impacts of the pandemic in addition to climate change. Some of these new borrowings are innovative forms of climate financing that source funds for climate-change related projects.

In relation to carbon trading, there are ongoing challenges that need to be understood. The need to address community issues is challenging, the bureaucracies that need to be created to qualify for funding are burdensome on constrained capacity, the resources required to access climate finance are substantial, despite some of the finance received being underutilised. Finally, our community case study revealed some of the pros and cons on the ground as well as highlighting the fact that the income received is insufficient for community livelihoods and the ticket is substantially clipped by middle-operators. At the end of the day community carbon trading players are at the bottom of the carbon markets food chain, where their role is to produce carbon purchasable credits which enable polluting corporations and states to continue to emit CO2 and endanger our lives and our planet.



> We are partnering up with the live and learn project on how to make flour from breadfruits and sundry salted fish. Test try it so that we will be able to sell these products to the main land

Naomi
Community participant
Funafuti
Tuvalu
(POCCA research team interview, 2023)

A structure in Papa Elise, Tuvalu, that is often used by the islanders to sun out fish for consumption. But it can go unused for an extended period due to low fish stocks (Photo: POCCA team, 2023).

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Chapter 19

Conclusion

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Bukama Village in the Yasawa's, Fiji, which is often threated by drought, topical cyclones, sea level rise, coral bleaching and other climate crisis related impacts (Photo: POCCA Team).

The chapters represent a multitude of voices across the areas of Indigenous knowledge, physical science, social science and humanities, all singing in unison about the need to unite efforts in addressing the plight of Pacific peoples as they are impacted by climate change. As stated in Chapter 1, the broad aim of the project is to carry out a comprehensive, evidence-based research and assessment of the diverse range of impacts, community experiences, adaptation strategies, community innovations and Indigenous knowledge systems relating to the ocean and climate change in PICTs. This was a challenge in terms of the geographical coverage and logistics but the close partnership between scholars across the massive oceanic expanse and the intellectual synergy this produced made the project possible.

The report starts from the premise that the physical science of atmospheric warming is quite clear about the impeding climatic catastrophe if the current rate of greenhouse gases emission continues, as warned by the IPCC Sixth Assessment Report (AR6). The Pacific Ocean Climate Crisis Assessment (POCCA) project dives deep and examines the experiences of communities, as people adapt and respond to the slow onset and sudden impacts of climate crisis in the Pacific. The quantitative scientific data on global warming can be the basis on which to engage in research and provides the basis for understanding the physical environment, but the study of the impacts needs social science and Indigenous knowledge lenses. As mentioned earlier, the most effective and reliable 'measure' of climate change impacts are lived experiences of people as they go through the pain, the fear and the feeling of hopelessness when uprooted from their ancestral land and when their lives are shattered by climate change-related calamities. In addition to this is how they build up resilience to overcome the challenges.

The POCCA project weaved together interdisciplinary approaches across physical science, social science, humanities and Indigenous knowledge. The need to save our planet and humanity must inspire us to work collaboratively across national, cultural and disciplinary boundaries. It is especially significant to ensure collaboration between different knowledge systems, in particular between science and Indigenous knowledge. This POCCA project is multidimensional in terms of epistemic, methodological and cultural approaches.

The value of the project to the region cannot be overstated. It is hoped that it will support the climate change approach of the *2050 Strategy for the Blue Pacific Continent,* the blueprint for Pacific development in the next decades. The report will certainly have a lot of applied benefits for policy makers, climate strategists, developmentalists and those involved in engaging with community wellbeing across the Pacific. The expert research findings in the report are very up-to-date and can be used as reference for researchers in the future. It can also be the basis of the UNFCCC climate stock-take in the Pacific.

What is often missing from official climate change reports are the people's voices and community narratives which, this report provides in a way which, is accessible and useful for readers. The report collects and weaves together a multiplicity of narratives from diverse communities across the Pacific.

At the outset the report provides an overview of the physical and natural science of the Pacific Ocean (Chapter 2).

This is important to contextualise how people have interacted with the island and oceanic environment for millennia and experienced the destructive forces of climate-related calamities such as cyclones and storm surges. Beyond this, in the bigger scheme of things, it is also important to look at the governance of the climate-ocean nexus in the Pacific region (Chapter 3). This shows that PICTs have been at the forefront of global ocean governance initiatives as 'global norm entrepreneurs', a term used in this report, as a way of protecting their sovereignty and development interests.

Indeed, a large number of climate change initiatives, in the form declarations, agreements, strategies and polices have been created, signed or implemented in PICTs (as shown in Chapter 4), and while some may say that these are signs of high level of activity and interest, the question of their effectiveness also arises. Perhaps one of the most contentious issues is the notion of 'vulnerability', especially how it is framed and articulated in a deficit way in climate policies (Chapter 5). There is a need to re-look at how we can use discourses, which are more empowering, transformational and inspires innovation and resilience. Related to this is the importance of people's perceptions and narratives of climate, the role of civil society and civic education (Chapter 6). People's narratives can be empowering and motivating for policy makers at the national, regional and international levels.

The close connection between the Pacific peoples and ocean is a fundamental thread which runs through the report (Chapter 7). Thus, any climate assessment on the Pacific should consider this relationship as almost primordial in nature and needs to be at the centre of the analysis. This is closely connected with people's relationship with the eco-system and biodiversity (Chapter 8), water security (Chapter 9) and food security (Chapter 12). What makes these connections meaningful are the modes of Indigenous social protection which Pacific peoples have utilised over millennia to sustain their wellbeing and relationship with the environment (Chapter 10). Part of this broader social protection and human security relationship is in the form of health, especially how climate change exacerbates poor health and wellbeing (Chapter 11).

Politically, climate change has implications on regional security, geopolitics and trans-national crime too (Chapter 13). This is a new area of study. Furthermore, in recent years, the issue of loss and damage (Chapter 14) has become a major one, especially in terms of who should pay for the damages caused by climate disasters. A major issue relating to loss and damage is the impact on socio-economic wellbeing and survival of marginalized communities (Chapter 15). In addition, another area which has been impacted on by climate change are places of cultural heritage (Chapter 16). As the impact of climate change become untenable, people are compelled to move, thus understanding the cultural and technical complexity of climate mobility should become an area of focus (Chapter 17). The mobilisation of resources such as climate finance is seen as a means of funding climate change mitigation and adaptation but questions have been raised about its benefits to the local Pacific communities because of the complexity of the process involved (Chapter 18).

The successes of POCCA as a project goes beyond just the final report itself. It was an initiative, which helped to enrich the Pacific research ecosystem and nurture our young Pacific scholars to engage in serious research challenges. A large number of PhD researchers were involved in the project and some of the theses were focused on various social, cultural, political, religious, economic and environmental aspects of climate change.

The POCCA project enabled the largest number of Pacific scholars (around 100) to come together at any time in history to work together collaboratively. This has transformed and boosted the Pacific research culture, regional networking and collaboration in significant ways.

The POCCA project expanded its influence and mana in a number of ways. Firstly, it provided the platform for the University of Canterbury successful bid to host the 2025 World Adaptation Science Program (WASP) conference in Christchurch. WASP consists of all the UN climate-related agencies including the UN Environment Programme, World Health Organization, UNFCCC, Global Environment Fund, Green Climate Fund, IPCC, United Nations University. With the support of the New Zealand Government, the University of Canterbury won the bid on behalf of the Oceania region. Secondly, the POCCA leaders were instrumental in setting up the research committee on Climate Security and Planetary Politics of the International Political Science Association. Thirdly, POCCA has also helped to increase the research and publication outputs of a number of scholars involved. Fourthly, the POCCA team was responsible for accrediting the University of Canterbury to the UNFCC climate conference system such as COP. These are just four of the many ways in which the POCCA programme has expanded its influence well outside the realm of the project.

The report provides the baseline from which policies, strategies, declarations and further research on climate change impacts and responses can be carried out in the Pacific. However, there are gaps that still need to be addressed. Hopefully the POCCA team will re-assemble at some point in the not-too-distant future to address these gaps.

The future?

Pacific peoples have developed adaptation and resilience mechanisms over generations and today, more than ever before, these are becoming more and more relevant as the climate crisis and the impacts become more pronounced. An integrated approach which requires borrowing outside technology and scientific knowledge and weaving these together with Indigenous wisdom and community innovation are needed to address the threats to island communities. In the bigger scheme of things, cooperation at various levels is needed—between local communities and governments, between governments and other stakeholders (regionally and internationally) and between all citizens of our planet. The role of researchers, private sector, political leaders, regional institutions, civil society organisations, international agencies and communities are important in these critical times.

This report has shown that, apart from the anguish and anxiety caused by the climate crisis, there are also stories of hope and resilience. That fact that Pacific peoples have been able to live on the smallest islands on the planet for generations, amidst extreme climate-related calamities, testifies to the importance of resilience, hope and optimism to prepare us for the future.

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Pacific Ocean and Climate Crisis Assessment