Progress Towards Sustainable Development Goal 6.b: Determining Effectiveness of Intervention Entry Points for Community-Based WASH Development in the Kingdom of Tonga

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Abstract

Despite global advances in water, sanitation and hygiene (WASH), Tonga continues to report some of the lowest rates of access to safely managed water and sanitation worldwide. Although community engagement is prioritised across the development sector, including within Tonga's WASH development, limited guidance exists as to how this should occur, or how "community" itself is conceptualised. This research responds to this gap, examining the impact of how interventions define and engage with communities, on the success of community-based WASH interventions in Tonga.

This research focuses on intervention entry points to community, aiming to strengthen evidence-based guidance for community-based WASH development in Tonga. It identifies four primary intervention entry points (intervention-initiated, place-based, local institution-based, and faith-based communities) and produces an initial comparison of their conceptual strengths and limitations. These insights are then field-tested and refined through a mixed-methods case study of drinking-water development on the island of 'Eua, centred on the 2020 'Eua Water Security Project delivered by the Mainstreaming of Rural Development and Innovation Tonga Trust. Drawing on community development plans (2019, 2025), census data, and 12 semistructured interviews, the case study also compares community-engagement approaches used by three major agencies in Tonga's water sector.

Findings indicate the need for implementers to critically interrogate their assumptions about community and the implications these assumptions have for engagement strategies. Substantial differences in entry-point performance are highlighted, with key areas of divergence being capacity to support long-term governance and resourcing, and capacity to facilitate implementers' understanding of target communities. Critically, the success of any entry point is seen to depend on an intervention's goals, capacities, and constraints.

Field research focused on the place-based entry point, found that challenges linked to high community diversity can be mitigated through targeted tools and organising mechanisms, including community WASH plans and community development plans.

Intervention assessment refers to five components of intervention success (appropriateness, effectiveness, impact, equity, and sustainability). Evaluation of this framework demonstrates its utility for further use in the assessment of Pacific WASH interventions, contributing to stronger coordination and learning across the sector.

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Glossary of Definitions and Acronyms

Appropriateness

Relevance, suitability and fit of the project in the community context.

Benefit persistence

The capacity for an aid project to directly or indirectly support changes to services or behaviours in a way that benefits recipients beyond the project's completion.

Cultural competency

The mistaken belief that if a cultural outsider learns about a culture they will become culturally safe.

Cultural safety

A way of operating that acknowledges and respects the culture and norms of all involved, to enhance dignity and mana. It goes beyond cultural awareness, requiring reflection on power imbalances and one's perspectives and biases and how these influence cross-cultural interactions.

District

For the purpose of this thesis, "districts" refers to the 23 administrative district lines utilised by the Tongan development sector, each with a recognised district officer.

Effectiveness

The success of a project in achieving intended outputs, the direct results, both products and social benefits.

Equity

Capacity for the project to include all members of the community in both activities and outcomes, particularly marginalised groups.

Impact

The wider effects of a project, both direct and indirect, intended and unintended, whether positive or negative.

Intervention entry point

The structures, either physical or otherwise, through which a project engages a group of people.

Sustainability

The extent to which project activities and outcomes have been maintained post-project life cycle.

Village

Often used interchangeably with community, for clarity throughout the thesis "village" is used to refer to Tonga's 156 recognised villages, each with a recognised town officer.

Water security

Reliable access to safe drinking water in sufficient quantities to meet the daily needs of households during peacetime and during periods of disaster response.

Acronyms

ADB—Asian Development Bank

CBA—Community-based adaptation

CDP—Community development plan

CRP—Community resilience profile

DFAT—Australian Department of Foreign Affairs and Trade

DO—District officer

GoT—Government of Tonga

IEPT—Intervention entry-point planning tool

IFAD—International Fund for Agricultural Development

LLEE—Live and Learn Environmental Education

MEIDECC—Ministry of Meteorology, Information, Disaster Management, Environment, Climate Change and Communications

MORDI Tonga Trust—Mainstreaming of Rural Development Innovation Tonga Trust.

M&E—Monitoring and evaluation

NGO—Nongovernmental organisation

PICT—Pacific Island countries and territories

PCC—Pacific Conference of Churches

SPREP—Secretariat of the Pacific Regional Environment Programme

SWOT—Strengths, weaknesses, opportunities, and threats

TO—Town officer

TOP—Tongan Pa'anga

TPH—Tonga Public Health

TWB—Tonga Water Board

USD—United States dollar

VWC—Village water committee

WASH—Water, sanitation and hygiene

Chapter 1: Introduction

1.1 Overview

This thesis aims to contribute to the knowledge base driving water, sanitation and hygiene (WASH) development interventions in Tonga, to support more effective planning and delivery, and greater sustainability of benefits. Community-based WASH interventions are conducted at a high volume across the Pacific and indeed the world more broadly; however, these are widely acknowledged to achieve minimal and unsustainable outcomes (Clarke et al., 2014; United Nations Children's Fund [UNICEF], 2023). Progress is limited by a lack of evidence to support the improvement of these outcomes.

This thesis theorises that the way an intervention conceptualises "community," and intends to work with that community, may be a critical element impacting intervention success. Using evidence from a narrative review, and a case study of rainwater harvesting on the Island of 'Eua, Tonga, this thesis investigates intervention entry points to a community, as a key design decision. Analysis within this thesis aims to inform the development of an intervention entry-point planning tool (strengths, weaknesses, opportunities, and threats analysis) (IEPT-SWOT) for practitioners. Intended to support more effective use of entry points in a Tongan WASH development context, this tool is the key practical output of this thesis.

Given the lack of an accepted framework for assessing Pacific WASH interventions, this thesis utilises a framework for assessing Pacific climate adaptation initiatives, adapted from McNamara et al. (2020). This involves assessing a project's success against five criteria—appropriateness, effectiveness, impact, equity, and sustainability—which is further outlined in Chapter 2. Utilising this framework first to assess existing literature, before field testing it through the conduct of a case study, a secondary output of this thesis is the evaluation of this framework itself, for broader use in assessing Pacific WASH interventions.

1.2 Significance and Rationale

1.2.1 Aid Effectiveness

The aid effectiveness agenda is an international movement aiming to support greater efficiency of aid and development initiatives at the national and international scale. The costs of inefficient aid, as described by Brown et al. (2000), are felt both directly and indirectly. These direct costs are more readily identifiable and include the consumption of donor and government resources through high overhead costs associated with planning negotiations, implementation, and

evaluation. Indirect costs, while less tangible, are equally as significant: loss of trust in organisations associated with failed projects; consumption of donor and government resources that could otherwise be used elsewhere, linked to project duplication; and the funding of unsuccessful projects. All costs ultimately reduce the impact of development spending, undermining efforts towards development targets.

This movement has been formalised through key international agreements, the most notable being the *Paris Declaration on Aid Effectiveness* (Organisation for Economic Co-operation and Development [OECD], 2005) which established five key principles of effective aid: ownership, alignment, harmonisation, managing for results, and mutual accountability. Key to improving aid effectiveness is the assessment of aid projects; these five principles are used to guide assessment of intervention effectiveness, supporting ongoing improvement (Brown et al., 2000; European Parliamentary Research Service, 2020).

To align interventions with these five principles, the *Paris Declaration on Aid Effectiveness* (OECD, 2005), of which the Kingdom of Tonga was a signatory, set out the expectation for development practitioners to prioritise recipient control when designing and implementing development projects (OECD, 2005). The declaration required alignment of donors' procedures and policies, aiming to shift control back to recipients. This declaration has been reaffirmed in the 2008 Accra Agenda for Action, and the 2011 Busan Partnership for Effective Development Cooperation, remaining the most up-to-date guidance for aid agencies (Haak & Nakamura, 2021; OECD, 2024).

1.2.2 WASH Development

Access to safely managed WASH is critical to the health and wellbeing of individuals and to the development and prosperity of communities (World Health Organization [WHO], 2018). WASH development is specifically addressed in Goal 6 of the United Nation's (2025) Sustainable Development Goals (SDGs): "Ensure access to water and sanitation for all" (SDG 6). However, given its central importance across health care, disease control, nutrition, and economic development, effective WASH development is essential to achieving all 17 of the SDGs.

As such, WASH development has been a key target for aid development internationally. While SDG6 is recognised overall as not being on track to be achieved by 2030 as targeted, some progress has been made since the inception of the SDGs in 2015. Globally, access to drinking water has increased from 67% in 2015 to 74% in 2024, access to safely managed sanitation services has increased from 48% in 2015 to 58% in 2024, and access to handwashing facilities

with soap and water (as a hygiene metric) has increased from 52% in 2015 to 71% in 2024 (United Nations, 2025).

Despite this progress, and emphasis by the United Nations on the importance of collective progress where no group or region is left behind, there are clear disparities between countries and regions. Oceania (excluding New Zealand and Australia) continues to report the poorest rates globally for SDG6 achievement, with access to basic drinking water facilities at approximately 50%, and access to basic sanitation at approximately 35% (United Nations, 2025).

1.2.3 The Role of Community in Development

Responding to the imperatives of the Paris Declaration on Aid Effectiveness (2005), WASH development—and aid more broadly—is typically targeted at the community level (OECD, 2005). This follows discourse within public health research, where it is well established that community engagement in the design of development projects supports the appropriateness and sustainability of interventions (Tsekleves et al., 2022; WHO, 2018). When appropriately employed, community-based interventions are driven by and connected with local priorities, responding to the cultural knowledge, local realities and desires of those they aim to serve (De Wit et al., 2024). As such, the inclusion of aid recipients in their aid supports appropriateness, empowerment and, as a result, sustainability (Clarke et al., 2014; De Wit et al., 2024; Tsekleves et al., 2022; Westoby et al., 2020).

This focus on the community scale is also embedded within the SDGs, where the inclusion of community in the WASH development context is explicitly recognised in Target 6.b of SDG6: “Support and strengthen the participation of local communities in improving water and sanitation management” (United Nations, 2024a).

1.2.4 Sustainable Development in Tonga

Sustainable development is a focus area for the Government of Tonga (GoT). Described as growth that is inclusive and environmentally responsible, the priority areas for this development are set out in the Tonga Strategic Development Framework 2015–2025 (Ministry of Finance and National Planning, 2015). This framework identifies Tonga’s focus on growing the private sector; increasing agricultural productivity; increasing tourism; and improving communications, energy, and transport (Ministry of Finance and National Planning, 2015).

1.2.5 WASH development in Tonga

As one of the countries at risk of being left behind in global WASH development, Tonga reports some of the lowest rates of access to safely managed water and sanitation in the world, at 30% and 34% respectively in 2022 (United Nations, 2025). As a result, in 2024, the United Nations (2024b) deemed Tonga not on track to meet SDG6 by 2030 as targeted.

At the United Nations 2023 Water Conference, Tonga reaffirmed intentions to move towards SDG6, acknowledging the importance of WASH for the development of the Kingdom, and committing to increased expenditure and government focus to this end (’Akauloa, 2023). The 2024 draft *Water Sector Plan* further acknowledges the need for this development to support the resilience of local communities and their resources, ensuring they are prepared to meet the challenges of a warming climate and increasingly extreme weather events (Kingdom of Tonga, 2024).

Like much of the Pacific, Tonga experiences a high volume of development projects with targets that span a range of areas including WASH, health, education, environment, and economy, with a focus on climate adaptation and mitigation (Nelson et al., 2021). WASH projects are conducted both by national government and local organisations, alongside international governments and organisations that may work independently or alongside community-based organisations through the provision of funding grants (Kingdom of Tonga, 2024).

Aid accounts for 35% of Tonga’s GDP, making it one of the most aid-reliant nations globally, ranking second among 125 developing countries for aid as a share of GDP (Lowy Institute, 2025). This development funding is primarily focused on climate adaptation and mitigation programmes. Although only about 1% of this funding targets WASH, there have been many community-based WASH development activities (Lowy Institute, 2025). Aid funding is provided by a range of international partners with 80% received from four development partners: Australia (46%), New Zealand (16%), China (12%), and The World Bank (9%) (Lowy Institute, 2025).

1.2.6 Research Gap

Despite a high volume of community-based WASH development activities, research into Tonga’s interventions (and those of neighbouring Pacific nations) indicates that impacts are largely minimal and unsustainable (Clarke et al., 2014; UNICEF, 2023). This failure is linked to a number of factors, including limited community ownership, inappropriate leadership, and

inappropriate expectations of communities to manage complex and resource intensive WASH systems (Clarke et al., 2014; UNICEF, 2023).

This thesis responds to this research gap, looking to explore opportunities to increase the impacts and sustainability of WASH development through more effective approaches to community engagement.

1.3 Introduction to the Kingdom of Tonga

1.3.1 Geography and Culture

The Kingdom of Tonga is an archipelago made up of approximately 170 islands (45 inhabited), in the South-West Pacific. The islands lie southeast of Fiji between 15° and 23° south and 173° and 177° west. There are four main island groups: Tongatapu, home to the capital, Nuku'alofa; Ha'apai in the centre; Vava'u in the north; and the Niuas (Niuatoputapu and Niuafo'ou) located to the far north, close to Samoa (Figure 1.1).

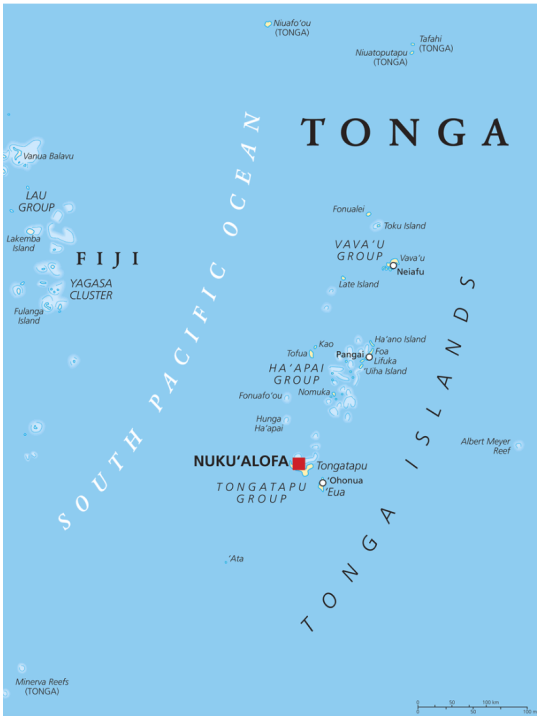

Figure 1.1

Map Showing the Location of Tonga's Island Groups

Source: iStock.com/PeterHermesFurian

New Zealand and Tonga have a strong collaborative political relationship based on historical and cultural ties. Working together as partners in the Pacific, their relationship is built upon

shared values and the desire to achieve prosperity across the Pacific. This cooperation is officially recognised by the Statement of Partnership, first signed in 2019 and renewed in 2024. This statement affirms their close ties as partners in the Pacific, committed to democracy, social welfare and cooperation. As a trusted development partner, New Zealand has a development presence across Tonga. A key area for this development is in the support of climate resilience and disaster preparedness and response, and greater action towards the achievement of the SDGs (Ministry of Foreign Affairs and Trade [MFAT], 2024).

In the most recent 2021 census, Tonga's overall population was just over 100,000 with 70% residing on the mainland island of Tongatapu (Tonga Statistics Department, 2022). There are significant numbers of Tongans living overseas, both permanently, and temporarily as part of seasonal workers' schemes and other temporary visa programmes. New Zealand is home to the largest population of Tongans outside of Tonga; New Zealand's 2023 census reported the population of New Zealanders who identify as Tongan at 97,000 (Stats NZ, 2024).

Household incomes in Tonga differ across urban and rural areas, with salaried work more common in the urban centers. Across Tonga, salaried work was identified as the primary source of income for 38.2% of households, almost equal to remittances (money sent to households from relatives or friends both within Tonga and overseas, primarily in New Zealand, Australia, and the United States) which were identified as the primary source of income for 38.1% of households. Tonga's economy is further supported by tourism, agriculture, and foreign aid (Tonga Statistics Department, 2022).

As the only Pacific nation to have retained complete independence throughout history, Tonga operates as a constitutional monarchy, currently led by King Tupou VI. Tongan society reflects this monarchical system, with the population segregated into royals, nobles, and commoners. This social structure is essential to Tongan culture, with social hierarchies holding key importance (Commonwealth Local Government Forum, 2018).

However, since the political reforms of 2010, the King's political power has been reduced, with the government now largely led by the Legislative Assembly made up of 17 elected people's representatives, and nine noble representatives (Commonwealth Local Government Forum, 2018).

Religion plays a key role in Tongan society and is central to key cultural practices and beliefs. Tonga is a predominantly Christian country, with a number of different Christian denominations present across the Kingdom. Free Wesleyan has the majority with 34%, followed by Latter Day

Saints (20%), Roman Catholic (14%), Free Church of Tonga (11%), and the Church of Tonga (7%) (Tonga Statistics Department, 2022).

Tonga's population is divided into 23 districts and 152 villages or communities. While the terms *village* and *community* are often used interchangeably in the Tongan development sector, village is the term used throughout this thesis. Importantly, the 17 electoral districts identified for the purpose of electing government officials do not necessarily reflect traditional district boundaries (Kingdom of Tonga, 2020). As such, the local development sector typically refers to 23 administrative district lines; these are the districts referred to in this thesis.

1.3.2 Tongan WASH Environment

Water Supply. The key challenges to safe water access in Tonga as identified by the GoT in the 2024 draft *Water Sector Plan* are climate change, urbanisation, and population growth, all of which increase the strain on the nation's water supply and infrastructure.

Reticulated water in Tonga, where available, is predominantly sourced from groundwater or community-level rainwater catchment systems. Only 'Eua, Niuafo'oua, Niuatoputapu, and Tofua have access to surface water that can be used in the reticulation network (Figure 1.3). The water lenses on Tonga's islands (particularly the outer islands) are typically shallow, porous, and prone to seawater intrusion, leading to groundwater that is saline and unpalatable. Despite this, groundwater is routinely accessed through bores and treated before being fed into reticulated networks. This is particularly common across communities in Tongatapu where the groundwater is typically less saline compared to the outer islands (White et al., 2020). This high salinity, combined with a cultural preference for rainwater, results in groundwater rarely being used for drinking in Tonga. Instead, groundwater is predominantly used for cleaning, bathing, flushing toilets, and other water use. For the majority of Tongan households, rainwater is the key source of drinking water, harvested through roof catchment systems (either at the community or household level) and stored in cement or plastic tanks (White et al., 2020).

Beyond these intrinsic challenges, Tonga is increasingly challenged by extreme weather events. Significant work has been done across Tonga to enhance water security and resilience to such events, including improvements to household collection and storage of rainwater, establishment of community-level rainwater harvesting, and expansion of groundwater access. The latter has been particularly significant on the outer islands. However, the 2024 *Water Sector Plan* recognises that the effectiveness of these interventions in improving water security for households in Tonga remains unknown, due to a lack of coordination between agencies in data

sharing (Kingdom of Tonga, 2024). This thesis includes a case study assessment of the Mainstreaming of Rural Development Innovation (MORDI) Tonga Trust 2020 water security project in ’Eua, which, beyond its contribution to the core aims of this research, contributes to the understanding of the potential impact of these projects (Figure 1.2).

Figure 1.2

Map of ’Eua, Showing the 15 Communities Marked in Red

Source: MORDI TT, ’Eua Project Completion Report.

Figure 1.3

’Eua’s “Waterfall,” a Surface Water Supply Running into the Petani Water Plant

Source: Author (2025).

Water Governance. It is important for Tongan water governance to be understood within Tonga’s broader government structure. As noted above, Tonga’s government structure was adjusted in 2009 to support more democratic leadership, resulting in the constitutional monarchy and parliamentary democracy seen today. This led to the establishment of 17 seats for the people’s representatives. Each village community was then identified under a nominated district to be represented by one of the 17 seats for the people’s representatives. Working alongside the nine nobles, these people’s representatives are tasked with understanding and

advocating for the interests of several communities that come under their stewardship. However, most community development work continues to follow traditional district boundaries, so does not always align with these electoral classifications (Kingdom of Tonga, 2020).

Community water resources in Tonga are predominantly managed at the village level by village water committees (VWCs), groups of community volunteers elected democratically and chaired by the community's elected town officer (Kingdom of Tonga, 2016). Responsible for the organisation and maintenance of community water resources, their duties vary between villages depending on the role of the Tonga Water Board (TWB) or other external water provider in the management of their supply. For those communities that maintain their own supply, be that a community rainwater catchment or bore, duties typically include maintenance of infrastructure such as tanks and pumps, and the collection of monthly water payments from community members to fund this ongoing maintenance. For those communities whose supply is externally managed by the TWB, typical duties are restricted to the collection of monthly water payments from households. Beyond routine management, VWCs have a key role in disaster response and preparedness, coordinating community efforts for the protection and remediation of supplies.

VWCs are recognised by the GoT as a critical component of the water system, passing information about the state of water assets up through their village leadership to be identified at the government level (Figure 1.4). Alongside typical duties, they act as a key community link for government and nongovernment organisations (NGOs), through which household water resources can be dispatched and related training facilitated.

Figure 1.4

Village Water Committee (an 'Eua Development Committee Meeting) Whereby Chairs of Each Community Development Group Report Development Project Updates to the District Officer

Source: MORDI TT image.

1.3.3 Mainstreaming of Rural Development Innovation Tonga Trust

Field research was conducted as part of this research in order to

a. Field-test the applicability of the assessment tool (see Section 1.1)

b. Field-test and refine the findings of the narrative review

To avoid this research being extractive, it was considered essential that findings directly support the communities and organisations that contribute data. In light of this, the field research occurred in partnership with MORDI Tonga Trust. The aims and methodology were negotiated to fulfil both the research requirements of the broader inquiry detailed in this thesis, and the research needs of MORDI, therefore directly contributing to work which benefits the communities and organisations that enabled the research. To support accessibility, this field research was reported directly to MORDI as a research report (Figure 1.5) and policy brief (Appendix A).

Figure 1.5

Research Report Provided to MORDI

MORDI is a community-based NGO, based in Nuku'alofa, Tonga, with outreach across Tonga's Islands. MORDI was founded in 2004, the core programme beginning following initial funding from the International Fund for Agricultural Development (IFAD) in 2007. MORDI's mission statement is: "to collaborate with communities and facilitate partnership with stakeholders to enable sustainable living." MORDI's programmes aim to be responsive to recipient communities, focusing on a range of areas including sustainable development, governance, rural development, humanitarian aid, and social enterprise (Figure 1.6).

Currently, MORDI works with 122 of Tonga's 152 villages, across all four island groups. MORDI's development model prioritises community ownership of development projects by

supporting communities to self-identify development priorities and develop related projects. Working across the development sector, MORDI supports predominantly rural communities to progress in whatever area the community determines to be a priority. Given the importance of WASH for development, this has led to MORDI facilitating a number of water projects.

MORDI's funding is derived from both international and national sources, in line with development interests. IFAD remains a prominent partner, supporting both Phases 1 and 2 of MORDI's major project: Tonga Rural Innovation Project (TRIP), alongside the GoT. Other key funders include the New Zealand Aid programme, the Australian Humanitarian Partnership to support vulnerable populations, and the Australian Government.

A further benefit of partnering with MORDI was access to Tonga's community development plans (CDPs). These CDPs have been used as a key source of data in this research. Due to the robust systems used to develop them, CDPs provide a representative summary of community priorities and experiences. Drawing on these plans therefore enabled valuable insights into community-based development in Tonga.

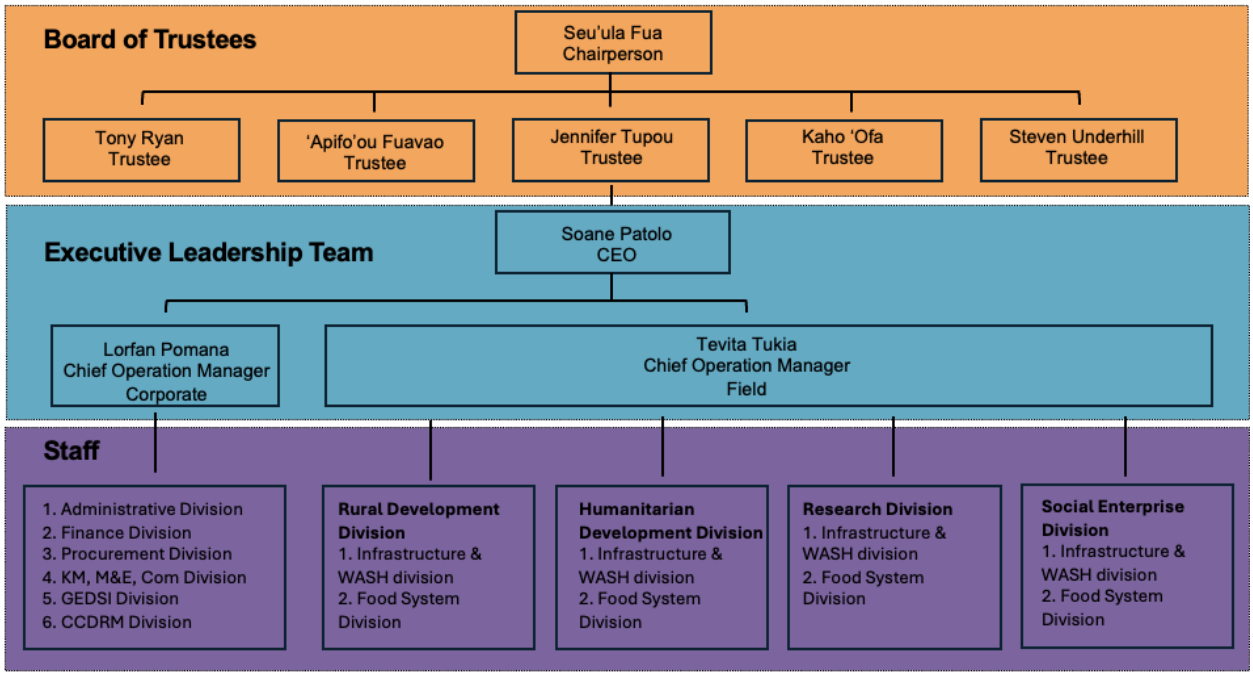

Figure 1.6

MORDI TT Organisational Chart at the Time of This Study

Source: MORDI TT image.

Community Development Plans. CDPs were first developed by MORDI through an IFAD-funded project in 2007 and have since become a central component guiding prioritisation and implementation of development initiatives in Tonga. These plans provide detailed information about community development priorities across a range of areas. Developed through participatory processes with the village community members, these plans are representative, and inclusive of broad community opinion.

In this process, the village is first divided into three groups: men, women, and youth (14+). These groups take part in discussions supported by MORDI facilitators to identify priority areas for community development and the related opportunities and barriers. Breaking communities into these groups is designed to ensure the inclusion of marginalised voices. To further support representation, MORDI requires that at least 80% of each demographic group be present before this process can be conducted. After these priorities have been recorded, the entire community is brought together to understand how these priorities compare, and to ultimately determine which priorities take precedence for the community, producing the CDP (example shown in Table 1.1 and Figure 1.7).

The intention of these CDPs is to provide a development map for each village, to support harmonisation of projects and training from government, NGOs, donor agencies, and the private sector. Within these plans, communities have identified priorities spanning all development sectors including WASH, industry, agriculture, health and wellbeing, education, and infrastructure. As a community resource, these CDPs are held by the town officer (village representative) of each village, and made available to development organisations and government departments on request. Increasingly CDPs are being prioritised as key development documents, the GoT requiring these be provided alongside applications for community funding grants. CDPs are further aggregated at the district and island level, through similar negotiations between town officers and district officers respectively.

The creation and maintenance of CDPs is a significant undertaking for MORDI. Once created, they are updated using the same process every 4–5 years, with the most recent update completed in 2025. Across Tonga there are 152 communities; currently, CDPs are limited to MORDI's 122 target communities; however, given the growing acknowledgement of their utility, it seems likely that future projects will be funded to support CDP development for the remaining 30 communities.

Table 1.1

Excerpt From Mata'aho Community ('Eua District) 2025 CDP

Table Continued

Community Development Plan 2025 - 2028							
Lisi 'o e Palopalema (List of **Problems Prioritised**)	**Ngaahi me'a 'oku ne fakatupunga** (Causes)	**Ngaahi Uesia** (Impacts)	**Ngaahi Solova'anga** (Possible **Solutions**)	**Ngaahi me'a 'e hoko** (Possible Output)	**Ngaahi Ola** (Possible **Outcome**)	**Fakafe'atungia** (Threat)	**Kaunga Ngāue** (Partners)
2. 'Uli vai pamu / Si'i tanaki'anga vai inu (Contaminated tap water & few amount of drinking water tanks)	**Lahi tā 'akau 'i he funga fonua** (Deforestation trees close to the water stream) **Lahi fana vao / Kemikale** (Utilization of fertilizer and agri-chemicles) **Si'i ivi fakapa'anga** (Lack of funds) **Feliuliuaki 'a e 'ea** (Climate Change) **Mamafa 'a e mahu'inga fakapa'anga 'o e tangike vai inu** (Expensive plastic water tank) **Lahi 'uha** (Heavy rainfall)	**'Ikai malu e vai pea malava ke honge vai e kolo** (High risk of water shortages) **Fieinua fanga monumanu** (Water shortage for livestocks) **'Ikai lava fu'ifu'i e ngoue vesitapolo** (Insufficient water for irrigation of vegetable crops) **Uesia ngoue** (Agricultural production affected) **Uesia e mo'ui he 'uli e vai** (Health issue due dirty water supply) **Uesia e ngaahi fiema'u fakaevai 'a e famili faka'aho** (Insufficient water for houshold daily needs) **Lahi e fakamole ki he fakatau vai mei falekoloa** (Increase spending on buying water from the store)	**Tō fetongi e 'akau he funga fonua** (Planting trees along the water stream) **Fakamamafa'i lao e fanavao / kemikale** (Regulation for use of agri- chemicles) **Feinga pa'anga** (Community fund raised) **Kole tokoni tangikē vai** (Seek assistance for provision of drinking water tank) **Kole tokoni ki he kainga'i muli** (Requesting support from families abroad) **Ta'ofi tā 'akau ofi ki he matavai he funga fonua** (Prevent deforestation near the water stream) **Kole tokoni ha kau taukei kenau fakahoko ha savea ki he tu'unga 'o e vai** (Request technical support for conducting feasibility study on water supply)	**Si'i 'auhia kelekele ki he vaitafe** (Less soil eroded to the water stream) **Si'isi'i 'a e maumau 'a e fanga monumanu** (Lack livestock damage) **Ma'u e pa'anga** (Sourced funding) **Ma'u e tangikē** (Received drinking water tank) **Ma'a e vaitafe** (Clean water flow from the stream) **Tolonga e matavai** (Maintain quality of water mainstream) **Lava hono tō fetongi e 'akau na'e tā** (Re-planting of trees that where removed) **Ngaue lelei e lao** (Operated regulations link to problem) **Fakahoko e savea ki he tu'unga 'iai e vai** (Survey on the community water system was conducted)	**Mahu e vai inu ma'ae famili** (Plenty of drinking water for the families **Ma'a matavai pea ma'a ai pe mo e vai tufa ki he kakai** (Water in the stream is clean and will **Mo'ui lelei e kakai / monumanu / veitapolo 'o e kolo** (Healthy people/ livestocks and vegetable crops of the community) **Si'i e longoa'a e kolo he palopalema e vai** (Less argument on the problem with water supply) **Lele lelei e ngaahi ngāue langa fakalakalaka ki he kolo** (Improved community development work)	**Tō ha mahaki faka'auha** (Disease Epidemic) **Fakatamaki Fakaenatula** (Natural Disasters) **Putu** (Funerals)	**Komiti Vai** (Community water subcommittee) **MORDI** (Maintstreaming Rural Development Innovation Tonga Trust) **'Ofisa kolo** (Town Officer) **Poate Vai** (Tonga Water Board) **Potungāue 'Atakai** (Tonga Meteorological Services) **Pule Fakavahe** (District Officer) **NZ AID** **AUS AID** **US AID** **MAFF** (Ministry of Agriculture Food and Forestry) **MOI** (Minsitry of Infrastructure) **Fakafofonga Falealea** (Parliament Represetative) **Kakai e kolo** (Communities)

Source: Prime Minister's Office Local Government & Community Development Division (2025, p.15).

GDP - CDP 1 - Merging of GCP Priority Problems to determine CDP Priorities

Fakahokohoko 'o e Palopalema Fakakulupu (Gender Specific Groups (GDP) Priority Problems)		
Kakai Fefine (Women Group)	**To'utupu** (Youth Group)	**Kakai Tangata** (Men Group)
1. 'Ikai ha maketi pau 'a e kolo (Unstable marketing of agricultural products)	**1. Kovi hala / si'i maama hala** (Kolo & 'Uta) (Poor community and agricultural road and insufficient street lights)	**1. Kovi tu'unga 'oku 'i ai 'a e ako** (Decline in children academic performance)
2. Lahi maumau fanga monumanu fakataka (Increase damaged from roaming livestock)	**2. 'Uli vai kolo** (Pamu) (Poor community water supply)	**2. Si'i peito moe toileti palangi** (Lack of of modern kitchen/ toilet)
3. 'Uli vai pamu / Si'i tanaki'anga vai inu (Contaminated tap water & few amount of drinking water tanks)	**3. Maumau'i ngoue he lahi fakataka monumanu** (Agriculture farming damaged by roaming livestocks)	**3. Si'i maama hala ki 'uta mo loto kolo** (Unavailability of street light in town and community roads)
4. 'Ikai ha falengāue ma'ae kakai fefine (No facility for women handicraft activities)	**4. Si'i naunau toutai** (Lack of fishing materials)	**4. Si'i me'angāue fakangoue** (Inefficient of farming tools)
		5. 'Uli vai pamu / Si'i tanaki'anga vai inu (Contaminated tap water and lack of drinking water tanks)
		6. 'Ikai ha maketi pau 'a e kolo (Unstable marketing of agricultural products)
		7. 'Ikai ha naunau fe'unga ki he fale hūfanga (Poor multi- purpose community hall structure)
		8. Kovi naunau toutai (Deficiency of fishing tools)

GDP - CDP 1 - Summary of set CDP Priorities

Pro. No	Fakahokohoko Palopalema Fakakolo (Gender-specific groups CDP Priority Problems)	Ranking Order as Per Gender-Specific Group, with Total Score			Score	Ranking
		Women	Youth	Men		
1	**Maumau'i ngoue he lahi fakataka monumanu** (Agriculture farming damaged by roaming livestocks) / Si'i me'angāue fakangoue (Inefficient of farming tools)	2	3	4	9	1st
2	**'Uli vai pamu / Si'i tanaki'anga vai inu** (Contaminated tap water & few amount of drinking water tanks)	3	2	5	10	2nd
3	**'Ikai ha maketi pau 'a e kolo** (Unstable marketing of agricultural products)	1		6	7	3rd
4	**'Ikai ha falengāue ma'ae kakai fefine** (No facility for women handicraft activities) / 'Ikai ha naunau fe'unga ki he fale hūfanga (Poor multi- purpose community hall structure)	4		7	11	4th
5	**Kovi hala / si'i maama hala** (Kolo & 'Uta) (Poor community and agricultural road and insufficient street lights)		1	3	4	5th
6	**Si'i naunau toutai** (Lack of fishing materials)		4	8	12	6th
7	**Kovi tu'unga 'oku 'i ai 'a e ako** (Decline in children academic performance)			1	1	7th
8	**Si'i peito moe toileti palangi** (Lack of of modern kitchen/ toilet)			2	2	8th

Figure 1.7

Excerpt From Mata'aho Community ('Eua District), Summary of 2025 CDP Priorities

Source: Prime Minister's Office Local Government & Community Development Division. (2025, pg.13).

1.4 Aim and Objectives

Responding to the lack of evidence to support improved outcomes for WASH development interventions in Tonga, this thesis hypothesises that the way an intervention conceptualises

community, and intends to work with that community, may be a critical element impacting intervention success. Therefore this research explores the concept of intervention entry points to community, aiming to develop actionable knowledge and tools to support effective community engagement in community-based WASH projects in Tonga.

The aim and subsidiary objectives of this research are provided below.

Aim:

To improve the evidence base guiding the development of effective and sustainable community-based WASH development in Tonga.

Objectives:

1. To analyse the use of intervention entry points in Tongan WASH development projects.

   This involves exploration of two central research questions:

   a) How have intervention entry points been used in Tongan community-based WASH development projects?

   b) What are the strengths, weaknesses, opportunities, and threats to the use of different entry points for Tongan WASH development projects?

2. To develop tools to support appropriate selection and use of entry points in Tongan WASH interventions.

   a) Critically appraise a framework for evaluating community-based Pacific WASH development projects.

      i. Identify an appropriate evaluation framework.

      ii. Field test the framework.

   b) Develop a pragmatic tool that can be used by implementers to guide critical use of entry points in Tongan WASH development interventions.

      i. Evaluate existing literature.

      ii. Conduct review of MORDI's 2020 'Eua water resilience project.

      iii. Compare the approaches taken by organisations to support water resilience on 'Eua.

1.5 Structure

This thesis consists of seven chapters and contains two key studies. This chapter (Chapter 1) has set out an overview of the research including its significance and rationale, the research context—including the Kingdom of Tonga's geographical, social and political situation, Tonga's WASH environment and MORDI's role in that environment—and finally, the aims and objectives for this research.

Chapter 2 lays out the methods and methodologies used in this research. This chapter begins with an explanation of the inception of this research, before exploring researcher positionality. The subsequent sections explain the research methodologies driving the conduct of the narrative review and case study. The chapter concludes with a discussion of ethical considerations and the role of MORDI as a partner organisation.

Chapter 3 focuses on the narrative review, the first study for this thesis. The chapter begins by aligning the study with the overall aims and objectives of the research and then presents an explanation of research methods used to undertake the review. A short background section then introduces intervention entry points conceptually, linked to the discussion of community-based development introduced in Chapter 1. The bulk of this chapter is then spent examining the application of various intervention entry points in past projects as documented in the primary and grey literature, utilising an adapted version of the McNamara et al. (2020) framework for assessing Pacific climate adaptation projects. This critical examination is then used to develop a semiquantitative performance assessment for each intervention entry point, and to identify key opportunities for their future use. This chapter concludes by identifying research limitations and linking the findings from this narrative review to the overall thesis.

Chapter 4 focuses on the 'Eua case study, the second study for this thesis. Again, the chapter begins by aligning the study with the overall aims and objectives of the research, before explaining the research methods used to undertake the study. The next section then sets the scene, providing an overview of 'Eua, and the island's water context. This chapter provides analysis of both MORDI's 2020 'Eua project to support water resilience, and the approaches taken by three other organisations working on 'Eua to support water development. These analyses are then summarised to demonstrate the strengths and weaknesses of each approach. This chapter concludes by identifying research limitations and linking the findings from this case study to the overall thesis.

Chapter 5 diverges from the focus on building evidence to inform the planning tool, to address the assessment framework used throughout this research. This chapter aims to critically appraise this framework's performance as a tool for assessing Pacific WASH projects. Again the chapter begins by aligning the assessment with the overall aims and objectives of the research and detailing the research methods. The chapter goes on to provide the critique for this framework, concluding by identifying research limitations and linking the findings to the overall thesis.

Chapter 6 amalgamates the findings from Chapters 3 and 4 to develop the IEPT-SWOT, supported by the adapted five-factor framework. This tool is designed to be used by practitioners to guide the use of intervention entry points for Tongan WASH development.

Finally, Chapter 7 provides an overall conclusion, revisiting the thesis aims and objectives, and making recommendations for further research.

Chapter 2: Methodology

2.1 Research Inception

In my role with the New Zealand Defence Force (NZDF) as an environmental health technician, WASH is at the forefront of my work. In my time in this role I have been exposed to the realities of the WASH environment throughout a range of Pacific Island countries and territories (PICTs) and seen that, for many, these WASH environments continue to be a key public health challenge. Having studied community development during my undergraduate study in population health, I became interested in better understanding how WASH development is occurring in the Pacific.

In early 2024, I was deployed to Lifuka, an island on Tonga's Ha'apai island group, to support a contingent of New Zealand, Tongan, and Australian military engineers conducting building tasks to strengthen the disaster resilience of Lifuka's key community structures. During this time I was fortunate to visit a number of the Ha'apai schools and community facilities (Figures 2.1, 2.2, 2.3). What became apparent to me was the large number of damaged and discarded water tanks and water equipment, stamped with the names of various aid organisations and foreign governments. After speaking with the local public health team it became clear that, as these evidenced, most aid projects on the island saw short-lived success and ultimately failed to address the persisting health issues challenging the population. These conversations reflected what I had read in the literature, the health team highlighting a lack of engagement and consultation from aid agencies as a key issue.

This ultimately led me to question how we, as external agencies, can do better. Through this research I hoped to further explore intervention entry points for community WASH interventions, an aspect of development that is not widely acknowledged or researched.

Figure 2.1

Chlorinating Tanks at a Ha'apai Primary School (Supporting the Local Public Health Team to Utilise Donated Testing Supplies)

Source: Author (2024).

Figure 2.2

Discarded Water Storage Units Provided as Part of a Past Disaster Relief Project

Source: Author (2024).

Figure 2.3

The Health Team Deployed to Lifuka 2024

Source: Author (2024).

2.2 Researcher Positionality

Research is unavoidably shaped by the context in which it occurs. Particularly in qualitative research, this context is rarely fixed but rather influenced by dynamic relationships between the research topic, participants, and the researcher (Braund et al., 2024; Langridge & Crawford, 2022). Therefore, who a researcher is, both individually, and in relation to the participants and research topic, must be critically considered through "reflexivity" throughout the research process, from planning to reporting results. Critique of power dynamics should be central to these considerations, particularly when research is occurring across cultures or there are power imbalances between researchers and participants (Langridge & Crawford, 2022).

2.2.1 Reflexivity

Described as an active process, reflexivity in research is the process of critical self-reflection to identify personal factors and to examine how these may influence the research process and findings (Braund et al., 2024). These personal factors, including culture, age, gender, experience, values, social position, and biases (conscious and unconscious), make up a positionality, describing one's place in the world and the lens they bring to the research space. Equally important is the way this positionality may be interpreted by others and therefore influence interactions.

The context of this research made this process particularly important. Researching in Tonga as a Pākehā/Pālangi (person of European descent) and therefore an outsider, this process of reflexivity was essential to inform ethical ways of working that protect the cultural safety and wellbeing of research participants and colleagues. Further, reflexivity was essential to ensure findings were interpreted fairly, and analysis provided an accurate representation of the research topic (Langridge & Crawford, 2022).

2.2.2 My Positionality

During the research process, four key aspects of my positionality appeared to have the most significant impact on my experience, and on the way I was perceived: my personal values and approach, culture (as an outsider), demographics (age, gender, and marital status), and my employment status as a student and a soldier. However, it is important to note that positionality is intersectional, these aspects of myself were not appraised in isolation, but rather influenced each other, together impacting my experience as a researcher in this context, the power dynamics present, and therefore, the ways I was able to work (Abrams et al., 2020).

Personal Values and Approach to Research. while less clearly defined than other aspects of my positionality, my values have a significant impact on the way I relate to others and therefore on my relationships with participants and colleagues throughout the research process. I like to talk and to learn about people and cultures. I found this open nature was reflected by Tongan people and naturally led to positive interactions.

To conduct the field research presented in this thesis I stayed in Tonga for a 3-month period. When implementers learned how long I would be in country, many became more open to participating in the research and speaking openly with me. This was mirrored in the enthusiasm shown when implementers and other participants learned that I had previously visited and worked on Ha'apai. I found that this commitment opened a number of doors for me, both practically, enabling me to work around the very busy schedules of those working in Tonga's development sector; and socially, allowing time for me to gain some validity in the eyes of participants.

My approach to this field work was informed by what I had read about research and development fatigue, where in response to long periods of engagement with researchers and project teams (and long periods of high-output expectations by those groups), communities and sectors become unmotivated to engage in research or development projects (Ashley, 2021). Such lack of motivation is often a result of well-intentioned project teams who, in their efforts to

describe issues and develop solutions, prioritise efficiency, researching in “extractive” ways that do not directly serve the host communities (Ashley, 2021).

With this in mind, it was critical to me that this field work was more than an academic exercise. While I intended to incorporate the field findings into this larger research output, it was essential that the findings could also be used to directly benefit the organisations and community members who took part in its development. This led to the research partnership with MORDI Tonga Trust, further described in Section 2.5.

Culture. I am a Pākehā woman, born and raised in Tāmaki Makaurau, Aotearoa (Auckland, New Zealand). I have had exposure to Pacific cultures (including Tongan) both socially and formally during my studies in population health. However, I am a cultural outsider in Tonga, I do not speak the language and have limited knowledge of cultural protocol. Having been raised in the Catholic Church I had some context to understand some cultural practices and ways of speaking; however, my insight was limited.

Cultural safety in research describes processes to acknowledge and respect the culture and norms of all involved, to enhance dignity and mana in cross-cultural interactions. It goes beyond cultural awareness, requiring reflection on power imbalances and one’s perspectives and biases and how these influence the experience of all involved (Durie, 2001; Lekas et al., 2020). Recognising potential risks to cultural safety as a Pālangi person in this research space, my partnership with MORDI Tonga Trust, a Tongan NGO, was a significant protective factor. This strategic partnership ensured Tongan protocols were respected throughout the research process, and that conclusions drawn were grounded in the Tongan context. During engagements with participants (from organisations and from the community) I was supported by my relationship with MORDI, our partnership enabling me to lean on their knowledge and credibility.

Beyond supporting cultural safety, my partnership with MORDI gave me access to far more data and information than I could have hoped for as an independent researcher. MORDI is a well-respected organisation in Tonga’s development sector. Its backing enabled me to have conversations and be included in larger discussions with community members and local organisations that were essential to my understanding of the Tongan WASH development environment.

Given that Tongan culture was not entirely foreign to me, it was important to continually challenge my assumptions, to avoid the illusion of cultural competency. Cultural competency is

the mistaken belief that if a cultural outsider simply learns about a culture they will become culturally safe. Such thinking typically relies on stereotyping and homogenisation, which overlooks nuances to create a narrow definition of a culture. Working in this way can lead to naive use of techniques and approaches which ultimately harm relationships between the researcher and participants, and lead to ineffective research (Lekas et al., 2020). This process of challenging assumptions became increasingly important as I progressed in my awareness of Tongan norms and the research space. This is a further area where my partnership with MORDI was invaluable, as MORDI's staff were available to check these assumptions, to support culturally safe research practice, and to provide ground truth to guide my analysis of findings.

Other Demographics—Age, Gender, and Marital Status. I was 25 at the time I conducted this research, and unmarried, which classed me as a youth in Tongan society. However, my position as an outsider enabled me to have candid conversations with senior people in the Tongan government and water development sector, unrestricted by cultural expectations linked to my age or gender that may have been held for a Tongan woman in the same situation.

Employment—Student/Soldier. I am a postgraduate student and employed as a soldier in the New Zealand Defence Force. Both of these roles impacted my status in Tonga and impacted the way I was perceived and interacted with. It became clear that my military status was taken as a mark of my trustworthiness and competence, bridging any gaps that may have been created by my age. Similarly, I found that I benefitted from the significant respect and support Tongan people have for higher education. Comments from participants suggested that this influenced their willingness to participate in the research. At the end of interviews many participants took the time to ask about my studies and offer words of encouragement.

2.3 Research Philosophy

Philosophical approaches to research are the various ways in which researchers understand the nature of reality (ontology) and knowledge (epistemology). These approaches provide a theoretical foundation for conducting research and guide researchers as they analyse their findings (MacIntosh & O'Gorman, 2015). The three most common philosophical paradigms are positivism, interpretivism, and pragmatism.

Positivism holds the ontological view that there is one true reality that can be understood and analysed. As such, a positivist epistemological view holds that acceptable knowledge is

deductive, following an objective scientific method, where a researcher's identity is not important (Al-Ababneh, 2020; Business Research Methodology, 2023).

Interpretivism holds the opposing view, denying the existence of one reality and instead recognising reality as a construct, continually interpreted by those experiencing it, and therefore highly contextual (Al-Ababneh, 2020). An interpretivist understanding holds that knowledge is entirely subjective and context specific, so acceptable forms of knowledge include individual narratives and perceptions of events as interpreted by a researcher (Al-Ababneh, 2020).

Finally, pragmatism sits somewhere between a positivist and an interpretivist paradigm, focused primarily on what enables effective problem solving (MacIntosh & O'Gorman, 2015). Similarities can be drawn between this epistemology and that of an interpretivist paradigm, both acknowledging the fluidity and context-specific nature of reality, and rejecting the positivist rigidity (Al-Ababneh, 2020). A pragmatist's epistemology is drawn from a focus on action; what qualifies as acceptable knowledge is therefore not rigid as it is for both positivists and interpretivists, but rather changes depending on which theories and knowledge will enable successful action (Al-Ababneh, 2020). Pragmatist research utilises both subjective and objective approaches, depending again on which will provide the most useful data to address the issue at hand (Business Research Methodology, 2023). This research utilised a pragmatic research philosophy, the practical orientation well suited to contribute practical solutions to inform future practice (Ansell & Boin, 2019; Muhaise et al., 2020).

Beginning with the theory that intervention entry points are an overlooked aspect of benefit persistence in development interventions, the research took an investigative approach, utilising mixed-methods research to develop a practical tool to guide future practice. Reflective of a pragmatic research philosophy, the research approach used both inductive and deductive analysis at different stages of the research to drive the development of actionable findings.

2.4 Research Design and Methods

2.4.1 Overall Approach

In line with pragmatist philosophy, this research used a mixed-methods approach, determined by what was practical and effective, rather than alignment with a specific research approach (Cornish & Gillespie, 2009; Kaushik & Walsh, 2019). The research was broken into two distinct studies: a narrative review and a case study. Both studies utilise a common evaluation

framework adapted from McNamara et al. (2020) (explored in Chapter 5) to enable comparative analysis of approaches to community-based Tongan WASH development projects.

Narrative Review. The narrative review was the first study in this research, used to identify intervention entry points, and inform a preliminary model to guide critical use of entry points in Tongan WASH development interventions. This review took an inductive narrative approach, enabling broad exploration of intervention entry points before assessing projects deductively against the evaluation framework adapted from McNamara et al. (2020). The specific methods used are outlined in Section 3.2.

Case Study. The case study directly responds to the findings of the narrative review, aiming to further contextualise the findings in a real-life setting, and to specifically further investigate projects with place-based communities. Utilising the same project assessment framework adapted from McNamara et al. (2020), this case study also provided the opportunity to field test this framework, contributing to the critical appraisal explored in Chapter 5. Ultimately this field research contributed to the development of a pragmatic model (the intervention entry point planning tool, Section 6.3) that can be used by implementers to guide critical use of intervention entry points in Tongan WASH development interventions. The specific methods used are outlined in Section 4.3.

2.4.2 Assessment Framework

This research utilises the assessment framework developed by McNamara et al. (2020), adapted for use in this context (Table 2.1). Used across both the literature review and field research phases of this research, this framework enables findings across these phases to be directly compared, to support the development of coherent overall findings. The application of this assessment in this research is explored and formally critiqued in Chapter 5, where the refinement and validation of this framework is specifically addressed as a research objective.

Table 2.1

Definition of Components of Adaptation Success as Developed by McNamara et al. (2020), With Reasons for Inclusion in Their Study

Component of adaptation success	Definition	Reasons for inclusion in study
Appropriateness similar to "legitimacy" and "relevance"	Overall relevance of the project and associated suitability of the initiatives in terms of community context, their priorities and their cultural and social ethos	Critical for community-based adaptation (CBA) evaluation due to the nature of the approach, which integrates local context, knowledge, capabilities, and priorities. Successful CBA is supported when it is relevant to existing social forms, effects change from within cultures and occurs as part of a culture.
Effectiveness	Extent to which the initiatives have achieved intended objectives; includes the products, capital goods and services that resulted directly from the intervention	Effectiveness was identified as a core aspect of most monitoring and evaluation studies/rubrics for deriving adaptation success This criterion for success is complemented by other evaluation components as relying solely on effectiveness is insufficient.
Equity	Inclusion and benefit of initiatives for everyone within the community, specifically any marginalised groups	Critical as there are existing concerns and censures that community-based approaches rely on an assumed image of community that doesn't consider separations within the community' Need to acknowledge differences in power, access, and control of resources to avoid excluding the most vulnerable and further entrenching existing underlying social structures and power relations—inequitable outcomes are counterproductive to successful adaptation.
Impact	The wider direct or indirect, intended or unintended, long-term effects of the initiative, whether positive or negative	Understanding the impact of projects beyond intervention-specific objectives is important as CBA has become increasingly recognised as a "pro-poor" and "no-regrets" approach that has synergies with general development (beyond climate-change objectives). Any adaptation has the potential to create unintended impacts (positive and negative) across temporal and spatial scales, and these should be accounted for.
Sustainability	Extent to which the initiatives have been maintained post-project life cycle and the extent to which processes have continued once the initial inputs have ceased	An important consideration in the Pacific context as CBA project cycles are short (average time frame of 3 years) and long-term funding is a challenge to secure; with these issues, it is important to understand whether adaptation is occurring beyond project life cycles (for example, when funding and external support cease)

Adapted from McNamara et al. (2020).

2.4.3 Partnership With MORDI

As established in Section 1.3.3, the focus, aims and objectives of the case study research were designed to both contribute useful data and analysis for this research project and to contribute valuable insights to support MORDI's operations. Reflective of the pragmatic ontological perspective this research is founded on, this process maximised the benefit of research findings, directly supporting the organisations and communities that contributed to them.

This led to the selection of MORDI's 'Eua water resilience project of 2020 (and subsequent developments) for the case study. The 'Eua Project met the research needs as it was a community-based WASH project with sufficient available baseline data and there were feasible options for further data collection to be undertaken. Similarly, the 'Eua project was identified by MORDI as a priority project for assessment. This was a large-scale project delivery for MORDI, likely to be duplicated in some capacity in the future, so MORDI's director, Mr Patolo, was interested in identifying opportunities for improvement.

2.5 Ethical Considerations

Prior to commencing the field research, the project was self-assessed by the research team as low risk using the Massey University Human Ethics Committee (MUHEC) checklist, and evaluated by peer review. The MUHEC was notified about the project (Massey University Ethics Notification Number 4000030317) (Appendix B). The chief concerns related to interviews: sensitive topics may arise; as a cultural outsider, the researcher may threaten cultural safety; and the involvement of MORDI TT staff as translators and community liaisons may lead to respondents feeling uncomfortable reporting on the MORDI TT project.

During the research design phase, ethical concerns were front of mind, particularly given that this research would be occurring in a physical and cultural space foreign to the research team. As such, reflexivity was a critical step in this process, with consideration given to the cultural lens that the primary investigator would bring to this project. Discussions were held across 2024–early 2025 with practitioners and researchers working in the Tongan and wider Pacific development context to support the development of the research plan to ensure it was appropriate and culturally safe.

MORDI's partnership in this research was a central protective factor. The MORDI team provided cultural guidance, community access, and live translation to enable interviews to be conducted in Tongan and common understandings to be checked. MORDI's team helped to ensure that

engagement was respectful and safe, and that findings would be relevant and beneficial for the host community.

Funding support for this research was received from MFAT and the New Zealand Army via the DevNet Postgraduate Research Award, and the Kippenberger Scholarship respectively. Neither funding sources influenced the scope or nature of this research.

Chapter 3: Narrative Literature Review (Study 1)

3.1 Introduction and Background

3.1.1 Overview

This chapter contains a narrative review of the literature relating to the use of intervention entry points for WASH development projects in Tonga. It leads to a semiquantitative comparison of intervention entry points shown in Table 3.1 and discussed in Section 3.6. This chapter presents the methods, findings and discussion sections of this review. The chapter concludes by identifying key opportunities for use of each intervention entry point, limitations of the review, and the link between this review and the overall thesis.

Reflective of the pragmatic ontological perspective driving this research, a narrative review was chosen for its pragmatic focus. Unlike a systematic review, where the search strategy and analysis aim to be fully comprehensive and objective, narrative reviews enable the broader, more flexible approach required to capture and analyse the diverse information types relevant to this research topic (Sukhera, 2022).

An overview of the importance of, and challenges with defining, community engagement and intervention entry points is provided below. (Further detail to the project background is provided in Chapter 1, with aims and objectives presented in Section 1.4.)

3.1.2 The Importance of Community Engagement

As established in Section 1.2, community engagement with development programmes is prioritised across the development sector, including within Tonga's WASH development. However, despite this focus on work occurring at the community scale, there is little guidance as to how this should occur, nor interrogation of the conceptualisation of community.

One review that begins to address this gap is a 2021 literature review conducted by Nelson et al. investigating the drivers of the low success rates seen in community WASH interventions. This review highlighted the impact of key mechanisms and contextual factors such as community location, resources, dynamics, and committee activity; and the nature of community participation, on the success of interventions. The authors encouraged further consideration of these elements by policymakers, implementers and institutions. This review aims to further support such considerations, ultimately developing a semiquantitative intervention entry point comparison.

3.1.3 Challenges Including Defining What Community Engagement Really Means

Unintended consequences of this focus on community intervention were critiqued by Mountfort (2013) who argued that effective community consultation is often limited by preexisting donor priorities and a lack of coordination between donor organisations. Challenges include identifying who the appropriate spokesperson for a community may be and overcoming the norm whereby most development agencies primarily liaise at a national or local government level. Misidentification or omission of appropriate connection points may also increase costs and workload for the recipient government, and lead to intervention decisions that fail to accommodate the breadth of local perspectives and priorities (Mountfort, 2013).

A key problem in this area is that the concept of community lacks nuance. Titz et al. (2018) offered a critique focused on the idea that the inherent ambiguity of the term leads to an oversimplification of the concept, and as a result, a one-dimensional understanding of the target group and the issues they face. Such oversimplification invites the fallacy of homogeneity within communities, ignoring social dynamics, competing interests and differing priorities. In the context of WASH development, such oversimplification leads to inappropriate solutions that fail to respond to the complexity of the issue and the cultural context in which it exists.

In the absence of specific guidance, in practice, development interventions often proceed based on a vague concept of a homogeneous community and a premise of community connection, without further consideration (Grant & Willetts, 2024; Titz et al., 2018). The result is that the nature of each community is (implicitly or explicitly) determined by an external project team, and community engagement is based on this perception. As noted above, these conventional approaches are typified by limited effectiveness and lack of sustainability.

3.1.4 Intervention Entry Points

Recognising this common pitfall, Westoby et al. (2020) proposed a way forward, presenting the concept of intervention entry points. Intervention entry points are the structures, either physical or otherwise, through which a project engages a group of people (Titz et al., 2018). Westoby et al. (2020) posited that if greater consideration were given to defining the target group or community, and determining the most appropriate entry point, engagement would be more appropriate, leading to more responsive interventions and greater progress towards SDGs (in particular SDG 6.b). Determining the best approaches requires an evidence-based appraisal of the modalities of community connection, and which practices tend to yield the most effective and lasting results. This review aims to contribute to this evidence space by identifying more effective and sustainable community-based WASH interventions.

3.2 Purpose and Questions Addressed

The purpose of this chapter is to contribute evidence to address Objective 1: To analyse the use of intervention entry points in Tongan WASH development projects. This analysis will then support the achievement of Objective 2: To develop tools to support appropriate selection and use of entry points in Tongan WASH interventions (Section 1.4). Beginning with an exploration of intervention entry points conceptually, this literature review utilises a narrative approach to identify and then explore four intervention entry points. Assessing each entry point against the components of adaptation success developed by McNamara et al. (2020), ultimately this narrative review leads to the development of a semiquantitative ranking of intervention entry points for community-based WASH development projects (Table 3.1).

3.2.1 Questions Addressed

This review is designed to address two key questions:

1. How have intervention entry points been used in community-based Tongan WASH development projects?; and
2. How have these identified intervention entry points influenced the success of community-based Tongan WASH development projects?

3.3 Methods

The literature review was the first phase of this research. It was used to identify the intervention entry points to be assessed in subsequent research and establish a preliminary model to guide critical use of entry points in Tongan WASH development interventions. This literature review took an inductive narrative approach, enabling broad exploration of intervention entry points before assessing projects deductively against the evaluation framework.

This review phase was approached in two stages:

1. Identify available intervention entry points for community-based public health interventions in Tonga; and
2. Examine the body of evidence to assess the performance of each intervention entry point against the five-factor framework developed by McNamara et al. (2020) for assessing the performance of community-based climate adaptation initiatives in the Pacific.

For the purpose of this research, an intervention is defined as any programme or activity implemented to improve the health of a specific community, be this practical or policy based.

Accounts relating to the existence, progress and outcomes of interventions in the Pacific Islands appear across a wide range of sources, from agency status reports, commentaries, and case studies, to research theses and peer-reviewed literature. For this reason, a broad approach was taken to identify possible source material. The literature search was conducted over two key stages. First, a search of the peer-reviewed literature was conducted. This search aimed to identify any research or commentary that addressed community-based public health work in Tonga. Given the breadth required, the search was conducted across four databases.

Formal searching of the primary literature was conducted between 26–29 April 2024 on Scopus, Google Scholar, Elsevier, and Discover supported by a Massey University subject librarian. These searches looked to identify peer-reviewed articles that addressed community interventions in the PICTs or Tonga both conceptually and through case studies. Search terms used were: “community consultation,” “community engagement,” “community collaboration,” “South Pacific,” “PICT,” “Pacific Island*,” “Tonga,” “Kingdom of Tonga,” “WASH,” “sanitation,” “water, sanitation, and hygiene,” “intervention*,” and “program*.”

The search was initially limited to literature published in English, in the last 5 years (2019–2024) returning 892 papers. This time window was subsequently expanded to 15 years (2009–2024), due to a lack of research in the more recent period. This wider search returned 1,810 papers. These were exported to RefWorks where duplicates were identified and removed, leaving 1,650 papers. Screening of the papers was then conducted; inclusion was determined by potential relevance to this review.

Working within a narrative review format, no explicit inclusion/exclusion criteria were used. Instead, articles were selected where they fell within the bounds of two distinct groups: case studies and contextual publications:

- Case studies: Due to the paucity of articles specifically addressing community-based WASH interventions in Tonga, case-study publications were included where the intervention focused on any area of community-based public health within Tonga. This approach enabled key findings around public health interventions in a Tongan cultural context (many of which also apply to WASH interventions) to be captured.

- Contextual publications: Articles that discussed WASH interventions were included where the focus locality was Tonga or other PICTs. This approach provided the theoretical basis to both highlight and make sense of the case study findings for Tonga, and (critically) to bring these into a WASH context.

Through this formal search and refinement process, 20 articles were identified.

Following this initial search and noting that most aid intervention case studies are prepared as internal documents or funder reports, a second stage of literature searching was undertaken, to capture key documents from the grey literature.

- Grey literature was accessed through NGO websites such as MORDI TT, Secretariat of the Pacific Regional Environment Programme (SPREP), and OECD. Government websites were also accessed, including those of WHO, United Nations and the Tongan Ministry of Health.

Through this second-round searching of the grey literature, a further five case-study articles were identified, bringing the total to 25.

3.4 Results

Within these 25 articles, the following four key intervention entry points were identified, some papers covering more than one entry point:

1. Intervention-initiated communities (15 papers)
2. Faith-based communities (13 papers)
3. Local institution-based communities (9 papers)
4. Place-based communities (9 papers)

As discussed in Chapter 2, following literature searching, inductive thematic analysis was conducted, whereby articles were read to identify themes, and findings were organised under these themes (Naeem et al., 2023). This review identified the presented four intervention entry points as key themes. The findings within these themes were then further analysed against the five components of adaptation success developed by McNamara et al. (2020), which are presented in Chapter 2 (Table 2.1). As discussed, the adaptation of the framework for this research included the development of key questions (presented in Table 5.1), and these were used to guide the identification of key elements to be included in the consideration and

semiquantitative ranking of intervention points presented below, intended to promote critical use of intervention entry points by implementers.

A narrative assessment of the intervention-based entry point, organised by each of the five framework components, is provided below. A qualitative assessment score (low, moderate, high) is provided after each factor is considered.

3.4.1 Intervention-Initiated Communities (Entry Point 1)

For the purpose of this review “intervention-initiated communities” are defined as any groupings used by an intervention or project that are not organic in the population but rather initiated for the purpose of a development project. For example, “Tongan youth.” For the purpose of this review, these exclude inorganic “place-based communities.”

Appropriateness. Titz et al. (2018) posited that the fundamental element of community is not the perceivable grouping; rather, it is an individual’s self-acknowledged belonging to that group.

Intervention-initiated communities are often based on shared population demographics, and do not engender the necessary sense of belonging to emulate a true community (Schulenkorf et al., 2022; Titz et al., 2018). In contrast with organic outgrowths of societal structures, a community structured around the intervention is an artificial (or “inorganic”) construct. Mountfort (2013) critiqued the use of intervention-initiated communities, suggesting that the political emphasis on development work occurring at a community level leads some intervention teams to focus their projects at this level without making the required adjustments to meaningfully engage or respond to these communities. As a result, interventions designed for these inorganic communities are less likely to be appropriate.

It is acknowledged in the literature that successful interventions directly respond to the self-identified needs and aspirations of recipient communities and do so in the context of their local reality (Chung-Do et al., 2016; McNamara et al., 2020; Titz et al., 2018). Rhodes-Dicker et al. (2022) conducted a project to provide sanitation education to remote islands where the local norms and realities supported open defecation. This education was ineffective as it did not respond to these local realities nor did it contextualise sanitation within existing local beliefs, demonstrating the risk of failure to fully understand target communities (Rhodes-Dicker et al., 2022).

Where interventions operate with oversimplified or homogenised understandings of communities, there is risk of misunderstanding needs and aspirations, and failing to see the diversity within the community, leading to the development of inappropriate solutions that lack alignment with local realities and community desires (Fotu et al., 2011; Rhodes-Dicker et al., 2022). This was seen in a project by Fotu et al. (2011) that aimed to support active transport to school and healthy breakfasts for Tongan youth. The project was unsuccessful, implementers noting their failure to consider the significant distances travelled by school children and the early mornings required to facilitate these long bus rides as key limitations (Fotu et al., 2011). Such inappropriate interventions, beyond wasting resources, risk damaging the relationships between aid agencies and the individuals they aim to support, undermining the potential for genuine engagement and development (Fotu et al., 2011).

As such, clearly identifying and fully understanding the target community are key to development appropriate interventions. The use of intervention-initiated communities as a target community poses a challenge to this understanding, as they are likely to be more diverse in circumstance and opinion than more cohesive organic communities. This increases the risk of interventions failing to meet the needs of the whole community (McNamara et al., 2020).

Appropriateness: low

Effectiveness. Key limitations to effectiveness in these intervention-initiated communities were found to be lack of community ownership and buy-in, and unpredictable community dynamics.

A review of community participation in WASH interventions by Nelson et al. (2021) identified community cohesion and connectedness, and community participation or empowerment as key enabling factors for WASH interventions success. Interventions targeted towards more specific community groupings will be supported by these enabling factors, and more successful as a result (Nelson et al., 2021). Conversely, intervention-initiated communities are unlikely to benefit from these enabling factors and, as a result, community approval and ownership will likely be more difficult to engender (McNamara et al., 2020; Nelson et al., 2021).

Reflecting on their project, which worked alongside Pacific communities to combine the use of Western science and traditional knowledge to predict weather events, Malsale et al. (2018) identified the importance of building relationships between key stakeholders within the target community and the external project group. These relationships are critical to supporting community acceptance and buy-in (Malsale et al., 2018).

Thorough understanding of the community, who it is composed of and how it operates is therefore critical to ensure key community gatekeepers and other significant stakeholders are included in this process (Malsale et al., 2018). Malsale et al. (2018) warned that, in Indigenous spaces, if this is not done correctly, it is likely that the intervention will not be accepted.

Beyond these key partnerships, MORDI's (2012) case study assessing its community development project in Tonga highlighted the significance of community dynamics. This case study illustrates the influence community dynamics have over priorities and decision making, and the need for intervention plans to accommodate them.

If communities are not wholly understood, or their complexity is underestimated, these dynamics may be unpredictable, increasing the risk of intervention failure. As such, it is critical for this complexity and intersectionality to be considered, this is particularly relevant for intervention-initiated communities, which are likely to be divided by family, church membership, gender roles and socioeconomic status (Fotu et al., 2011; Rhodes-Dicker et al., 2022).

Assessment of the community obesity reduction programme conducted by Fotu et al. (2011) identified this complexity as a key challenge for the less targeted aspects of their programme. The team concluded that targeting programming towards more specific groups such as adolescents; or situations such as the village's socioeconomic status, geographical location, and cultural values is necessary to support development and delivery of more relevant and effective programmes (Fotu et al., 2011).

Effectiveness: low

Equity. The same mechanisms that support communities to protect their membership and sustain their cultural values can also (intentionally or otherwise) restrict the ability for subgroups, particularly minorities and marginalised groups, to express their opinions and claim their rights (Kies-Ryan, 2022). Implementers need to be aware of these realities in order to combat them; this requires a more nuanced understanding of who makes up the community, one which may not be supported by the use of intervention-initiated communities as an entry point (Titz et al., 2018).

If these dynamics are not addressed through the project design, there is a risk that projects will only serve a sector of the community: those physically capable of interacting with the project, or most aligned culturally. Given that many projects come from the same positionality (typically an outsider, Western lens), this leads to the risk of elite capture, whereby the most powerful and

resourced members of society receive the greatest benefits following the intervention (Malsale et al., 2018; Westoby et al., 2020).

Findings from a Vanuatu-based study suggest that creative implementation and research methods can be utilised to privilege marginalised voices in a community project, strengthening community engagement and participation in diverse communities (Kies-Ryan, 2022). In all projects, external actors should be wary of any entrenched inequalities within the chosen communities to avoid exacerbating them (Kies-Ryan, 2022; Malsale et al., 2018; McNamara et al., 2020; Titz et al., 2018).

Equity: low

Impact. Working within the community's existing governance structures is essential. Malsale et al. (2018) warned that permission granted at the national level does not guarantee that the local community has been consulted. To best protect cultural safety, and to avoid causing unintended harm, it is critical that existing community channels are utilised to begin engagement processes and to gain approval. This poses challenges for intervention-initiated communities, which may bring together multiple governance structures (Malsale et al., 2018; Titz et al., 2018). High awareness of the organic communities involved is therefore essential.

Through their assessment of community-based adaptation projects in the Pacific, McNamara et al. (2020) identified creating new inequalities, or exacerbating existing inequalities within a population, as key risks of adaptation projects. This is largely due to project decisions triggering internal disputes, and exclusion or marginalisation of individuals or groups from the project or its outcomes (McNamara et al., 2020). This risk is heightened when initiatives are driven by outsiders with limited understanding of the community (McNamara et al., 2020).

Impact: low

Sustainability. Sustainability is a key challenge across WASH interventions. For broad, artificial, or undefined communities, this challenge is likely to be more significant, driven by limited community cohesion, limited existing governance, and unclear community resources.

McNamara et al.(2020) and Westoby et al. (2020) both acknowledged the importance of community ownership for post-funding-cycle sustainability, recognising that such community ownership is contingent on community cohesion. As previously established, this cohesion is likely reduced in intervention-initiated communities.

The high migration rates within Pacific populations are a key sustainability risk for all community-based projects. For projects with intervention-initiated communities, this risk is heightened as their governance structures are typically developed for the project. These are inherently more vulnerable to population changes than governance and leadership within self-identified communities will be, the latter relying on established processes to cope with such instability (MORDI, 2012).

Finally, a key sustainability success factor identified across the development literature is utilising existing community resources (McNamara et al., 2020; MORDI, 2012; SPREP, 2015). For intervention-initiated communities, these community resources are likely to be less clear, and individual communities may be less motivated to contribute these to the larger group (SPREP, 2015).

Sustainability: low

3.4.2 Faith-Based Communities (Entry Point 2)

Faith and culture are critical components of Pacific communities. Tonga's 2021 census reported that more than 99% of the population affiliates themselves with a religious group (Tonga Statistics Department, 2022) (see also Chapter 1).

Appropriateness. In Tonga, traditional knowledge and spirituality underpin understandings of natural phenomena such as water, soil, and contaminants (Kies-Ryan, 2022; Martin et al., 2023; Morrison, 2021; Nunn, 2017). As such, Nunn (2017) argued that in order to develop appropriate interventions and programmes that alter WASH beliefs and behaviours in Tonga, it is critical that practitioners are considerate of existing beliefs and behaviours, and the faith and cultural elements that drive them. He argued that secular messaging will be ineffective and even damaging if it clashes with the community's spiritual agenda. As such, utilising faith-based organisations as intervention entry points may lead to more appropriate and effective implementation.

This is supported by findings from McNamara et al. (2020) and Nelson et al. (2021) who critiqued the unsuccessful introduction of composting toilets in Vanuatu. This lack of success is attributed to a failure to recognise local beliefs, harmonise the project with local realities, and address misconceptions and fears associated with the hygiene and safety of this technology, the result summarised by a community member: "people were not comfortable" (McNamara et al., 2020; Westoby et al., 2020).

Findings by Havea et al. (2019) suggest that working through faith-based communities may reduce these risks as community leaders' inherent understanding of their membership's beliefs can support projects to be culturally safe. Further, leaders of these communities are well-placed to translate WASH messaging so that it is understood and accepted by the wider community (Havea et al., 2019). This is further supported by Nunn (2017) and Martin et al. (2023) who highlighted the significant influence of religious leaders in Tonga over the beliefs and practices of their communities.

Appropriateness: high

Effectiveness. A key strength of faith-based communities is their cohesion (Grant & Willetts, 2024). This cohesion enables interventions designed alongside the community to be widely applicable to the target group (Grant & Willetts, 2024). Two case-studies successfully utilised faith-based organisations as intervention entry points, reporting that the regularity and predictability of religious meetings supported effective communication and facilitation of activities (Fotu et al., 2011; Takeuchi et al., 2017).

Significant success was seen in a project by Fotu et al. (2011) where the intervention aimed to shift the cultural norm in Tonga away from high consumption of fizzy drinks (sugar-sweetened carbonated beverages). The intervention first targeted a church function, encouraging the church to provide only water to guests. The church maintained this policy for following events and several other churches were seen to later adopt the policy (Fotu et al., 2011). The church community responded positively; this was significant as, in Tonga, food is a status symbol, and a way of showing guests that they are valued. It is typical for guests at such events to be provided large amounts of high-sugar drinks (Fotu et al., 2011). This intervention demonstrates that as a key cultural space, faith-based communities can be effective in altering cultural norms.

The capacity for faith-based communities to deliver key messages and reach across vast communities was acknowledged by Nunn (2017) who reflected on the impact of the Moana Declaration issued by the Pacific Conference of Churches (PCC). The Moana Declaration formally acknowledged climate change and the risks it poses to Pacific communities; this document was then used to drive discussion in the region, the PCC putting key messages about climate change into sermons across the Pacific (Nunn, 2017). Further, utilising faith-based communities as an entry point was seen to support effective community ownership and governance, providing existing processes and structures that are accepted by the community (Malsale et al., 2018).

Effectiveness: High

Equity. The high level of cohesion within faith-based communities enhances equity, as interventions designed for the community are likely to be acceptable and accessible to all members (Grant & Willetts, 2024). However, the lack of cohesion between communities poses a key risk to equity, potentially leading to the exclusion of those who do not identify with the most common faith-based community within an area. Despite being a majority Christian country, religious affiliation in Tonga is split across multiple congregations, the most common (Free Wesleyan Church) hosting the majority at only 34% (Tonga Statistics Department, 2022). As such, programmes conducted within a specific religious community are unlikely to be accessible to broader groups (Francis et al., 2023; MORDI, 2012). To protect equity, interventions must be decentralised, targeting each faith-based community in a location; however, the resource intensiveness of such an approach is unlikely to be viable for all projects (Francis et al., 2023).

Equity: moderate

Impact. Beyond the risk of excluding substantial parts of the target community, failure to work with all faith-based communities in a location may increase the strain on relationships between faith-based communities, potentially driving intercommunity conflict (Francis et al., 2023; MORDI, 2012).

Further, the sensitive nature of WASH and the tendency for WASH interventions to challenge common beliefs and community practices poses a risk to cultural safety if not managed appropriately (Havea et al., 2019; Kies-Ryan, 2022; Martin et al., 2023). Working with faith-based organisations as intervention entry points was found to be a protective factor for cultural safety in WASH interventions, supporting an interwoven understanding of faith and Western science where historically intervention organisations have dismissed or trivialised cultural understandings, thereby reducing the risk of unintended negative impacts (Malsale et al., 2018; McNamara et al., 2020; Morrison, 2021; Nunn, 2017).

Impact: high

Sustainability. Nunn (2017) and Kies-Ryan (2022) both suggested that interventions that acknowledge Indigenous and religious beliefs and knowledge are likely to see greater acceptance and endurance. Such interventions are more likely to be aligned with a community's fundamental ways of understanding and interacting with their environment, reducing the resistance to maintenance of outputs, be these social or structural.

Further, Kies-Ryan (2022) acknowledged that the church has significant influence over the way people live. She suggested that, as such, interventions that successfully impact the way the church operates or the messages they push are likely to see greater sustainability (Kies-Ryan, 2022).

Finally, faith-based organisations have existing governance structures that are resilient to the increasingly high migration rates seen in the Pacific. It is widely acknowledged that interventions located within these organisations benefit from these existing structures, seeing more effective management and maintenance, and greater sustainability (Fotu et al., 2011; McNamara et al., 2020).

Sustainability: high

3.4.3 Local Institution-Based Communities (Entry Point 3)

In this review, local institutions are defined as any organisation, public or private, that exists to serve a local community. Examples include schools, healthcare facilities, and local emergency-response groups. However, for the purpose of this review, this category excludes faith-based organisations, because these are considered separately.

Appropriateness. Local institutions are a key resource in PICTs, particularly those with dispersed island communities (White et al., 2020). Across the literature, authors identified the utility of these local institutions for designing interventions that are responsive to the local community (Martin et al., 2023; Rhodes-Dicker et al., 2022; Takeuchi et al., 2017; White et al., 2020). Significantly, this entry point provides opportunity to anchor projects in the local reality and supports the use of local resources and expertise (Martin et al., 2023).

A key strength of this entry point identified by Rhodes-Dicker et al. (2022) is the opportunity for community members to direct how a message or new technology is introduced to the community, if at all. This was exemplified by the multifactor health-promotion programme conducted by Fotu et al. (2011). Assessment of individual activities within this intervention found that where projects operated through local institutions such as schools and health agencies, they achieved greater integration of external and community resources, with tools and approaches adapted to the local environment to better respond to the community's self-identified needs and desires (Fotu et al., 2011). The importance of this adaptation to local realities was exemplified by findings from Fotu et al. (2011) that, unlike Australian iterations of this project, the hierarchical society in Tonga resulted in teachers being more effective as role-models than students.

Similar success is reported by Takeuchi et al. (2017) who conducted a project to improve Tongan children's dental hygiene. Collaborating with local primary schools, Takeuchi et al. delivered dental education and facilitated daily brushing and use of fluoride mouthwash. This programme was highly effective and accepted by all primary schools across Tonga, seeing 99% enrolment in the programme by 2011 and a 22% reduction in decayed, missing and filled teeth in Tongan children at age 12 (Takeuchi et al., 2017). Takeuchi et al. attributed the project's significant buy-in to this collaboration with the schools.

The local ownership fostered through this entry point is significant in the WASH space, where topics are often sensitive and projects need to be careful not to shame or ostracise communities in their efforts to improve WASH. Supporting local institutions to lead this process enables ideas and technologies to be socialised in an appropriate way or to be avoided if deemed inappropriate for the community (Rhodes-Dicker et al., 2022).

Appropriateness: high

Effectiveness. Morrison (2021) identified the opportunity for local institutions to bridge the gap between the local community and external funders/practitioners. Morrison also argued that local institutions know how to effectively engage their local communities and will likely see greater buy-in than projects run by community outsiders could achieve. As such, interventions and programmes that work alongside local institutions are likely to be highly effective (Morrison, 2021).

The innate community understanding apparent in projects designed through local institutions ensures interventions are informed by the local perspective and workers are cognisant of previous projects, including their successes and failures (Martin et al., 2023; Rhodes-Dicker et al., 2022). This understanding has been found to support reach, as engagement strategies are appropriate and harder-to-reach sectors of the community can be identified early in the planning process (Martin et al., 2023; Rhodes-Dicker et al., 2022).

Fotu et al. (2011) demonstrated that working through local institutions enabled greater community responsiveness. By empowering schools to determine how to deliver their programme, each school was supported to meet the needs of its community, delivering messaging and activities that the community could take ownership of (Fotu et al., 2011).

WASH improvement is complex, requiring shifts in behaviours, technologies, and often beliefs. Both Fotu et al. (2011) and Takeuchi et al. (2017) demonstrated the need to consider the

population engaged with the local institution. For these two Tongan school-based initiatives, it was noted that results were reflective of the low power of children and youth in Tongan society. As such, while impacts were seen for the school children involved in the institutions, more widespread community impact was limited by the lack of buy-in by families (Fotu et al., 2011; Takeuchi et al., 2017).

Effectiveness: moderate

Equity. The key risk to equity when working through local institutions is the risk of further disadvantaging those who are already excluded from their local community. This may be combatted by working through organisations that are accessed by less supported sectors of society or by all members, such as government schools, government hospitals, and organisations focused on supporting vulnerable groups (Fotu et al., 2011; Rhodes-Dicker et al., 2022; Takeuchi et al., 2017).

Interventions are still likely to face the issue of elite capture, with Fotu et al. (2011) and Takeuchi et al. (2017) both noting that differences in levels of impact are based on the willingness of the institutions' leaders and administrators to adopt the policies and practices of the programmes.

Equity: moderate

Impact. Overall, the risk of unintended negative impacts is minimal. The key risk identified by Fotu et al. (2011) occurs where institutions are overloaded, pressured to provide more support to a programme than they have capacity for. Fotu et al. highlights the importance of addressing this by recognising the resources required to implement a programme and either providing these or working through appropriately resourced institutions.

Impact: high

Sustainability. Working through local institutions has been seen to have significant benefits for sustainability (Haak & Nakamura, 2021; Martin et al., 2023; Schulenkorf et al., 2022; Takeuchi et al., 2017; Westoby et al., 2020). Key supportive factors include effective utilisation of local resources, resilience of established governance structures, and consistency of connection with stakeholders.

It is recognised across the literature that sustainable community development should make use of resources already held in the community where possible (Chung-Do et al., 2016; Martin et al., 2023; MORDI, 2012; SPREP, 2015; Westoby et al., 2020). The literature indicates that working

through local institutions increases the opportunity to do so. Utilising established governance structures is a key strength of working through local institutions, both for consistency of stakeholder connection and for leadership resilience (Martin, et al., 2023; Schulenkorf et al., 2022; Takeuchi et al., 2017).

Westoby et al. (2020) demonstrated this resilience in their assessment of programmes conducted through local technical colleges. These programmes continued after funding ceased and the original programme participants moved on, other iterations were paused and then revived following staffing transitions; this resilience is required to achieve long-term sustainability (Westoby et al., 2020). This is particularly relevant in Tonga, where the increasingly high migration rates in the population have posed challenges to programme leadership and maintenance (MORDI, 2012; Westoby et al., 2020).

Sustainability: high

3.4.4 Place-Based Communities (Entry Point 4)

Place-based communities are among the most common entry points in Pacific aid intervention. For the purpose of this review, place-based communities are defined as individuals grouped together, either organically or by an external actor, due to proximity. In the literature, this entry point was most commonly used for interventions isolated to a village or island.

Appropriateness. Across the literature, motivation for the use of place-based communities is primarily funder or implementer convenience (McNamara et al., 2020). As a result, while this entry point can be advantageous, its utility in previous interventions has often been inappropriate given the proposed target groups and desired outcomes (McNamara et al., 2020).

Findings from Westoby et al. (2020) demonstrate a key risk of uncritically grouping individuals and families based on geographical proximity. In the identified case study, motivated by funder beneficiary quota requirements, the project established a water retrieval point to support two villages, piping the water to the distant community through the other's land. This project failed to understand or support the relationships between these groups, and eventually disagreements led to the closer community cutting the other's access to the supply. This example highlights a key risk, that geographical proximity does not necessarily equate to social cohesion (Westoby et al., 2020).

Reflecting on previous projects, MORDI (2012) demonstrates that it is not necessarily immediately apparent if, or how, a place-based community is divided. Reporting on a past project based in a village community, MORDI identified that a key challenge in this water project was balancing divided community opinions, as it did not become clear until the implementation phase that the community was fragmented into two family groups with distinct motivations and decision-making structures. This suggests that for such place-based interventions, early and robust community discussion is critical to identify these dynamics.

As previously noted, place-based communities can be an effective entry point if used intentionally, cognisant of the diversity within the community (Westoby et al., 2020). Westoby et al. (2020) identified that interventions with such diverse groups need to be based on common motivations. This was seen to be effective in whole-of-island or local ecosystem approaches, such as the crown of thorns outbreak response in Vanuatu in 2011. “We know our resources are the water, if the coral is dead there is no more fish, so we will collect and prevent, and we know how’’ (FG participant, Westoby et al., 2020, p.1470). As highlighted by this participant quotation, this response programme was effective because it leveraged cultural motivations common to all, going beyond community motivations (Westoby et al., 2020).

It is important to consider the scale of a place-based community. Whole-of-island approaches may see widespread appropriateness in smaller islands where cultural beliefs and motivations are more likely to be applicable to the whole island (Malsale et al., *20*18). For example, the populations of Ha’apai or ’Eua are likely to see greater homogeneity compared to that of Tongatapu (Malsale et al., 2018). It is also important to consider the degree of variability in circumstances within a locality (McNamara et al., 2020; White et al., 2020). Many Pacific islands with dispersed island communities are characterised by a wide range of local conditions that need to be accommodated when determining an appropriate intervention. As such it is less likely in these spaces that whole-of-island interventions will be appropriate for the whole community (White et al., 2020). A further consideration, when determining this variability, are the additional or intersectional impacts of gender and age on an individual’s circumstances (White et al., 2020). Schulenkorf et al. (2022) suggested that due to this variability, even successful projects working at this scale will likely not be appropriate for all members of a place-based community.

Appropriateness: moderate

Effectiveness. Effectiveness of place-based community interventions is contingent on the community's diversity and the implementers' awareness of this diversity. As discussed, diversity of place-based communities will vary significantly in the Pacific. As such, as with appropriateness, the effectiveness of whole-of-island approaches may be restricted to small islands with relatively homogenous lifestyles and living conditions (Malsale et al., 2018; McNamara et al., 2020). By contrast, for larger islands, or islands with greater variance in lifestyles and living conditions, such broad, place-based interventions are unlikely to be effective (Malsale et al*.,* 2018; McNamara et al., 2020).

Trust and sustainability have been identified as key limitations of place-based interventions (Malsale et al., 2018; McNamara et al., 2020; Schulenkorf et al., 2022). To combat this, it is recommended that programmes focused at this scale operate through an established community organisation or under established community governance structures (Malsale et al., 2018; MORDI, 2012). This involvement of local organisations supports interventions to blend in with local realities, increasing the likelihood of community approval and ownership of the intervention and its outcomes (McNamara et al., 2020; MORDI, 2012).

Effectiveness of place-based community interventions is also dependent on the goals of the project. Through their findings around reducing obesity in Tonga, Fotu et al. (2011) demonstrated that projects conducted at this broad level are unlikely to achieve widespread changes in beliefs or attitudes, such as the acknowledgement of obesity as a priority issue (Fotu et al., 2011). However, this approach is highly effective for the introduction of community resources (gardens, sports grounds, teaching programmes), particularly when these are then managed by more specific community groups present in the area such as churches or schools (Fotu et al., 2011; Schulenkorf et al., 2022). Further, Schulenkorf et al. (2022) found that less rigid project implementation is more able to meet the needs of a diverse community. By empowering leaders within each village to adapt the project implementation to the barriers and drivers present in the local village, Schulenkorf et al. were able to increase reach and engagement.

Effectiveness: moderate

Equity. Due to the breadth of place-based interventions, elite capture is a key risk (Francis et al., 2023; Westoby et al., 2020). Francis et al. (2023) demonstrated a successful mitigation, conducting activities both at the village level and household level, to ensure decision making and priority setting were as inclusive as possible.

If successful, broad-scale interventions should lead to benefits that impact the entire community, so could be more equitable than more targeted interventions (McNamara et al., 2020). However, this relies on the intervention goals and methods being appropriate for the entire community. For example, Schulenkorf et al. (2022) undertook limited community consultation in the planning phases of their community netball project, primarily engaging with town officers. As a result, project decisions regarding times, locations and objectives restricted the involvement of some community members

Equity: low

Impact. Key risks of place-based interventions are driven by their lack of specificity. This can lead to unintended consequences for the more specific communities present within the target place-based community, potentially raising tensions as a result of competing priorities and balances of power (McNamara et al., 2020; MORDI, 2012; Westoby et al., 2020). Malsale et al. (2018) specifically warned that caution is needed where interventions introduce a decision-making body, as these may be seen to undermine existing decision-making processes.

Impact: low

Sustainability. Key limitations to the sustainability of place-based interventions are lack of consideration of power balances and inappropriate or insufficient governance. Interventions working with broad notions of place-based community can brush over or fail to recognise co-existing divisions. Without careful management, these divisions can disrupt the management of programmes, leading to their failure (MORDI, 2012; Westoby et al., 2020).

A key element of successful community programmes is the utilisation of existing community resources (McNamara et al., 2020). This is seen to be true of governance structures also (Malsale et al., 2018; McNamara et al., 2020; MORDI, 2012; Schulenkorf et al., 2022). Governance structures designed to maintain and sustain projects require ongoing input and are vulnerable to breakdown due to the high migration rates that have become the norm throughout the Pacific (Fotu et al., 2011; Malsale et al., 2018; McNamara et al., 2020; MORDI, 2012; Schulenkorf et al., 2022). Greater sustainability is seen in projects that utilise existing village leadership structures. It is suggested that similar success could be achieved by basing these place-based interventions in specific community organisations such as schools (Fotu et al., 2011; MORDI, 2012).

Sustainability: low

3.5 Summary of Findings

The semiquantitative rankings for each intervention entry point against the five components of adaptation success adapted from McNamara et al. (2020) are collated in Table 3.1. This table establishes a semiquantitative comparison of intervention entry points. These comparisons are further explored through the discussion in Section 3.6.

Table 3.1

Summary of Entry-Point Performance as Assessed Qualitatively Against the Five Components of Adaptation Success Adapted From McNamara et al. (2020)

	Intervention initiated	Place based	Institution based	Faith based
Appropriateness	Low	Moderate	High	High
Effectiveness	Low	Moderate	Moderate	High
Equity	Low	Low	Moderate	Moderate
Impact	Low	Low	High	High
Sustainability	Low	Low	High	High

3.6 Discussion

An overall summary of entry-point performance as assessed qualitatively against the adaptation success components from McNamara et al. (2020) is shown in Table 3.1. The comparative performance of each intervention entry point, organised by component, is discussed below.

3.6.1 Appropriateness

Key factors that support appropriateness in Tongan WASH interventions are community cohesion and local ownership. Where present, these factors enable representative priority setting, high levels of intervention acceptance, and interventions to be perceived and experienced consistently across the community.

Overall, this review found that intervention-initiated communities perform the lowest with regard to appropriateness. This is primarily due to the inability of interventions to respond to the priorities and preferences seen in these diverse communities. Place-based communities perform at a moderate level, their key limitation being that geographical proximity does not necessarily equate to shared priorities, leading to similar challenges as seen for intervention-initiated communities. However, where the diversity of these communities is considered and interventions designed to appeal to common-held beliefs, place-based communities are highly effective entry points. Such success was seen in the Vanuatu response to the crown of thorns outbreak, when the whole island was brought together, motivated by a shared sense of

responsibility for the protection of their ocean environment. This reliance on widely held beliefs and motivations is vulnerable to unanticipated diversity, as such, intervention teams need to be mindful of the diversity of local conditions. Intervention at this scale accepts that there will likely be sectors of the community for whom the intervention will not be appropriate. As such, while intervention-initiated communities may also respond to interventions based on widely held beliefs, the inability to assess the diversity of these communities is a key limitation. It appears that this may be an appropriate entry point to introduce new infrastructure such as community gardens; however, it is unlikely to be effective for interventions aiming to alter attitudes and beliefs. This is highly pertinent for WASH contexts, where interventions often contend with influencing both infrastructure development and maintenance, and beliefs and attitudes. These findings suggest that there may be benefits to addressing these elements at different levels.

Interventions designed for faith-based communities and local institution-based communities support high levels of appropriateness. For faith-based communities this is due to the cohesion in the community and an increased awareness of who makes up the community and their specific needs. Faith-based communities are more likely than other communities to share beliefs and understandings, so interventions designed to reflect these understandings are likely to be appropriate for the whole community and are effective in supporting cultural safety. Further, this intrinsic awareness of their own community supports faith-based communities to translate WASH messaging to foster understanding and acceptance by their members. This is further supported by the position of influence religious leaders hold in Tongan society. This suggests that faith-based communities are likely appropriate entry points to alter WASH beliefs, attitudes, and behaviours, in the Tongan context.

Similarly, local institution-based communities are found to benefit from an increased awareness of the community. The local ownership fostered through this entry point leads to the adaptation of tools and approaches to meet the community's needs, enabling potentially sensitive topics to be socialised in an appropriate way or avoided as required. Critically, interventions with these communities have greater integration of external and community resources and expertise than other entry points. As such this entry point is likely to be effective to support the introduction of new behaviours, ideas and infrastructure.

3.6.2 Effectiveness

Intervention-initiated communities are ranked the lowest of the four entry points for supporting intervention effectiveness. This is primarily driven by a lack of community ownership and buy-in.

Further, the diversity of these communities limits implementers' awareness of the divisions within the community and therefore, the effectiveness of projects across these divisions.

Local institution-based communities and place-based communities are both assessed as moderate for supporting intervention effectiveness. Access to local knowledge is a key strength of local institution-based communities, as interventions are more likely to build upon the successes and failures of previous programmes, using established engagement strategies, and proven communication channels. School-based programmes most frequently utilise this entry point in the literature. While many have seen positive responses from children involved in the institutions, more widespread community impact is limited by the lack of buy-in from families. Taking this into a WASH context, there is limited evidence to suggest that teaching children and youth about WASH behaviours and technologies will lead to this knowledge being passed onto families (Fotu et al., 2011; Takeuchi et al., 2017). However, Schulenkorf et al. (2022) suggested that success may be seen from basing health programmes designed for the whole population in school settings, in order to benefit from their local knowledge, acceptance within the community, and existing governance structures.

The use of authority figures as role models is a success factor in the Pacific context for both school-based interventions and those based in churches. This suggests similar success may be achieved through championing medical staff. However, there is a lack of literature assessing programmes based in other types of institution communities such as local medical clinics.

A key consideration for place-based community interventions is the necessary broad scale of operation. These broad-scale interventions are seen to be effective in mobilising communities and supporting the introduction of new infrastructure and community resources. However, they are ineffective for altering beliefs and attitudes. Critical to effectiveness at this scale is implementing agencies' awareness of the community's diversity, with less rigid project implementation methods seen to be most effective in meeting the needs of these diverse communities.

Conversely, the high level of effectiveness in faith-based community interventions is supported by their high levels of cohesion, enabling development of interventions that are widely applicable. The regularity and predictability of religious meetings support effective communication and facilitation of meetings and activities. Faith-based interventions have been shown to be effective in altering cultural norms, leveraging the church's influence over the way

people live to see greater acceptance of new ideas across broad communities (Fotu et al., 2011).

3.6.3 Equity

Both intervention-initiated and place-based community interventions are ranked as low for achieving equitable outcomes. This is primarily due to an inability to identify and respond to the needs and priorities of all groups within the target community, leading to increased risk of elite capture. However, where place-based communities respond to commonly held beliefs and remain focused at the broad scale, outcomes benefit the whole community.

Local institution-based community interventions similarly risk elite capture. This is largely due to the risk that intervention programmes further disadvantage those who (for whatever reason) are already excluded from their local institutions. This can be combatted by working through institutions that are established to support these excluded groups, e.g., hospitals, government schools, and outreach organisations.

There can also be a lack of equity between communities engaged in local institution-based community interventions. The willingness of institution leaders and administrators to adopt the policies and practices of programmes leading to differing focuses and levels of effect amongst host institutions. However, where these institutions are aligned with the needs and priorities of those they serve, this is less likely to be harmful at the individual level.

The risk of elite capture is lower for faith-based community interventions, provided they are aligned with the needs and priorities of their community members. The high level of cohesion among these communities supports wide acceptance of interventions designed for the community. A key limitation to equity in such interventions is the limited likelihood for interventions to have off-target benefits that reach into wider society. As such, to see widespread, equitable impacts, it is important to work with all faith-based communities in an area, which, given the number of religious groups in Tonga, may be resource intensive.

3.6.4 Impact

Prevention of unintended negative impacts is supported by increased awareness of communities, both the needs and desires common to all, and those held by distinct sectors. As such, intervention entry points that perform well in this component enable greater consideration of community dynamics. The key negative impacts apparent are risks to cultural safety, and the risk of exacerbating existing inequalities and tensions both within and between communities.

Factors to capitalise on positive impacts are more difficult to identify in the literature. However, it seems that greater community awareness would support implementers to identify opportunities to maximise off-target benefits during implementation.

Intervention-initiated and place-based community interventions are assessed as low performing, primarily due to high risk to cultural safety, implementers' limited awareness of the target community reducing their capacity to work within the community's norms and to address biases and power imbalances present. Key factors driving these limitations include intervention approval being sought at higher government level rather than at the local level, and failure to identify and engage key community gatekeepers. There is further risk that by working with limited awareness of community dynamics, interventions may exacerbate existing inequalities. This risk is increased when interventions are driven by community outsiders.

A further risk to cultural safety seen in both intervention-initiated and place-based community interventions is the creation of decision-making bodies for management of the intervention. These pose risk where they supersede existing decision-making processes (Malsale et al., 2018).

Both faith-based and local institution-based community interventions are assessed as high performing. Faith-based communities are found to be particularly supportive in a WASH context, where topics are often sensitive. Interventions working through this entry point support a holistic understanding that combines faith and Western science, driving development to fit within Tonga's cultural context (Malsale et al., 2018; McNamara et al., 2020; Morrison, 2021; Nunn, 2017). Similarly, local institutions have the required cultural understanding to protect cultural safety throughout intervention activities. The key risk identified for these entry points is that if intervention activities are not seen to engage all faith groups or institutions equally, intercommunity tensions or conflicts may increase (Francis et al., 2023; MORDI, 2012). A further risk apparent in interventions with these communities is failure to understand the community's capacity to support an intervention. It is critical that assessment is conducted, and interventions designed with cognisance of these restraints.

3.6.5 Sustainability

High levels of intervention sustainability are seen to be supported by community ownership, alignment of intervention activities with community beliefs and ways of life, and utilisation of established governance structures. Intervention-initiated and place-based community interventions again perform poorly against this component. Key limitations identified for both

entry points are low resilience of intervention outcomes and low capacity for maintenance. Low community cohesion is a key driver of these deficits for intervention-initiated communities. This limits community ownership and any sense of responsibility for the intervention and its outputs, which in turn restricts any investment of community resources.

For both intervention-initiated and place-based communities, existing governance structures relevant to the whole community are either nonexistent or limited. As such, intervention teams commonly develop governance structures, in the form of committees or boards, to drive and maintain the intervention and its outputs (SPREP, 2015). Where interventions impose governance structures they risk interfering with existing power dynamics, either undermining culturally appropriate decision-making structures, or failing to appropriately integrate them. Either misstep limits the longevity of these governance bodies.

Where imposed governance structures are appropriate, these structures are vulnerable to Tonga's high migration rates. These newly developed governance bodies lack the natural transfer of leadership and responsibility afforded to the more established governance structures seen in faith-based institutions and local-institutions. This has been successfully combatted by some place-based community intervention designs, where projects partner with local institutions to support a more "embedded" form of governance.

Both faith-based and local institution-based community interventions perform well against this component. Beyond resilient governance, sustainability of faith-based community interventions is supported by the alignment of interventions with the community's spiritual beliefs, and the church's significant influence in Tongan society.

Similarly, local institution-based interventions benefit from consistency of stakeholder connection, leading to more natural maintenance of intervention activities and therefore outcomes.

3.7 Key Opportunities

Through the above assessment, this review highlights a number of opportunities for the application of different intervention entry points for community based WASH development in Tonga. Key opportunities for each entry point are discussed in turn below.

3.7.1 Intervention-Initiated Communities

These show little opportunity for long-term projects but may be appropriate settings for short-term projects aimed at increasing knowledge or knowledge sharing between communities.

These networks may be utilised to deepen connections across existing organic communities to accelerate the uptake of new ideas and support the development of collective knowledge.

By transcending organic community organisation, design of intervention-initiated communities can intentionally support more equitable participation, effectively capturing groups that are typically excluded, and amplifying their voices. When used in this way, intervention-initiated communities may be effective spheres for field-testing and refining interventions before they are deployed in other community settings.

As such, while intervention-initiated communities appear to be a poor intervention entry point when treated as a stand-alone community, if the limitations are acknowledged, they can be useful settings to support development.

3.7.2 Faith-Based Communities

These are highly appropriate and effective settings for interventions aiming to alter cultural norms or introduce new ideas. The capacity of religious leaders to translate WASH messaging to be understood and accepted within cultural and religious worldviews bridges traditional knowledge and Western science, protecting cultural safety and leading to significant buy-in from community members and supporting long-term intervention effectiveness.

To be successful and to prevent harm, intervention teams need to be conscious of equity and inclusion when working with faith-based communities, ensuring they are aware of the relationships and boundaries between congregations and design interventions accordingly. Given the clear benefits identified, faith-based communities should be prioritised as intervention entry points for future community WASH development in Tonga.

3.7.3 Local Institution-Based Communities

Local institutions appear to be effective entry points for programmes aiming to alter behaviours and socialise new ideas. However, school-based programmes appear to have limited population-wide effects beyond the direct intervention group, linked to the low power of youth in Tongan society. This suggests that utilising alternative government institutions to host interventions (e.g., hospitals, health clinics) may be an opportunity to realise the potential of this entry point.

Similar to school-based programmes, as members of the community, health professionals are likely well placed to identify appropriate methods to engage the community, supporting intervention teams to develop accessible programmes. Further, similar to the influence teachers

have on student populations, the respected status of health professionals may support trust in these wider populations.

However, unlike school programmes, the direct intervention group is likely to be a larger cross-section of the community and may include respected individuals with greater capacity to influence the wider community.

3.7.4 Place-Based Communities

These appear to be an appropriate entry point for the delivery of resources, particularly tangible, location-specific resources such as gardens, community water tanks, and recreational spaces. However, the limited capacity for maintenance and governance identified in projects through this entry point suggests that, when used in isolation, this is a poor entry point for community WASH projects. However, it seems that this entry point may be effective if used in combination with either a local institution-based or faith-based community; these more specific community conceptions support robust governance and maintenance.

Within the Tongan village governance system, where appropriate governance committees exist, these may be effective to manage such resources. However, the long-term capacity of these committees is unclear.

3.8 Limitations

The two main limitations impacting this literature review were the paucity of research (a) in the primary literature, and (b) relating to the effectiveness of WASH interventions in Tonga. Attempts have been made to address both limitations to the extent possible.

To satisfy the breadth of data required to inform this review, many case studies were drawn from internal business reports. As these documents were not written for the purpose of research, it is likely that some information pertinent to this review was not included and therefore was not captured by this review.

Due to a lack of WASH research in Tonga, many included findings are based on public health interventions, most of these targeting obesity. While these findings have been interpreted in a WASH context, there is risk that some findings are specific to their context and cannot be extrapolated to a WASH context.

The field research that follows in Chapter 4 provided the opportunity to address these limitations. This field research enabled validation and extension of these initial findings and,

critically, the opportunity to apply the same assessment framework directly to a Tongan community-based WASH development context.

3.9 Conclusion and Link to the Wider Thesis

This narrative review aimed to identify and analyse the most effective entry points for community WASH interventions in a Tongan context. Four key entry points were identified: intervention-initiated communities, faith-based communities, local institution-based communities, and place-based communities.

These four entry points were then assessed against the five components of adaptation success developed by McNamara et al. (2020): appropriateness, effectiveness, equity, impact, and sustainability as defined in Table 2.1. The findings shown in Table 3.1 and discussed in Section 3.6 demonstrate the comparative performance of each entry point. However, it is clear that the goals of the intervention are critical in determining which entry point(s) will best support adaptation success, with each entry point offering different opportunities and limitations to intervention teams.

Building on key publications by Titz et al. (2018) and Westoby et al. (2020), this review has brought the context of WASH projects into the foreground. Findings suggest that to see greater success, implementers need to be more critical of the setting of their intervention, shifting practice to view the context of an intervention as a key design decision, chosen to support a project's specific goals, rather than a pragmatic or funder-driven decision.

The paucity of peer-reviewed literature, and indeed of open-source project evaluation is a key limitation for Tongan WASH development. Prioritising this reporting will support development projects to learn from the successes and failures of others and build a strong evidence base to guide future projects.

This narrative review has established the focus for the research within this thesis, identifying the four entry points to be further examined in subsequent chapters. The evidence presented in this chapter will contribute to the development of an IEPT-SWOT (Section 6.3). This evidence will be further developed and refined in Chapter 4, through the case study where these more theoretical findings will be field tested and evidence triangulated.

Chapter 4: Case Study (Study 2)

4.1 Introduction

As noted in Section 3.3 the literature analysed in Chapter 3 was drawn from a range of sources, including funder and organisation reports, not all written for the purpose of academic review. As such, some pertinent information may be absent. Further, findings from some articles may be context-specific and extrapolating them to the WASH context may mean some nuance was overlooked.

Given these limitations, it was important to field test the literature review findings within the Tongan WASH context. As place-based communities appear to be a commonly utilised entry point across Tongan WASH implementers, this community-entry point was the focus of this field research.

Research requirements were considered in partnership with MORDI to identify an appropriate case study that would meet the research needs while meaningfully contributing to MORDI's work. This led to the identification of the case study project: Progress Towards SDG6 on 'Eua, Tonga: Review of the MORDI project to enhance disaster preparedness for water security (MORDI, 2020).

This case study also provided the opportunity to field test McNamara et al.'s (2020) assessment framework by applying it directly to a Tongan WASH intervention. Assessment of the framework's performance in this context was essential to contribute to the appraisal of the framework (explored in Chapter 5).

4.2 Purpose

The purpose of this chapter is to contribute evidence to address Objective 1: To analyse the use of intervention entry points in Tongan WASH development projects. This analysis will then support the achievement of Objective 2: To develop tools to support appropriate selection and use of entry points in Tongan WASH interventions (Section 1.4).

This case study was conducted by assessing the outcomes of MORDI's 2020 'Eua water resilience project (5 years on from implementation); considering which aspects of the approaches adopted by different organisations would work best for achieving the objectives of SDG6 on 'Eua; making actionable recommendations for strengthening MORDI's future approach to water security projects; and gathering data to enable comparative analysis of

findings from this case study and the literature review in order to validate and refine the literature findings (ultimately supporting the development of the Entry point Planning Tool).

4.3 Research Methods

The philosophy, approach and methodology used throughout this research were outlined in Section 2.3. This section provides further detail to describe the research development and methods used throughout the case study.

4.3.1 Research Development

The field research was conducted alongside MORDI over a 3-month period, aiming to assess the impacts of 'MORDI's 2020 'Eua water resilience project, prioritising the perspective of 'Eua community members. As such, 'Eua's 2019 and 2025 CDPs were used as key sources of data, contextualised through community interviews. These plans provide a reliable community consensus on water priorities and the related issues, causes and solutions.

This field research was designed over a period from 2024 to early 2025. During this time, I held discussions with New Zealand-based researchers working in Tongan- and wider Pacific-development contexts to support the design of an appropriate and culturally safe research plan. This process led to a range of refinements to the initial project conception and design. For example, an earlier plan to conduct community-level focus group interviews was set aside due to the added complexity this approach would introduce and the challenges of addressing these within the limited research window available for the research phase of a Master of Health Science thesis. A further key decision was to apply Talanoa methodology principles to ground the research process in a Tongan cultural context.

Talanoa research, as described by Vaioleti (2006), is "a personal encounter where people story their issues, their realities and aspirations" (p. 1). It recognises that knowledge is contextual, so data are gathered and interpreted within the relevant cultural context. Vaioleti suggested that such an approach enables deeper knowledge to be captured in Pacific research.

As a cultural outsider in Tonga and a non-Tongan speaker, during the refinement process it was determined that I would not be able to support the deep connections and personal understandings required to enable true Talanoa methodologies to be followed. However, responding to the underlying principles of Talanoa, this research design aimed to uplift the voices of members of 'Eua's communities, and local implementers, by gathering data through participant-led conversations, and interpreting it within the local context, guided by 'Eua's CDPs.

However, once in-country, discussions with MORDI led to further refinement of this plan. A key adjustment was that while the principles of Talanoa research would be followed, in order to align the research with MORDI's approach and capacities, interviews would be semistructured. Alignment with Talanoa principles in this format was facilitated by MORDI implementers, who provided translation and liaison support. These implementers had existing relationships with each of the participants, which enabled open conversations where participants were encouraged to explore each topic and explain their personal experiences with the projects.

Contextual interpretation of the data was supported by both (a) the depth of CDP data available, and (b) MORDI's implementers, who were able to guide understanding of the Tongan WASH development environment. MORDI's support over the 3-month research period enabled the research to be conducted with an understanding of the complexities of Tonga's development environment. This support was essential, illuminating the nuances impacting decision making; and the way organisations interact with each other, with communities, and with projects.

4.3.2 Data Sources

This case study drew on four key sources of information:

1. Community interviews (3)
2. Implementer interviews (9)
3. CDPs (for 2019 & 2025)
4. Additional secondary data.

The methodology took a mixed-methods approach. All quantitative data were secondary data taken from MORDI's household surveys, the 2016 and 2021 Tongan censuses (Tongan Statistics Department, 2019, 2022), local public health statistics, and 'Eua's CDPs. Qualitative data used were a combination of data gathered alongside community members and local implementers through interviews specifically for the purpose of this research, and secondary data gathered for the development of 'Eua's CDPs.

Data used to assess the differences between implementer approaches to community water resilience projects were gathered through semistructured interviewing supported by review of key documentation. Representatives from four different local implementing organisations were interviewed as part of this project (MORDI, Live and Learn Environmental Education [LLEE],

Ministry of Meteorology, Information, Disaster Management, Environment, Climate Change and Communications [MEIDECC], Sione's Foundation).

Further key resources to support understanding of the planning and implementation of the relevant projects were drawn from MORDI's internal documents, open-source Tongan government documents, and other documentation that participating organisations chose to share with for the purposes of conducting this research.

Primary Data. Primary data gathered in this study were restricted to interviewing conducted with the low-risk notification advised by the MUHEC (notification number 400030317) in line with its guidelines for low-risk ethical research (Appendix B). All interview participants provided informed consent for their responses to be included in this research (both verbal and written) (Appendices C & D), and, in accordance with ethical standards, all contributions remain anonymous.

I conducted three interviews with community members to obtain critical context and detail to support analysis of CDP data. Using a semistructured methodology, participants were asked about all aspects of the project: its planning, implementation, and outcomes. This flexible format enabled participants to guide the conversation and focus on issues most relevant to them. Responses were then deductively coded using the themes identified in the CDPs.

Community interviews were purposively selected. It is important to note that the purpose of these interviews was to contextualise the CDP findings and to frame my analysis of these findings. This was particularly important given my limited first-hand understanding of the research context.

The three community member interviewees were selected from one community in 'Eua, which is not identified here to preserve the interviewees' anonymity. To reflect the diversity of views within the CDPs, three individuals were selected, each representing one CDP group: women's, men's, or youth. All interviews were conducted in person, with the assistance of an interpreter familiar to the participants. Live translation enabled immediate clarification of key points and allowed me to verify overall understanding at the conclusion of each interview.

Further interviews were conducted with a local community leader from 'Eua and public service workers from the TWB and from Tonga Public Health (TPH). These interviews followed the

same methodology; however, while an interpreter was made available, all three participants chose to conduct the interviews in English.

A further six interviews were conducted with local implementers from four different organisations. These interviews focused on exploring variations in implementation approaches to community water-resilience projects on ’Eua. Again, using a semistructured format, the conversations were framed around the five-factor framework adapted from McNamara et al. (2020) for evaluating community-based aid interventions in the Pacific (appropriateness, effectiveness, equity, impact, and sustainability). This framework supported the broad exploration of key intervention design elements without imposing unnecessary limitations. The interviews were deductively coded to support comparison across interventions. All implementers chose to conduct their interviews in English.

The semistructured approach used for all interviews was intended to support open conversation, in line with Talanoa principles. Questions to guide these discussions were developed in collaboration with MORDI implementers and adapted for each group to ensure relevance. As interviews with implementers followed the five-factor framework adapted from McNamara et al. (2020), this assessment framework was provided to support transparency. All interview question/framework sheets are provided at Appendix E.

Secondary Data. Secondary data for this research were taken from MORDI’s household surveys, the 2016 and 2021 Tongan census, local public health statistics, and ’Eua’s CDPs (2019 & 2025).

Providing a representative assessment of community perceptions regarding water issues, ’Eua’s CDPs from 2019 (unpublished) and 2025 were a key source of data (Prime Minister’s Office Local Government & Community Development Division, 2025). These were used in this research in two ways. Firstly, comparative analysis of quantitative data (specifically, the prioritisation of drinking water in the 2019 and 2025 plans) enabled assessment of the shift in water as a priority area for development as identified by ’Eua’s communities. Secondly, thematic analysis of qualitative data enabled a better understanding of the nature of progress towards drinking water resilience in ’Eua.

Household surveys were conducted by MORDI’s field team before and shortly after water tanks were installed, as well as by the Tongan government through its national census. These surveys report on the primary drinking water sources for households on ’Eua, and as such have

previously been used as an objective metric for success in projects aiming to increase access to household water tanks.

Further insights into effectiveness were drawn from data provided by TPH and the TWB. Their assessments of water tanks in Tonga and the ’Eua water plant provided greater detail to understand the successes and limitations of water development on ’Eua. Additional supporting information related to the planning and implementation of the projects was sourced from internal MORDI documentation, open-access government publications, and other relevant materials provided by participating organisations.

Analysis of documentation was conducted to gather both quantitative information, including number of tanks provided, households supported, and project targets; and qualitative information, including project goals and community planning feedback. These documents supported analysis of implementer approaches, demonstrating many of the elements discussed in interviews.

As detailed in Section 1.3.3, the robustness of the CDP development process ensures these documents are representative, reflecting the opinions and desires of the whole village community. As such, these were used as the primary source of community input, enabling interviews to remain supplementary.

4.4 Project Background

4.4.1 Water on ’Eua in General

’Eua is Tonga’s second largest island by land mass, located 20 km by sea (approx. 2.5 hrs by ferry) southeast of Tonga’s capital, Tongatapu (Figures 4.1 and 4.2). ’Eua is home to 15 villages divided into two districts: ’Eua Motu’a (Old 'Eua) in the north, made up of six villages, and ’Eua Fo’ou (New ’Eua) in the south, made up of nine villages (Figure 4.2). In 2019, all 15 communities on ’Eua worked with MORDI to develop (or update for ’Ohonua) CDPs. These CDPs demonstrated the state of water needs in ’Eua as identified by community members. Drinking water was a key feature of all 15 plans, with 100% of communities including drinking water development in their priorities, 80% of these listing water development among their top three priorities, and 47% listing water development as their top priority. This led to the inclusion of water development in the top three priorities in both ’Eua Motu’a and ’Eua Fo’ou’s District Development Plans and in ’Eua’s Island Development Plan (Ministry of Internal Affairs & MORDI TT, 2019a, 2019b, 2020).

Figure 4.1

Map Showing Location of 'Eua 20 km Southeast of Tongatapu.

Source: Google Maps, 2025.

Figure 4.2

Map of 'Eua Showing the 15 Communities

Source: 'Eua Island Strategic Development Plan 2015–2018.

Water issues identified in the CDPs were similar across the 15 communities; community members primarily identified a lack of functional rainwater-storage tanks and the poor quality of the reticulated supply. While Houma's feedback was consistent with 'Eua's other communities, it is important to note that unlike the other communities whose reticulated supply is maintained by

TWB, Houma's reticulated supply is drawn from an independent borehole maintained and controlled by their VWC.

Climate resilience is a key consideration for drinking water development on 'Eua as extreme weather events including drought and tropical cyclones are frequent in the region. The most recent tropical cyclone occurred in April 2020. Tropical Cyclone Harold caused significant damage to 'Eua's infrastructure; however, local implementers reported that impact to drinking water was largely limited to contamination of rainwater tanks. This contamination was remediated through tank cleaning by the Tonga National Youth Congress during the disaster recovery phase, indicating the resilience of tank systems. The most recent drought occurred in September 2023, lasting approximately 3 months (MEIDECC, 2023).

4.4.2 Drinking Water-Source Use Patterns

Baseline data collected prior to MORDI's 2020 water security project found the primary source of drinking water in 'Eua's communities to be rainwater (Table 4.1). Overall, 73% of households reported having their own rainwater tank, while 23% of households reported relying on neighbours' water tanks. The remainder of the households (4%) reported using the reticulated supply, with or without boiling, or purchasing bottled water. Community members reported in interviews that at the time this survey was conducted there was a high level of water insecurity, with particular concern for the capacity of households to withstand periods of drought.

Table 4.1

'Eua Water Use Prior to MORDI TT 2020 Water Security Project

		Main source of drinking water					
			Tank water				
Location	Total households	Reticulated supply (tap water)	Own water tank	Neighbouring water tank	Bottled water	Boiled water	Other
Tonga	18,005	1,799	10,890	3,537	1,713	34	32
'Eua Island	885	22	647	207	8	1	0
'Eua-Motu'a district	508	10	345	149	4	0	0
'Eua-Fo'ou district	377	12	302	58	4	1	0

	Percentage of households on each supply					
		Tank water				
Location	Reticulated supply (tap water)	Own water tank	Neighbouring water tank	Bottled water	Boiled water	Other
Tonga	10.0	60.5	19.6	9.5	0.2	0.2
'Eua Island	2.5	73.1	23.4	0.9	0.1	0.0
'Eua-Mot'ua district	2.0	67.9	29.3	0.8	0.0	0.0
'Eua-Fo'ou district	3.2	80.1	15.4	1.1	0.3	0.0

Note: Table adapted from MORDI TT (2020).

4.4.3 Drinking Water Sources

The primary source of drinking water on 'Eua is rainwater, drawn either from a personal household tank or a neighbour's household tank. The reticulated supply remains a minor source of drinking water. 'Eua's main reticulated supply is centrally managed by TWB, treated at the Petani Drinking Water Plant. As noted, the furthest north community of Houma does not have access to this centrally managed supply, as the community's gradient prevents sufficient flow from the plant. As such, Houma's reticulated supply is managed locally by their VWC, drawn from a bore located within the community. This thesis focuses on the centrally managed supply.

Reticulated Water Supply (Including Bore Supply). As one of the few Islands of Tonga to host drinkable surface water, 'Eua's reticulated supply is primarily drawn from surface streams and underground cave stream systems located in Matavai. However, when these sources are insufficient, the supply is supplemented with groundwater from two bores located in 'Ohonua.

Like other islands in Tonga, ’Eua’s groundwater (accessed through bore holes) has high salinity levels, and therefore palatability issues (White et al., 2020). As such, a key benefit of utilising surface water and cave streams is that, unlike other islands in Tonga, ’Eua’s reticulated supply has relatively low salinity (even when supplemented by groundwater), and should be highly palatable (White et al., 2020).

However, historic deforestation of the catchment area has led to significant water-quality issues. Large amounts of soil erosion following heavy rainfall leads to high turbidity in the source water, which, in turn, blocks water inlet pipes, and puts significant pressure on the water plant’s filtration systems. Historically, this turbidity could not be managed by the Petani water plant, so following heavy rainfall, the water piped to communities was full of sediment and largely undrinkable. A further issue with the supply was that during drought periods the catchment would dry out, causing the system to stop for days at a time. This was reported by communities in the 2019 CDPs to have significant impacts on school and work activities, and to impede daily living.

Reports from TWB indicate that, as of 2025, 90% of ’Eua’s population have access to the centrally managed reticulated supply. However, these water issues have led to low trust in the reticulated system and, as a result, increased reliance on rainwater.

Rainwater Supply. Like most Tongan communities, rainwater is the primary source of drinking water on ’Eua. This is typically collected and managed at a household level through roof catchment systems (Table 4.1). However, the data indicate that prior to project implementation in 2020, many households relied on collecting water from neighbours’ water tanks.

In a roof-catchment system, rainwater is collected through gutters installed on a roof and fed into a collection tank (Figure 4.3). As such, the quality of the water collected is reliant on the quality and cleanliness of the roof, gutters, and tank. Therefore, to ensure water safety, these systems need regular maintenance and cleaning. For this reason, it is often recommended that households boil tank water or otherwise disinfect it before use. As seen in Table 4.1, in ’Eua, boiling of water is not common.

Figure 4.3

A 5,000 L Water Tank Connected to a Roof-Catchment System

Source: Author (2024).

Utilising household water tanks has key benefits in a disaster preparedness context, as households maintain a supply that can be used during recovery phases while key infrastructure is repaired. However, as these systems are reliant on rainfall, depending on storage capacity, they may not be drought resilient.

Bottled Water. As identified in Table 4.1, some households in ’Eua rely on bottled water as their primary source of drinking water. This is uncommon, likely due to the high cost. The average price of a 1.5 L bottle sold in the local stores is 3.33 TOP (1.38 USD) (Numbeo, 2025).

4.4.4 Drinking Water Development

Since 2020, a number of projects have been completed to support ’Eua’s water security. These have been carried out by a range of organisations, the most prominent being MORDI, MEIDECC (The National Water Tank project), LLEE, The Tongan National Youth Congress, and Sione’s Foundation. Most projects have targeted ’Eua’s rainwater systems, providing water tanks, training, maintenance, cleaning support, and equipment. Sione’s Foundation, however, addressed the reticulated supply.

This case study focuses on the project to increase the supply of water tanks, however, the upgrade of the Petani water plant is an important part of ’Eua’s water picture so is also detailed below.

Reticulated Supply Improvement. As identified, the most significant development to ’Eua’s reticulated supply is the result of a project by Sione’s Foundation (2023), funded by the McCloy Family Foundation. This project upgraded the water-treatment plant in Petani, enabling it to produce potable water regardless of the source-water conditions. This involved the installation of new filter systems and refinements to the water-intake process. Retaining the existing water catchments, the project installed a switch to block the most problematic stream supply when it shows high contamination levels (following heavy rainfall), to limit the pressure on the filtration system. The project also utilised the two existing boreholes to ensure groundwater can be accessed to supplement water supply when surface water is limited or water inlets are blocked by sediment.

The upgraded plant was opened in March 2023 and handed back to TWB for ongoing management and maintenance. Reports from TWB, in 2025, show that the plant is meeting demand, capable of producing 1 ML/day, sufficient for ’Eua’s standard consumption of 800,000 L/day.

The supply undergoes flocculation, sedimentation, filtration and chlorination before being gravity fed to households. TWB conducts daily testing of the water produced, measuring both free available chlorine and turbidity at the treatment plant and at set points in the reticulation network. Samples are also sent to Tongatapu weekly, for bacteriological testing.

Data from TWB indicate that the plant has been operating effectively, consistently producing potable water with turbidity below 1 NTU and within acceptable ranges for free available chlorine and bacteriological indicators (WHO, 2022). TWB reports that since the plant opened in 2023 there have been no reports of water production stoppages, or complaints received by users.

Despite the success of this water plant upgrade, interviews with community members in this research project indicate that the communities’ trust in the system remains low. This is reflected in comments by ’Eua’s public health team and census findings (Table 4.3), which reported that use of this reticulated supply for drinking is limited.

Local implementers from MORDI, LLEE, MEIDECC, and TPH indicated minimal awareness of the plant's upgrades (personal communication, April 2025). Most organisations did not know that the plant had been upgraded, and none reported feeling confident in the safety of the water it produced. Local public health officials reported that they instruct households not to use the supply for drinking without boiling first, and to use rainwater if available.

4.5 MORDI's 2020 'Eua Water Resilience Project

As noted previously, MORDI is a Tongan NGO that facilitates co-designed development with communities. All MORDI projects are developed from the CDPs, alongside recipient communities. After identifying water as a development priority, water-tank project proposals are then written by VWCs, with support from MORDI implementers.

Following the identification of water as a key development priority across the 15 communities on 'Eua (in the 2019 CDPs), in 2020, MORDI conducted a project to increase water security by delivering water tanks to households who could not afford to provide their own. Aiming to support sustainable development, community ownership is a central focus of MORDI's approach. Community ownership is fostered in MORDI's projects through the requirement for financial and in-kind contributions by recipient communities.

The financial contribution for this project was set at $500 TOP ($203.50 USD) per household, to cover the cost of materials for guttering and concrete slabs (to support the water tanks). When this was initially put to the village community it was rejected, with some households being unwilling to pay when they could not see what the money was going towards. MORDI then negotiated for the community to purchase these materials from the supplier directly at this rate, which was found acceptable as an approach by most households.

The in-kind contribution in this project was labour to support the installation of concrete slabs, tank stands, and guttering systems. Beyond supporting ownership, this was an essential component of project sustainability, as it went hand in hand with training. Engaging VWCs and often supported by the community's youth members, individuals were trained and then worked with MORDI implementers to install these systems. This process ensured community members have the practical skills to install these systems in the future as repair, replacement and expansion become necessary (Figure 4.4).

At the time of project delivery, both LLEE and MEIDECC were implementing rainwater tank projects across Tonga. Co-payment was not part of these other projects. This became a challenge for MORDI's implementation as some households that initially qualified to be part of

MORDI's project opted out, hoping instead to receive a fully funded system from LLEE or MEIDECC. A MORDI implementer noted that some of these households missed out entirely as a result. MORDI reported that there was little collaboration with LLEE and MEIDECC at this time, beyond sharing household survey data to prevent overlap among the organisations (personal communication, April 2025).

Maintenance training was a further key component of the project. All recipient households were required to take part in maintenance training delivered by MORDI implementers. Despite the project's presence across 'Eua, training was delivered for each community independently. MORDI reported that these smaller numbers are preferred as they enable implementers to ensure that all participants understand the training and gain the necessary hands-on experience to manage their systems going forward.

MORDI's project evaluation included identification of 'Eua's households' primary drinking water source, both pre- and post-implementation. These data, and those collected in Tonga's corresponding national censuses, are shown in Table 4.3.

4.5.1 Project Goals

The goal of the 2020 'Eua Island Rainwater Tank Development project was to support drinking water security for all 'Eua's communities by delivering rainwater harvesting systems to in-need households, and key community spaces such as schools and community halls, to ultimately ensure access to clean and safe drinking water for all households across 'Eua.

In the project, MORDI defined water security for 'Eua as reliable access to safe drinking water in sufficient quantities to meet the daily needs of households both during peacetime and periods of disaster response and recovery. The primary objectives, therefore, were to ensure households have access to a reliable supply of clean drinking water, and to mitigate risks of contaminated and unsafe water sources which contribute to the spread of disease in 'Eua.

In response to 2019 CDPs, working alongside recipient communities, this project provided water tanks and the related guttering and mounting materials to households, prioritising those that met the following criteria:

- Caring for elderly or disabled people
- Widow as head of home
- Large numbers (10+) living in the home.

The supply was designed to cater for household drinking water only, with the supply volume matched to the needs of each household. At baseline, households received one 5,000 L tank, while households with more than 10 people received two 5,000 L tanks. Where a house was not appropriate to be used as a catchment, due to the quality or height of the roof, community buildings, or neighbours were identified as repositories for identified households.

Slowed by the impact of Tropical Cyclone Harold on 09 April, 2020, this project was delivered over 9 months between 04 April, 2020–10 December, 2020. Ultimately this project delivered water tanks and the associated guttering and mounting materials to 265 households and community facilities across all 15 of ’Eua’s villages (Table 4.2).

Figure 4.4

Images of 5,000L Tanks Provided by MORDI TT to Households in ’Eua

Source: MORDI TT images.

Following MORDI’s project, both the MEIDECC National Tank Project and LLEE further contributed to rainwater tank systems in ’Eua, adding particularly to the numbers of smaller (3,000 and 5,000 L) tanks. Combined data from LLEE, MORDI TT, and MEIDECC’s National Tank Project indicate that a total of 450 tanks (of various sizes) were supplied to ’Eua's communities in 2020 (Table 4.2).

Table 4.2

Water Tanks Provided to ’Eua from 2020 to 2025

		Tanks by volume (L)						
Organisation	Total tanks	3,000	5,000	10,000	27,000	Total capacity	Guttering and fittings	Concrete slab
MORDI	298	0	265	27	6	1,757 000	265	265
LLEE	52	44	5	2	1	204,000	90	90
MEIDECC	100	0	100*	0	0	500,000	0	0
Total provided to 'Eua	450	44	370	29	7		355	355

*estimate provided by MEIDECC

4.6 MORDI Internal Project Evaluation

Prior to MORDI’s implementation, a baseline survey was conducted by the town officers and VWCs (supported by MORDI) for each community. This survey listed each household by name and recorded any information relevant to the household’s drinking water, including: their primary source of drinking water, the number of people in the household, and their physical capacity to host a water tank system (height of house, material of roof, etc.). This survey was undertaken in person and verified by a MORDI implementer who visually inspected all existing tanks and each potential tank site to ensure results were reliable. These data were then used to identify households that would qualify to receive a water tank.

A summary of data from this survey identifying the main source of drinking water for the household is included in Table 4.3. Notably, MORDI’s survey data for ’Eua’s drinking water sources matches the data captured in the 2016 census, indicating no changes in water source use on ’Eua between 2016 and 2020, demonstrating the lack of progress towards water security in ’Eua prior to MORDI’s project. The congruence in the findings of MORDI’s survey and the census further indicate the ability for census data to accurately capture this metric.

Table 4.3

'Eua Drinking Water Sources by Household in 2016 (Census Data), 2020 Pre-Implementation (MORDI Data), 2020 Post-Implementation (MORDI Data), and 2021 (Census Data)

Location	Total households	Main source of drinking water					
		Reticulated supply	Tank water		Bottled	Boiled	Other
			Own	Neighbouring			
Pre-implementation							
		2016 Tongan Census					
Tonga	18,005	1,799	10,890	3,537	1,713	34	32
'Eua Island	885	22	647	207	8	1	0
'Eua-Motu'a district	508	10	345	149	4	0	0
'Eua-Fo'ou district	377	12	302	58	4	1	0
		2020 MORDI Baseline Survey					
'Eua Island	885	22	647	207	8	1	0
'Eua-Motu'a district	508	10	345	149	4	0	0
'Eua-Fo'ou district	377	12	302	58	4	1	0
Post-implementation							
		2020 MORDI Post-implementation Survey					
'Eua Island	885	0	885	0	0	0	0
'Eua-Motu'a district	508	0	508	0	0	0	0
'Eua-Fo'ou district	377	0	377	0	0	0	0
		2021 Tongan Census					
Tonga	18,847	1,150	12,205	2,853	2,577	47	15
'Eua Island	931	42	757	119	13	0	0
'Eua-Motu'a district	537	27	420	83	7	0	0
'Eua-Fo'ou district	394	15	377	36	6	0	0

Note: *there is an overcount in the 2021 Census data for 'Eua Fo'ou district.
Table adapted from MORDI (2020) and Tonga Statistics Department (2019, 2022).

Immediately following their implementation, MORDI used the same methodology to undertake a post-implementation survey, again identifying each household's primary source of drinking water by visiting each household and verifying resources. The results, also included in Table 4.3, indicate that all households on 'Eua had access to their own tank supply. Given that there were a number of households who were unable to receive a tank in MORDI's project due to structural limitations, and still others who chose not to participate in the project, these reports appear to be idealised.

Data from Tonga's 2021 census were also included in this project assessment as part of this case study. This census was carried out on 30 November 2021, almost 1 year following the conclusion of the 'Eua project in December 2020. As such, unlike MORDI's survey, the census

data capture progress by LLEE and MEIDECC so the number of household tanks would be expected to be further increased from MORDI's 2020 survey (Tonga Statistics Department, 2022).

However, while these census data report an increase in use of household tank water by 'Eua's households from 2016 to 2021, the increase is more moderate than that reported by MORDI, with the use of alternative water sources continuing to be reported. It is important to note that some difference in these data sets is expected, due to both the use of different methodologies, and expansion of 'Eua's communities between 2020 and 2021. However, the level of variance surpasses what would be expected, further suggesting limitations in MORDI's reporting.

Overall, regardless of the data sets consulted, clear progress towards universal access to household water tanks on 'Eua is evident. Percentage shifts in household drinking-water source use are shown in Figures 4.5 and 4.6. These shifts indicate that, in both of 'Eua's districts ('Eua Motu'a and 'Eua Fo'ou), access to household water tanks saw at least a 10% increase, primarily as a result of a reduction in households relying on neighbouring water tanks. This shift demonstrates the success of MORDI's project, with clear progress towards project goals.

Figure 4.5

Percentage Change in 'Eua Household Drinking Water Supply Following MORDI's 2020 Project.

Note: Full drinking-water source figures are shown in Table 4.3. Data from Tonga's 2016 and 2021 Censuses (Tonga Statistics Department, 2019, 2022).

Figure 4.6

Percentage Change in 'Eua Household Drinking Water Source Following MORDI's 2020 Project

Note: Full drinking-water source figures are shown in Table 4.3. Data from MORDI (2020) surveys.

4.6.1 Critique of Evaluation

MORDI's (2020) evaluation of the 2020 'Eua water security project was primarily limited to evaluation of water-tank delivery and installation. Beyond data collected on household access to water tanks, the project evaluation identified that additional training was required to upskill community members before they could support the installation process. This evaluation did not measure the impact of VWC development, plumbing skill and system-repair training, or household tank-maintenance training. These were key elements intended to support the sustainability of this project.

A key limitation of MORDI's 2020 evaluation report is that it (understandably) did not extend to incorporate progress made by other organisations. During MORDI's implementation period and in the months following, LLEE and MEIDECC's National Water Tank project also provided water tanks to households on 'Eua. As noted previously, MORDI's collaboration with these organisations was limited to the sharing of data to avoid duplication; importantly, this collaboration did not extend to evaluation. All evaluation appears to have occurred by each organisation in silos. By conducting the evaluation before LLEE and MEIDECC had completed their projects, MORDI may have missed an opportunity to accurately capture the final status of water security on 'Eua.

Expanding and delaying project evaluation in future projects may support MORDI to more accurately identify the effects of their projects on communities (both direct and indirect), including consideration of the beneficial leveraging impact that their work may have on the viability of initiatives by other agencies (as may have happened in this case). Delaying post-project evaluation could therefore provide greater understanding of MORDI's overall impact and identify additional opportunities for future action to maximise project benefits. Wider evaluation would also enable MORDI to determine whether projects are working as intended and identify improvements for future implementations.

MORDI's post-implementation survey data are at odds with reports of nonparticipation by some qualifying households and ineligibility by those without appropriate structures to support household tanks. The congruency of MORDI's pre-implementation survey and the 2019 Tongan Census indicates that census data are appropriate to estimate levels of water-tank access on 'Eua, therefore Tonga's 2021 Census data can be reasonably used to estimate levels of water tank access on 'Eua following implementation.

Utilising census data in the future may therefore provide a more reliable and more useful record of the stored water capacity on 'Eua. However, importantly, stored water capacity is only one component of water security, without additional insights into the impact of water safety training and other implementation goals, levels of access to safely managed water supplies will remain unknown.

4.7 CDP Analysis

Analysis of CDPs enables shifts in village community-development priorities to be tracked. Thus, unlike implementer project reports, these data go beyond assessment of specific project outcomes to provide insights into the broader impacts of development work as identified by village community members.

On 'Eua, the timing of CDP updates in relation to water-development projects provided the opportunity to assess the broad outcomes of MORDI's water project. 'Eua's initial CDPs were prepared in 2019 and the major water-tank projects initiated in 2020. The updated CDPs published in 2025 reflect the impact of MORDI's water projects, along with the impacts of similar water-tank projects by LLEE and MEIDEC, and other water-development projects conducted by Sione's Foundation (in 2023) and the Tongan National Youth Congress.

Co-designed with village community members, CDP data are grounded in the lived perspective, and 5 years on from the water tank projects, the reality of progress made through these

interventions is likely reflected in the updated documents. These CDP data are considered in this case study alongside interviews and internal reporting by implementer organisations to support evaluation of project effectiveness and implementer approaches. However, it is impossible to completely disaggregate the impacts of these projects on CDP priorities.

CDPs are rich sources of data, including both rankings of development areas and statements that identify development problems, their causes and impacts; as well as possible solutions, outputs and outcomes to address these problems. To best utilise this depth of data, CDP analysis in this work occurred in two phases. Phase 1 considered the ranking of development priorities quantitatively, while Phase 2 took a qualitative approach, focused on shifts in the nature of development issues, causes and solutions.

This analysis compares 2019 and 2025 CDP data, alongside interview responses, and key data from TPH, TWB, and Asia Development Bank (ADB). The key water issues, as identified by ’Eua village communities in the 2019 and 2025 CDPs, have been organised into five key themes, summarised in Figures 4.7, 4.8, and 4.9, and discussed in Section 4.7.2.

4.7.1 Comparison of Water Prioritisation From 2019-2025 CDPs

The changes in the priorities identified by each community's disaggregated demographic groups (women’s, men’s, youth), and by each community as a whole, are presented in Table 4.4, shown as both a percentage of communities and as a raw score (number community groups out of the 15 comparable groups on ‘Eua, or six and nine on ’Eua Motu’a and ’Eua Fo’ou respectively). Water prioritisation was measured by assessing the listing of water: as the top priority, within the top three priorities, and within the CDP priorities at any ranking.

Table 4.4

CDP Priority Comparisons 2019–2025 From ’Eua’s Demographic Groups and Communities (Shown by District and Island)

	Year	Water listed as top priority	Water listed in top 3 priorities	Water listed as any priority
Whole island by groups				
Eua women's groups	2019	53% (8/15)	93% (14/15)	100% (15/15)
	2025	20% (3/15)	53% (8/15)	67% (10/15)
	Change	33% neg	40% neg	33% neg
Eua men's groups	2019	27% (4/15)	87% (13/15)	93% (14/15)
	2025	13% (2/15)	47% (7/15)	73% (11/15)
	Change	14% neg	40% neg	20% neg
Eua youth's groups	2019	13% (2/15)	47% (7/15)	67% (10/15)
	2025	0% (0/15)	27% (4/15)	47% (7/15)
	Change	13% neg	20% neg	20% neg
Whole island by district				
Eua Motu'a communities	2019	67% (4/6)	83% (5/6)	100% (6/6)
	2025	17% (1/6)	67% (4/6)	100% (6/6)
	Change	50% neg	16% neg	0%
Eua Fo'ou communities	2019	33% (3/9)	78% (7/9)	100% (9/9)
	2025	11% (1/9)	67% (6/9)	90% (8/9)
	Change	22% neg	11% neg	10%
Whole island				
Eua communities	2019	47% (7/15)	80% (12/15)	100% (15/15)
	2025	13% (2/15))	67% (10/15)	93% (14/15)
	Change	34% neg	13% neg	7%

Note: Neg is used to indicate a reduction in reporting percentage

Table 4.4 demonstrates that while drinking water development has decreased as a priority concern across all groups on ’Eua, it remains a key development issue. In both 2019 and 2025, there were clear differences between the priority ranking of drinking-water development between women's, men's and youth groups in the ’Eua communities.

Across the communities, in both 2019 and 2025, women's groups were more likely to list drinking-water development as a priority and to list this as a higher priority than the men's or youth groups. However, all groups saw the prioritisation of drinking-water development decline,

both as top priority, within the top three priorities, and as a listed priority within the CDP. The decline in communities listing drinking water in the CDP priorities from 2019 to 2025 was notable across all three groups, with a 33% decrease for women's groups, and 20% decrease for men's and youth groups.

At a district level, the shift from 2019 to 2025 is less dramatic. Similar changes were seen between 'Eua Motu'a and 'Eua Fo'ou, with 'Eua Motu'a seeing a larger decline in communities listing drinking water development as a top priority, a decline of 22% compared to 50%.

Overall, drinking water improvement has become a lower priority for communities in 'Eua from 2019 to 2025, with a 34% decline in communities listing water as their top priority, a 13% decline in the inclusion of drinking-water development in the communities' top 3 priorities, and a modest 7% decline in the inclusion of drinking-water development in the CDPs. Discussion with both implementers and community members confirmed that the drop in priority is a genuine response to water improvement on 'Eua, rather than a result of newer and more urgent problems becoming apparent.

Overall, these results indicate that while progress is being made, development of drinking water for 'Eua's communities still requires further action, as two thirds of the communities still listed it as one of their top three priorities. The differences seen in the prioritisation of water by women's, men's and youth groups demonstrate the importance of representation in community consultation and co-design processes, reinforcing the strength of MORDI's disaggregated approach to CDP development.

4.7.2 Using the CDPs to Further Explore Drinking Water Issues

This analysis compares 2019 and 2025 CDP responses, alongside interview responses from community members and implementers, and key data from TPH, TWB, and ADB. Figures 4.7, 4.8 and 4.9 set out the frequency of different drinking-water problems, impacts and solutions identified by 'Eua's 15 village communities, comparing responses from 2019 and 2025. Language from the development plans has been used where possible and responses have been kept within the categories they were reported in (problem, impact, solution); however, similar phrases have been grouped together to support comparative analysis, for example: increased disturbance from asking neighbours for water and damage to social living.

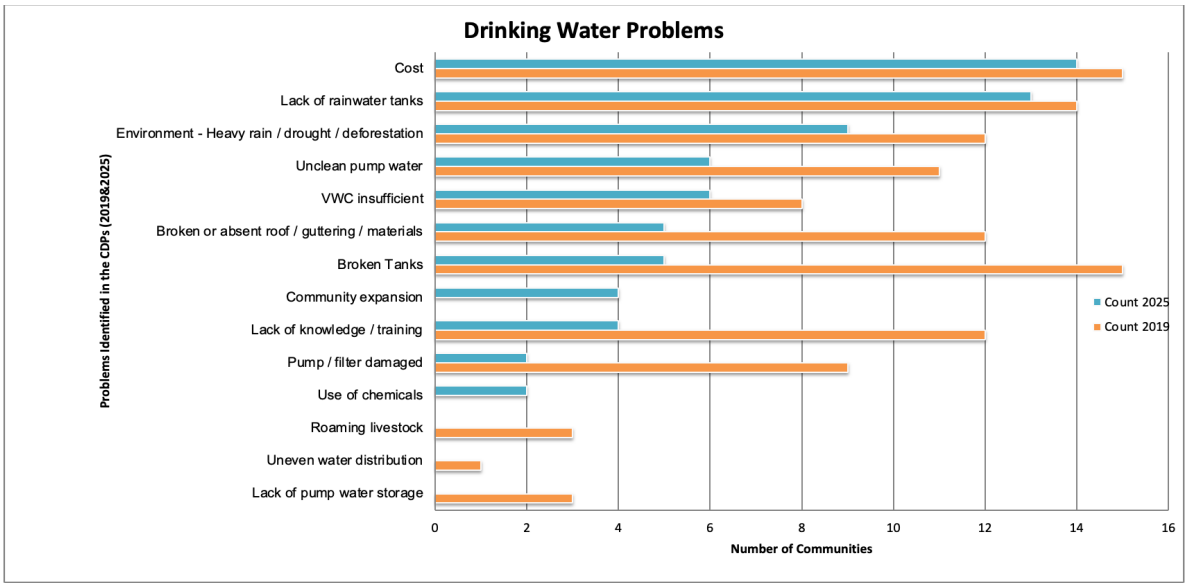

Figure 4.7

Frequency of Identification of Drinking-Water Problems by 'Eua's 15 Village Communities in the 2019 and 2025 CDPs

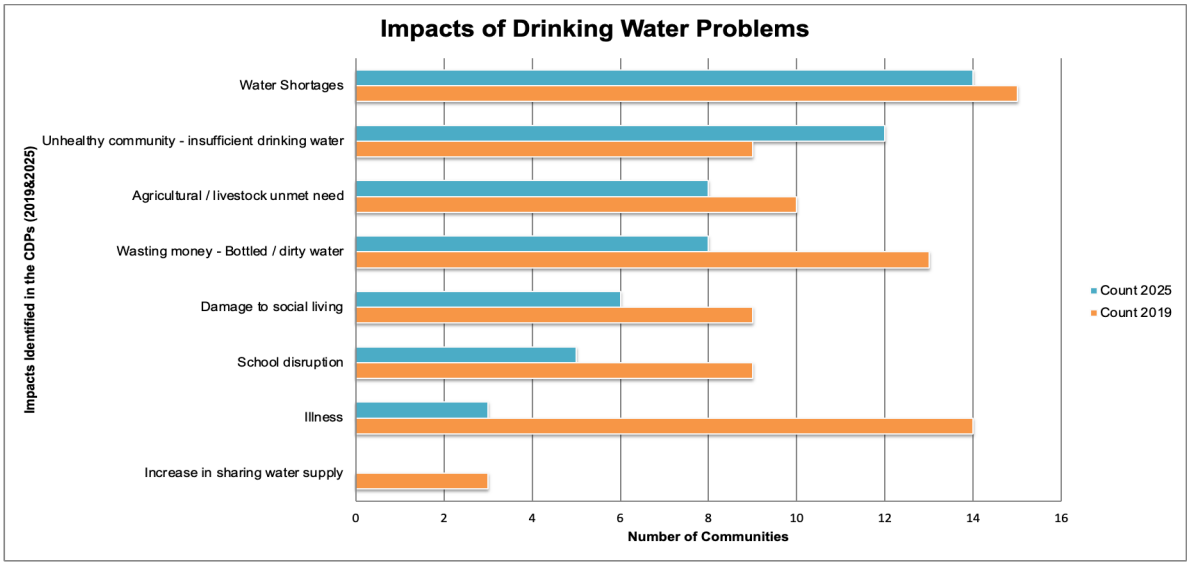

Figure 4.8

Frequency of Identification of Drinking Water Problem Impacts by 'Eua's 15 Village Communities in the 2019 and 2025 CDPs

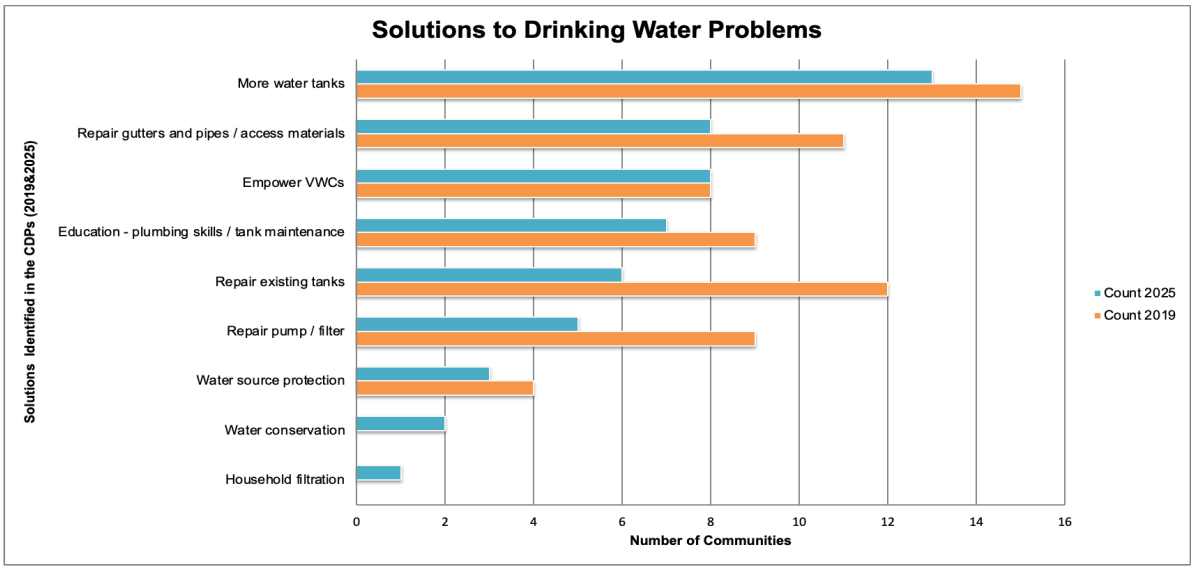

Figure 4.9

Frequency of Identification of Solutions to Drinking-Water Problems by ’Eua’s 15 Village Communities in the 2019 and 2025 CDPs

The key water issues as identified by ’Eua’s village communities in the 2019 and 2025 CDPs have been summarised under five key themes.

Resources. The key findings under this theme are (1) lack of water tanks remains the prominent issue in communities; (2) damage to tanks and guttering systems, while reduced, continues to be an issue; however, tank damage appears to be limited to cement tanks; and (3) materials for repair and replacement of systems remain inaccessible due to cost and practical limitations.

Lack of Water Tanks. Water improvement in ’Eua’s 2020 projects aimed to ensure that all households on ’Eua had access to a rainwater tank. These initiatives were a direct response to the 2019 CDPs, which reported that many households either lacked water tanks entirely or relied on damaged cement tanks. The 2025 CDPs show that despite these projects, lack of water tanks remains a prominent issue. However, while there are still some houses without access to their own water tanks, conversations with community members and local implementers suggest that most households now have at least one tank, and that, for many, the continued concern reflects a growing desire for multiple tanks per household. As such, lack of drinking-water storage remains the prominent water issue for ’Eua’s communities, reported by 13/15 communities (compared to 14/15 in 2019).

Drought preparedness was reported by community interview respondents as the key driver for community members requesting multiple tanks. Interview respondents noted that those with two tanks were happy that they could cope during droughts, while those with only one tank were worried. Among those most concerned were households with only one 3,000 L tank.

It is important to note that drinking water tanks are not the only water supply available to ’Eua’s communities. Following the significant upgrade by Sione’s Foundation in 2023, the town supply, centrally managed by the TWB is a reliable source of potable water accessible to 90% of ’Eua’s households. As such, the volume of rainwater required in reserve for drought protection is far reduced. Even for those uncomfortable with drinking from this source, tank capacity would only need to be sufficient to provide for drinking, with the town supply available to meet other water needs.

Lifestyle change has further increased demand for water tanks. ’Eua’s 2025 CDPs acknowledge that communities have expanded in some areas, reported by 4/15 communities. This expansion was attributed to family growth, with more people living under one roof; migration into communities; and a shift away from intergenerational living toward multiple households residing on the same block of land. Implementers noted this trend as a key challenge. For MORDI, it highlights a limitation in their approach. MORDI’s project aimed to provide a one-time implementation, delivering a stable tank network for target communities. A key component to the sustainability of this tank network is the requirement that water tanks stay in their designated position within the target community and are not shifted as families move. Ongoing community growth challenges the long-term sustainability of this model. As communities expand, there will be further need to identify additional funding sources and projects to support emerging households. It is clear that water-tank provision cannot be treated as a one-time implementation.

Damage to Tanks and Guttering Systems. Broken water tanks were a prominent issue in 2019, reported by all 15 of ’Eua’s communities. In 2025, this dropped to 5/15 communities, reflecting the work done by MORDI and other organisations to replace these broken tanks in 2020. Respondents from these five communities noted that some cement tanks that were functional in 2019 have since been damaged by weather events. It is notable that there were no reports of damage to the plastic tanks supplied as part of this project in 2020. Data from the MEIDECC project further support this finding, identifying that of the more than 6,500 tanks they have now supplied to communities throughout Tonga, only two have been recalled due to

damage. This indicates the resilience of plastic tanks to Tonga's climates and weather events, demonstrating the appropriateness of these systems.

Damage to roofs and guttering systems saw a large drop as a priority issue, reported by 12/15 communities in 2019 compared to 5/15 communities in 2025. This decline is notable given the number of extreme weather events that have occurred since implementation, suggesting that some communities have been able to carry out repairs. The communities' capacity to make repairs was acknowledged by a community member from 'Eua, who noted that the training they received enabled them to help their community to repair issues when required. One community noted in their CDPs that the damages were a result of poor installation. This issue highlights the strength of supported installation as part of implementation and indicates a need for further training support in some communities.

Cost and Inaccessibility of Materials for System Repair and Replacement. Cost remained a dominant issue, reported by 14/15 communities compared to 15/15 in 2019. Beyond the cost of the water tank itself, respondents noted that the cost of shipping tanks and materials from Tongatapu to 'Eua or travelling across to purchase these was a key limitation that restricted households from undertaking maintenance and repairs, and from expanding their systems independently. Interview respondents identified that making these materials available locally would improve access. Specific solutions were beyond the scope of this research; however, further inquiry to explore options would be valuable.

Water Quality and Quantity. The key findings under this theme are (1) the quality of the town supply continues to be reported as a key issue despite upgrades to the Petani water plant; evidence suggests this is a result of communities' residual low trust in the supply; (2) 2025 CDP responses indicate communities are increasingly looking towards new technologies and innovative water solutions; (3) water conservation is an emerging topic as water becomes more available on 'Eua; and (4) the cleanliness of tank water appears to have become a lower priority for communities.

Quality of the Town Supply. The town water supply has been a long-standing issue for village communities in 'Eua. Following improvements made to the plant in 2023, issues with town supply (quality and reliability) reported in the CDPs declined from 11/15 in 2019, to 6/15 in 2025. The cause of these supply issues remained unchanged in the CDPs between 2019 and 2025, attributed to weather events, and human impacts such as deforestation and roaming livestock. While these causes did not change, the discussion shifted to become more recovery

focused. Communities discussed the replanting of cleared areas and remedial planting around water catchments, fencing of water catchments, and prohibition of roaming livestock and further deforestation.Low trust in the town water supply (its quality and reliability) was a key theme identified in the CDPs and by interview respondents, both from the community and implementing agencies. This is a key limitation for rainwater tank projects in ’Eua, as these are developed to supply drinking water only, with the required capacity determined on the understanding that households in ’Eua have access to a town supply to support other water use.

Encouraging ’Eua’s communities to view household water tanks as part of a larger system, rather than the whole system, will be key to the long-term success of water tank projects. A common response heard from those requesting more tanks, is that one tank is insufficient to provide for their household during droughts. However, a reliable, drought-resilient town supply should mitigate this concern, allowing the tanks to be reserved for drinking only. Further, if the tanks run dry, as a potable supply, the town-supply water can be used for drinking as required (with or without boiling).

New Technologies and Innovative Water Solutions. Another key shift identified was the need for innovative solutions to address water supply issues. In the 2019 CDPs, the focus was on repairing or replacing water pumps and generators, or other specific pieces of water equipment. In 2025, fixing water pumps and filters was still requested (dropping from 9/15 communities in 2019, to 5/15 communities in 2025) but it was more common to see requests for external advice and assessment to identify long-term solutions. This may be a product of changing attitudes throughout Tonga; however, it may also be a result of MORDI’s broader work, which has encouraged the use of research and external experts such as geologists and engineers to provide advice to guide the construction of resilient buildings and the development of innovative planting systems and practices. This shift demonstrates the capacity for the introduction of new ideas through co-design processes.

Water Conservation as an Emerging Topic. Water conservation is an emerging conversation among implementing agencies and community members. Community members noted that while previously water conservation was strongly ingrained in society, now, with freely available water, habits are shifting. This was also acknowledged by the TWB that noted that water usage has been steadily increasing since the plant opened in 2023, to the point where now ’Eua is now using 800,000 L per day. Based on a standard usage rate of 100 L/person/day (Howard et al., 2020), ’Eua’s total daily expected water usage would be approximately 500,000 L (assuming use by 100% of ’Eua’s population). Noting that this rate of

800,000 L per day excludes any use of rain tanks, it seems that increased water conservation efforts are required. These might include pipe checks to reduce the volume of water being lost in the reticulation network, and education to encourage water conservation behaviours. Again, specific solutions are beyond the scope of this research; however, further inquiry to explore options would be valuable.

Cleanliness of Tank Water a Lower Priority. The safety of water supplies is a key consideration. While households are responsible for maintaining their own tanks, community tanks (schools and community halls) are maintained by VWCs with support from TPH. TPH personnel reported that due to limitations in funding and resources, despite aims of quarterly community water testing, in reality, testing occurs annually on the mainland and sporadically on outer islands. Similar limitations are seen for chlorine treatment of these tanks, with shortages of staff and chlorine (calcium hypochlorite) impeding regular implementation. This inconsistency likely contributes to high levels of *E.coli* contamination in Tongan rainwater tanks reported by ADB (2023), which increases health risks associated with Tonga's drinking water. As a result, the safety of these supplies relies on management by the VWC.

Given this health risk, TPH recommends boiling drinking water from tank supplies, particularly for vulnerable populations such as children, the elderly, and immunocompromised individuals; however, implementer respondents reported that adherence to this guideline has diminished over time. Another key protective practice encouraged by TPH is "first-flush" diversion, which can be achieved manually by disconnecting tanks before the first rain following a dry period, or through first-flush devices; however, it is believed that adherence to this practice is similarly low.

Chlorine is offered to households sporadically, limited by low supply. While the treatment of community tanks is prioritised, these too are treated inconsistently due to low supply. The 'Eua public health officer noted that chlorine is not popular among all communities, some rejecting it because of the taste, others not approving of chemicals being added to their water. A key challenge presented is the belief that because rainwater comes from the heavens it is safe and good to drink. This indicates the need for education around the contaminants that roof catchments introduce to the water source.

Declines in water safety practices, such as cleaning water systems and boiling water are attributed by TPH to complacency due to a lack of waterborne outbreaks in recent years (the last occurring in 2015). While there is no specific data beyond a lack of recorded outbreaks, local health professionals indicate that water-borne illnesses are uncommon on 'Eua. This is

further supported by CDP findings that show concern for water-borne illness has declined, reported by only 3/15 communities in 2025 compared to 14/15 in 2019. While this may suggest improvements in water quality, it is suggested by TPH and MORDI implementers as being more closely linked to improved sanitation.

TPH identified health literacy as a key limitation, suggesting that many community members do not understand the importance of water-treatment protocols, and that education to encourage water safety should be a priority.

Sustainability. The key findings under this theme are (1) maintenance of tank systems and the related training are a key challenge; (2) while VWC performance has improved since 2019, many communities still report that they are inactive, requiring empowerment; and (3) the role of the Tongan National Youth Congress in household-tank maintenance has been poorly communicated with communities.

The Challenge of Tank-System Maintenance. Maintenance of tank systems was identified as a key challenge for communities. Surveillance of household water tanks by the TPH team identified bacterial contamination (measured through *E. coli* testing) as an issue for the majority of tested household tanks. The ADB 2023 VWC pilot report similarly found bacterial contamination (using *E. coli* levels as an indicator) in rainwater tanks to be alarmingly high. Of the three pilot villages tested, ADB reported rates of unacceptable *E. coli* contamination (>1 colony forming unit /100 mL) in water tanks at 68%, 73%, and 33% of household water tanks, ADB attributing this contamination to poorly maintained systems. This ADB report recommended a focus on the regular cleaning of tanks, guttering and roofs, and public education to encourage the boiling of water. This testing was all conducted on Tongatapu, and while water-quality data specific to ’Eua’s household tanks is not available, it is assumed that these results are representative of household tanks across Tonga. In line with this, the need for greater focus on roof-catchment system maintenance on ’Eua was identified by community respondents and local implementers alike.

VWC Activity and Effectiveness. At the community level, poor maintenance and lack of ongoing training was linked to VWC insufficiencies. A key issue in 2019, it remains relevant in 2025, declining slightly from 8/15 communities in 2019 to 6/15 communities in 2025. However, the nature of the issues has shifted. While earlier reports often cited the absence of VWCs, the 2025 findings highlight that while VWCs now exist in every community (following their

establishment in 2020), some are inactive or ineffective, needing empowerment or (in the view of some), leadership changes.

This change demonstrates a key success of MORDI's 2020 project-implementation design, which required each community to maintain a VWC. These committees, along with other community members, were actively engaged in project implementation and trained in water-system repair, maintenance, and plumbing skills. In doing so MORDI's 2020 project developed significant capacity in target communities.

Interview respondents highlighted this capacity as a major opportunity, noting that many VWC members have the knowledge and skills to train and support the community in managing their water systems. Reflecting these comments, reports of training and knowledge deficiencies dropped from 12/15 in the 2019 CDPs to 4/15 in 2025, indicating substantial progress; however, gaps clearly remain. Respondents emphasised the need for ongoing support, with those trained in 2020 requiring refresher training and motivation to remain active. At present, VWCs tend to be engaged only during disasters or extreme weather events. However, with further support, they have the potential to lead regular community-based training and water-system management.

Challenges to activating VWCs were identified consistently by community and implementing organisations, a key feature being that "nobody works for free." It was suggested by interview respondents that VWC members might be more engaged if they had access to ongoing training and development or received some benefit.

While ongoing maintenance is the responsibility of the household, this is intended to be monitored by local public health officers. Due to short staffing and funding limitations within TBH, there is little capacity for this work. Supporting VWCs to take on this role presents a possible solution.

Expectations Regarding the Role of the Tonga National Youth Congress. A key theme presented in community interviews was the expectation that the Tonga National Youth Congress water-tank-cleaning programme would continue to clean household tanks each year, and that this should be relied on as the primary means of tank cleaning. Providing a portable reverse osmosis capability, this organisation enables tanks to be cleaned without disposing of the water they are storing. This capability has been deployed on 'Eua previously following Tropical Cyclone Harold in 2020 and the Hunga Tonga eruption in 2022. Discussions with MEIDECC's National Tank project implementers indicate that funding for this work from the GoT

is likely to be made available for community tanks (schools, and community halls); however, it will not be made available at the household level outside of disaster response efforts. NGOs have previously funded this work on an ad hoc (when funded, necessary or needed) basis; however, interview responses indicated that this ad hoc nature has not been well communicated. Reliant on external funding, supporting the outsourcing of tank cleaning at a household level is unsustainable and potentially disincentivises communities from establishing routine cleaning systems for their tanks.

Equity. The key findings under this theme are (1) MORDI's project design supports equitable access to the project benefits; (2) supporting women's involvement in water system management is a key opportunity; and (3) specific access for elderly and disabled people is not required due existing support in place.

MORDI's Project Design Supports Equitable Access. Maintaining an equity lens in water development is critical to prevent exacerbating existing inequalities. MORDI's long-standing relationship with its target communities supports it in managing these dynamics; however, equity gaps require ongoing attention. Interview respondents from the community and implementing agencies consistently reported that all community members benefited equally from the water-tank projects, with no one being left out. This was primarily supported by MORDI's project design. The household survey process requires that MORDI implementers visit each household to verify the water resources available. In doing so they ensure access for all community members, including those who may be less active in the wider community.

Equity is further supported through the use of strict eligibility criteria that prioritises those most in need: households with large numbers (10+), elderly or disabled members, and/or widows as head of household. These criteria are strictly upheld as a key feature of MORDI's approach, MORDI implementers emphasising that to maintain trust with their target communities it is critical that no favouritism is shown. The use of strict criteria ensures that support for households and communities is always fair and transparent.

However, the requirement for homes to be physically suitable to host a roof-catchment system (sufficient building height, roof condition, and structural stability) pose a barrier to access. MORDI addressed this barrier by connecting vulnerable households to nearby community catchment systems or installing multiple tanks at a neighbour's home to enable it to serve more than one household.

Recognising and Promoting the Central Role of Women. While there has been an intentional effort to include women in the consultation, implementation, and training components of water projects, both community members and implementers emphasised that this must remain a key area of focus. Data from both the 2019 and 2025 CDPs demonstrate that women are more likely to recognise water as a priority than men and youth in their communities (Table 4.4). This is consistent with interview respondent feedback that identified that women spend a lot more time in the home and have greater interaction with water than men or youth. As a result, women tend to have a more immediate awareness of water issues and are more likely to identify problems such as leaks or storage shortages. As the typical primary household managers, women were identified as more proactive in managing water reserves, and responsible for preparing for dry seasons or drought. As such, women are identified as a target group for maintenance and repair training. Strengthening women's capacity in this area not only addresses practical household needs but also contributes to more resilient and sustainable water systems at the community level.

Equitable Access for Elderly and Disabled People. Elderly and disabled people were not identified by interview respondents as needing any particular accommodations to support water access. Both community and implementer respondents maintained that elderly and disabled people receive support from their families and community, so specific accommodations for water access are not required. This is supported by the CDPs for both 2019 and 2025, in which acknowledgement of any particular water issues for elderly and disabled people is absent. MORDI implementers commented that while they do not supply any specialist equipment, some families independently install pumps to run water inside for these family members.

Social Impact. The key findings under this theme are (1) improvements to water systems have improved social living; however, there are still gaps; and (2) increased water access has supported school operations and attendance; however, legacy water concerns continue to influence CDP responses.

Improvements to Water Systems Improved Social Living. Disruption to social living emerged as a significant theme in the 2019 CDPs, reported by 9/15 communities. This reduced to 6/15 in 2025. These disruptions were attributed to households needing to share water, with disruptions most significant during periods of water shortage.

Key concerns identified in the CDPs were that families often have to send children out in the evenings to collect water from neighbours or distant sources. This is disruptive to household routines and poses safety concerns for children. These ideas were supported by community and implementer interview respondents; however, they noted that this issue was not universal. One respondent explained that, in their village, everyone was family so sharing water was not problematic; they felt comfortable collecting what they needed from one another. While reports of this disruption declined in 2025, the continued reporting of these issues suggests there is still unmet need in some communities.

Increased Water Access Supported School Operations and Attendance. School interruption is a further impact noted by 9/15 communities in the 2019 CDPs. This is due to water stoppages, either at the school, preventing them from opening; or in some households, preventing some families from being able to appropriately prepare for school each day. Interview respondents reported that when the town supply stops or becomes unusable, it will often be days before school resumes. In the 2025 CDPs, 5/15 communities reported disruption to school due to water shortages, an improvement from 2019. In 2025, this was linked to concerns about the reliability of the reticulated supply, so it is possible that these concerns reflect a lack of awareness of the reticulated system upgrades made in 2023.

4.8 Organisation Comparison

While this case study focused specifically on MORDI's water resilience project, two other key agencies (MEIDECC and LLEE) have also been involved in providing 'Eua with water tanks, associated infrastructure, training and other support. The main developments occurred during 2020, with some ongoing activities continuing since then. Like MORDI, MEIDECC and LLEE focused on the provision of water tanks with the goal of ensuring water security for 'Eua's households. The similarities in these projects provide the opportunity for agency approaches to be compared and key strengths and weaknesses to be identified.

Data for this comparison were drawn from interviews with implementers from each organisation within their professional capacity, alongside interviews with key public service personnel. These interview data were further supported by assessment of key documentation provided by each organisation.

This assessment utilises the five-factor adaptation success framework adapted from McNamara et al. (2020), as used to assess interventions in Section 3. Results are summarised in Table 4.5 and discussed in the sections following.

Table 4.5

Summary of Strengths and Limitations for Development Agency Approaches as Assessed Against the Five Components of Adaptation Success From McNamara et al. (2020)

Components	MORDI	MEIDECC	LLEE	Key factors discussed
Appropriateness	**Strength**: Based on CDPs + household surveys for specificity. **Limitation**: Limited capacity for evidence-based development.	**Strength:** Informed by community requests. **Limitation:** Projects are not designed specifically for the community; there may be more appropriate options available.	**Strength**: Based on resilient community profiles and resilient community plans. **Limitation**: Limited capacity for evidence-based development.	1) Identification of recipients influenced the approach to ensuring appropriateness (community driven vs project driven). 2) Capacity to introduce innovative solutions may be limited in grass-roots approaches.
Effectiveness	**Strength:** Development of VWCs. **Limitation:** Lack of ongoing input	**Strength**: Capacity to deliver a large volume of tanks. **Limitation**: Lack of support for training and developing community capacity.	**Strength**: Capacity to collaborate with MEIDECC to support training and implementation both proactive and reactive. **Limitation**: 3,000L tanks may not provide sufficient water for a household.	1) Lack of data collection and data sharing is a key limitation across organisations. 2) Inconsistency presents challenges for organisations, some of these may be addressed by greater collaboration. 3) Training and development is a key opportunity for all organisations.
Equity	**Strength**: CDP development process ensures needs identified are representative. **Limitation**: Women centred training was not provided.	**Strength**: Prioritise the most vulnerable. **Limitation**: Lack of control in the implementation, sometimes tanks remain disconnected—more likely in less resourced households.	**Strength**: Prioritise the most vulnerable. **Limitation**: CRP and community WASH profiles developed by a community-resilience working group, limited engagement means opinions may not be representative of the whole community.	1) Prioritisation of recipients was common across organisations. 2) Barriers to participation were common across organisations. 3) Gender-based training is an opportunity for all organisations.

Components	MORDI	MEIDECC	LLEE	Key factors discussed
Impact	**Strength**: Development of CDPs and VWCs which become a resource for the community. **Limitation**: NA	**Strength**: NA **Limitation**: NA	**Strength**: CRPs and WASH plans become a resource for the community. **Limitation**: NA	1) Development of VWCs. 2) Development of community resources. 3) Promotion of community-grounded development.
Sustainability	**Strength**: Focus on training and VWC development. **Limitation**: Lack of ongoing training and support.	**Strength**: NA **Limitation**: No training built into the implementation.	**Strength**: Focus on training and developing community capacity. **Limitation**: Lack of ongoing training and support.	1) Community ownership. 2) Tank maintenance and repair. 3) Systems thinking in water development. 3) Resilience to community changes.

4.8.1 Appropriateness

The factors influencing appropriateness identified through this comparison are (1) identification of recipients—community driven versus project driven; and (2) capacity to introduce innovative solutions.

Identification of Recipients. All organisations reported using Tongan Census and CDP data for initial recipient identification and then collecting additional data to increase specificity to support planning. MORDI and LLEE then utilise community-driven approaches, engaging directly with communities to identify these specific needs.

Using a community-driven model, both MORDI and LLEE begin by selecting a community, then identify projects that reflect local priorities, such as the widespread demand for water tanks on ’Eua. Accurate assessment of needs and priorities is supported in MORDI’s approach by ensuring alignment with CDPs and then undertaking household surveys to identify recipient households. Similarly, LLEE develops CRPs and WASH profiles through collaboration with community working groups. While LLEE’s approach does not engage at the household level as MORDI’s does, both approaches prioritise the alignment between community and project goals.

Conversely, MEIDECC follows a project-driven model. It responds to community applications, typically submitted by town or district officers, before verifying requests through community consultations. Aiming to prioritise applications based on need, MEIDECC’s key consideration for water-tank delivery is total water availability. This has led to a lower initial priority for ’Eua due to

the presence of a surface water supply. Notably, despite identifying drinking water as a key development priority in the CDPs, as local government officers did not make an application, ‘Eua was not initially included in the National Tank project. This failure to accurately capture community needs indicates a flaw in MEIDECC’s project design.

While MEIDECC increases the likelihood that tank provision aligns with community needs by basing its support on community requests, MORDI and LLEE’s community-first approaches better ensure strong alignment with local priorities. The focus on alignment with the CDPs ensures MORDI’s design is based on representative priorities, further supporting appropriateness.

Across all models, donor priorities and funding constraints ultimately influence what can be delivered and to whom. This is particularly notable in MEIDECC’s water projects, which, depending on available funding, provide different levels of support (tank, gutters, concrete slab). Recognising this limitation, LLEE has further expanded its support by partnering with MEIDECC to provide training and small-resource support to enhance MEIDECC’s delivery. Highly responsive to community needs, LLEE’s flexible approach to implementation has supported the overall appropriateness of the water tank projects on ‘Eua.

Capacity to Introduce Innovative Solutions. Plastic rainwater tanks are widely considered an appropriate solution to improve drinking water access in Tonga. However, broader WASH improvement may require the adoption of innovative solutions, which are innovative either by their own nature or for that specific location (for example, atmospheric water generators or reverse osmosis technologies).

A key risk of community-driven approaches, like those of MORDI and LLEE, is that solutions may be limited to those that are already familiar to community members. Therefore, while co-design supports cultural alignment, it does not guarantee that selected solutions are optimal for the physical context. Therefore, by determining viable solutions and retrofitting them to community needs, MEIDECC’s approach may better support the implementation of innovative solutions.

Recognising this limitation, MORDI has been an advocate in communities for funding research to develop evidence-based solutions specific to a village community’s physical context. CDP data from 2025 suggest that this has been effective, with a number of communities listing research and external assessments in their identified solutions for water issues.

4.8.2 Effectiveness

The factors influencing effectiveness identified through this comparison are (1) the lack of data collection and data sharing is a key limitation across all three organisations; (2) inconsistent approaches between organisations present challenges (may be addressed by greater collaboration); and (3) training and capacity development are key opportunities for all three organisations.

Data Collection and Sharing. Implementation by all organisations on ’Eua was supported by a clear understanding of the scale and location of need. MORDI conducted a detailed household survey that identified each household by name and documented their access to water tanks, as well as limitations (such as roof height and quality) that could impact system suitability. This survey was later annotated to track which households would receive support through MORDI’s project, creating a transparent record of unmet need on the island. MEIDECC and LLEE’s projects were then able to respond to these remaining households, coordinating efforts to prevent duplication. Interview respondents noted that this level of collaboration was atypical for water-tank projects across Tonga. While the reported version of these data appears to have some errors (Table 4.3), the success of this approach highlights the benefit of increased collaboration in the implementation of water projects in Tonga.

Across Tonga, there is a lack of centralised “mapping” of water access and resource distribution. This is a particular challenge for large islands like Tongatapu, where multiple organisations have implemented overlapping water initiatives. This lack of integration leads to duplication and gaps. MORDI and LLEE both reported instances where they arrived in communities ready to install tanks, only to find that the National Tank project had already delivered tanks. Some of these also remained uninstalled, or were not delivered to the recipient households identified by the town officer, or were delivered in incorrect quantities.

This lack of coordination and collaboration extends beyond physical activities. Across Tonga’s water development sector, key information, including CDPs, CRPs, community WASH plans, and monitoring and evaluation (M&E) reports, remains siloed. Organisations consistently identify the lack of a supported information-sharing network as a major barrier. Beyond improving individual projects, better data sharing could enable stronger coordination and learning across the sector. In particular, sharing M&E findings could contribute to continuous improvement in development approaches.

Inconsistency in Approach—Opportunity for More Collaboration. MEIDECC has delivered over 6,500 tanks across Tonga through the National Tank project as of 2024. However, the project faces several limitations that impact effectiveness: limited oversight of tank delivery, inconsistent provision of system components, and a lack of training on maintenance. Programme funding is the primary factor leading to this inconsistency. Funded by various donors, depending on the funding period, households may receive any combination of tank components: tanks, stands, concrete pads, gutters, and installation support. On ’Eua, delivery was restricted to tanks only.

LLEE provided 52 complete water-tank systems to households and community facilities on ’Eua. As a smaller organisation often constrained by funding, LLEE plays a key role in partnering with MEIDECC to fill the identified gaps, supporting installation, supplying gutters, and delivering maintenance training. LLEE implementers identified that, while sometimes this collaboration is planned, other times it is more reactive, as disconnected tanks are identified in target communities.

While the MEIDECC’s tank delivery on ’Eua included only the tanks, close collaboration allowed LLEE to supply gutters and provide installation and maintenance support to some recipient households. This highlights both the benefits of collaboration and the need for stronger data-sharing frameworks to support organisations to identify and address gaps more effectively.

MORDI’s implementation also faced unique challenges due to overlap with other programmes. Its model required a co-payment and an in-kind contribution (labour), designed to foster community ownership. However, this approach was undermined by the availability of fully funded tanks from other programmes. Some households that initially enrolled with MORDI chose to withdraw in hopes of receiving a tank at no cost from MEIDECC or LLEE; and MORDI reported that, in some cases, this resulted in households missing out entirely. While MORDI’s model promotes sustainability, inconsistencies between organisational approaches can unintentionally reduce project reach and effectiveness.

Needs for Ongoing Training and Development. These water projects significantly improved drinking water access on ’Eua. However, all were designed as one-off, resource-delivery efforts. MORDI’s goal was to meet household-level drinking water needs and support maintenance of these supplies to ensure access to safe water. However, one-off training and maintenance efforts appear to be ineffective, as evidenced by gaps in VWC operations, and reports of limited maintenance skills among community members. LLEE similarly conducted

training as part of implementation, and in 2023 provided a further plumbing workshop targeting those households caring for people with disabilities.

To improve effectiveness, water-tank programmes should be viewed as ongoing initiatives rather than one-time interventions. Continued engagement, particularly in the form of ongoing support and refresher training for VWCs, is needed to sustain tank system functionality, safety of the supply, and to empower communities to manage their systems independently.

4.8.3 Equity

The factors influencing equity identified through this comparison are (1) all agencies utilise specific criteria to prioritise those most in-need households; (2) inappropriate roof quality is a barrier for participation common across all agencies; and (3) gender-based training is an opportunity for all agencies.

Prioritisation of Recipients. All three agencies aim to prioritise those households with the greatest need, those with large household sizes, elderly or disabled members, widows, and families living in poverty.

MORDI's CDP process supports equitable community decision making by beginning with demographic group discussions before expanding to the whole community. This structure helps to balance traditional power dynamics and elevate marginalised voices. Additionally, requiring 80% community participation ensures broad representation. While the CDP process does not specifically engage individuals who are less involved in community activities, MORDI's comprehensive household-level survey fills this gap by capturing detailed data on individual household needs and feasibility. This ensures that no household is overlooked.

MEIDECC's project planning primarily relies on communities making requests to the climate fund. This can lead to uneven access as communities with more active town and district officers are more likely to benefit. Further, because MEIDECC works at the community level for both planning and delivery, less engaged households may be excluded. However, in the 'Eua project, MEIDECC utilised MORDI's household survey data, allowing for more equitable targeting of recipients.

The LLEE project focuses on the development of a CRP and community WASH plan to map community assets and needs. Facilitators aim for diverse participation in the development of these documents, including youth, men, and women, though no formal participation thresholds are set. Again on 'Eua, LLEE was further supported by the household-level data provided by

MORDI. However, community WASH plans similarly aim to identify household-level needs, further supporting equitable planning.

Barriers to Participation. A key limitation to equity in all rainwater tank projects is the requirement that households have a roof suitable in height and quality to support a catchment system. This results in some of the most vulnerable members of communities being left out of these projects. Although all three agencies reported tracking these households for future consideration, implementers acknowledged that roof upgrades typically fall outside the scope of their water projects. On ’Eua, MORDI has attempted to address this by identifying alternative community water sources or enhancing neighbouring household systems to accommodate additional users, though the effectiveness of these solutions remains unclear.

Gender-Based Training. Equity in training was a key focus for both MORDI and LLEE during the ’Eua project. While no gender-specific training was provided, women were actively encouraged to participate. Both agencies have identified dedicated water-related training for women as a priority for future initiatives.

4.8.4 Impact

Key wider impacts identified through this comparison are all positive impacts: (1) development of VWCs; (2) development of community resources; and (3) promotion of community-grounded development.

Development of VWCs. A key wider impact of MORDI’s project on ’Eua has been the establishment and strengthening of VWCs. In 2019, several communities identified the absence of VWCs in their CDPs. As part of the project, every participating community was required to elect a VWC, and MORDI worked closely with these committees throughout implementation. This process significantly developed and resourced the VWCs, enhancing local resilience and community capacity for ongoing water management.

Development of Community Resources. Another key impact of both MORDI and LLEE’s approaches was the creation of community resources. CDPs, CRPs and community WASH plans extend beyond the lifespan of individual projects and are retained by community leadership. They can be used to support future funding applications and guide development efforts across sectors. Participation in the creation of these plans also encourages community members to critically assess the resources and vulnerabilities within their community, this can be empowering and support community organising efforts.

Promotion of Community-Grounded Development. Finally, by conducting work aligned with the CDPs, as was done in this project in ’Eua, MORDI continues to demonstrate the utility of CDPs and the viability of development work that is grounded in and steered by recipients. This has resulted in increased use of CDPs within development projects led by GoT.

4.8.5 Sustainability

The factors influencing sustainability identified through this comparison are (1) community ownership; (2) capacity to undertake tank maintenance and repair; (3) lack of systems thinking in WASH by communities and agencies; and (4) resilience of solutions to community changes.

Community Ownership. Central to MORDI’s programme design is the promotion of community ownership to support the sustainability of projects. As noted, MORDI fosters this ownership by requiring co-payment and in-kind practical support from recipients. MORDI believes that this investment increases the likelihood that recipients will value and maintain their water-tank systems. The success of this approach has not been directly assessed; however, MORDI implementers reported belief in the efficacy of this approach, noting that the number of tanks supplied by the MEIDECC project that they find abandoned in communities suggests these resources are not as valued by recipients.

Tank Maintenance and Repair. Another key aspect of MORDI’s approach is building long-term sustainability by enhancing community capacity. In the ’Eua water project, this was achieved through mandatory participation in maintenance training for recipient households, alongside efforts to upskill members of the VWCs.

LLEE similarly emphasises the importance of capacity development in recipient households through training. Unlike MORDI and MEIDECC, LLEE provides a complete system and support installation. This approach evolved from earlier challenges where communities had failed to prepare slabs on time or tanks were delivered but left disconnected. Under the current model, materials are delivered and installation is supported without required financial input from recipients. However, as in MORDI’s approach, LLEE expects communities to assist with installation, and conduct these installations as part of training to develop community capacity.

MEIDECC’s programme is focused on delivering physical resources. However, recognising that a lack of maintenance training is limiting effectiveness (indicated by poor water safety), future implementations are expected to include funding for training.

For both MORDI and LLEE, training and maintenance efforts are conducted as one-off projects. Gaps in VWC operations and reports of limited maintenance skills among community members indicate that this approach is insufficient. To improve long-term effectiveness, water-tank programmes should be viewed as ongoing infrastructural initiatives rather than one-time interventions. Continued engagement, particularly in the form of support and refresher training for VWCs, may support sustained functionality by empowering communities to manage their systems independently.

CDPs and community interviews identified that repair and maintenance is further limited on ’Eua by lack of access to materials (gutters, hardware, fittings). Beyond the cost of the materials, the cost of accessing these from Tongatapu is restrictive for many households. Currently, support for ongoing access to these materials is absent from all water programmes on ’Eua.

Systems Thinking in WASH. Further feedback from 2025 CDPs and respondent interviews (community and implementers) indicated the need to drive development and thinking that is mindful of the entire WASH picture. Such thinking is supported in LLEE’s implementation through the development of community WASH plans. Taking part in the development of these plans may support target communities to take a wider view on water development to understand how different systems can be balanced to achieve water security, where the vulnerabilities are in their current systems, and what contingencies are available to them in times of disaster response and recovery. This is likely to also support discussions relating to water conservation and system maintenance. However, for this approach to be effective, it is important to ensure wide community participation (which is not currently a feature of LLEE’s WASH plan development).

Resilience to Community Changes. A point of difference in MORDI’s water tank distribution is that all tanks provided to a community must remain in that community as part of their tank network. To facilitate this, each tank is labelled and numbered, and households are prohibited from relocating tanks between communities. This approach is intended to mitigate the instability in water tank availability within communities that results from high migration. However, it has been challenged, as while this model supports access within the target community, it can disadvantage vulnerable households who move away and are left without a tank in their new location.

Beyond migration, water-tank needs in communities are impacted by population growth and changes to household numbers as new homes are built. All programmes were designed as one-

time implementations. However, it is important to recognise that the number of tanks provided will be insufficient in the long term, due to both the aforementioned population expansion, and natural wear and tear. The expected lifetime of each tank is around 20 years, after which it can be expected that replacement tanks will be required (Rotomould, 2025). Therefore, access to funding and materials to increase tank numbers in communities is important for sustainable drinking-water access. MEIDECC has acknowledged this challenge, initiating plans to allocate a portion of annual funding to ongoing water-tank delivery. However, given that this funding is intended to support all 152 communities across Tonga, access by individual households is likely to be limited.

4.9 Considerations and Recommendations

This case study makes it possible to develop recommendations across eight key areas: (1) VWCs, (2) water safety, (3) sustainability, (4) systems thinking, (5) the ’Eua water plant, (6) inclusion of women, (7) CDPs and SDGs, and (8) evaluation and data sharing. These areas pertain to work within implementing agencies (planning and evaluating), work alongside communities (planning, implementing, evaluating), and future work on ’Eua specifically. This section presents these recommendations. Section 4.9.1 provides the rationale and recommendations for each area in full, and Section 4.9.2 summarises the eight recommendations into a concise list.

4.9.1 Considerations and “Long-Form” Recommendations

Village Water Committees. VWCs are a key, yet underutilised, resource for ’Eua’s communities. Collaboration between VWCs, TWB and TPH is a key opportunity. With targeted capacity building and resourcing, VWCs could effectively address many of the community-level training and routine maintenance gaps identified in this case study.

Lack of engagement from VWC members is a key limitation, increasing engagement and output will require meaningful incentives. Encouraging mutual support between VWCs seems a valid opportunity as facilitating collaboration between committees could encourage knowledge sharing and greater engagement, ultimately strengthening capacity.

Water Safety. Aligned with SDG6, the goal of MORDI’s project, and indeed all water projects across Tonga, is to support the provision of safe water. To date, physical resource delivery (tanks, gutters, tank stands) has been the focus of water-security projects. Going forward it will be important to ensure that as much focus is given to supporting safe water practices.

ADB's (2023) identification of *E .coli* contamination (an indicator of faecal contamination) in rain tanks suggests that other, more pathogenic organisms may be present in the water supply and posing risk to consumers. Faecal contamination is a key risk in roof-water catchment systems due to the catchment's exposure to animals such as birds and bats, whose waste can easily enter the supply. This risk is reduced where roofs and gutters are regularly cleaned and first-flush devices (manual or otherwise) are utilised to manage the increased risk following dry periods during which such contamination may accumulate.

TPH has identified concerns of ineffective maintenance across Tonga's communities, including 'Eua. Water-system maintenance training delivered by MORDI has been well received and believed to be effective; however, to support long-term uptake of water safety practices, training needs to be ongoing.

To identify the scale of the issue on 'Eua, bacterial water testing of 'Eua's water tanks should be conducted (household and community). This will identify the likely cause(s) and scale of the issue and may also be a valuable resource for VWCs and TPH to motivate safe water practices.

Public health education to support system maintenance and water-safety practices in communities (including the chlorination of community supplies) is currently challenged by limited capacity in TPH. With support, this gap could be addressed by VWCs.

Sustainability. A key limitation to the sustainability of MORDI's implementation was one-off provision of both physical resources and training. Beyond the need for long-term approaches to training addressed above, the delivery of tanks and materials should consider sustainability. As communities expand and systems deteriorate, additional tanks and materials will be required. Given the barriers to accessing repair materials, supporting community capacity through developing reliable supply systems for key resources such as materials and tanks may be beneficial.

The use of disaster-time assets such as household tank cleaning by Tonga National Youth Congress outside of disaster response may support dependency. Water-safety projects need to be mindful of the long-term impact of their efforts and focus on establishing maintenance systems that can be supported by the target community without ongoing input.

Systems Thinking. Water resilience on 'Eua is supported by capacity across the water system (reticulated supply, household catchments, and community-facility catchments). While on 'Eua, this approach was not necessarily by design, as project implementation did not occur

as a coordinated effort, its success demonstrates the importance of systems thinking in water development.

Widespread understanding of how water-source interdependence can support resilience is essential to bringing systems thinking into community-based water development. LLEE's community WASH plans may be an effective tool for engaging communities in these discussions, and framing projects within the broader water system. LLEE currently develops these plans alongside a community working group prior to implementing projects; however, to effectively encourage this mindset broadly within village communities, there may be benefit to having these discussions as part of CDP development.

'Eua Water Plant. The 'Eua water plant is a key resource contributing to water security on 'Eua. However public distrust of reticulated water (quality and reliability of supply) is a major limitation to perceived water security by community members. Similarly, a lack of awareness among public health teams and key implementers further limits integration of the reticulated network into broader water planning, potentially reducing aid efficiency.

This distrust highlights weak coordination between the TWB and other public services involved in Tonga's water system. Rebuilding the trust of communities and other stakeholders requires ensuring that developments to the plant are understood and the new capability is clearly communicated through transparent water testing, plant tours, and support from trusted messengers. This work should be a coordinated effort by TWB, TPH and VWCs.

Inclusion of Women. Women are key contributors to sustainable and resilient community water systems. This is linked to their typical role in caregiving and household management, this increased presence in the household compared to their male counterparts resulting increased awareness of water-supply issues and increased availability during times of water-system malfunction. Building on historic high engagement, water-development efforts should continue to prioritise the inclusion of women in all stages of projects, with a specific focus on training in maintenance and repair.

CDPs and SDGs. This report supports Paddington's (2020) findings that using CDPs as a participatory-adaptation planning tool contributes to achieving the SDGs—specifically SDG 6: Clean Water and Sanitation.

Further, this report demonstrates the utility of CDPs for research and evaluation. Developed through inclusive co-design processes, CDPs are a representative reflection of community

priorities and perspectives. As such, evaluations grounded in these plans are more likely to be representative and community-centred.

Evaluation and Data Sharing. There is a lack of data to track progress towards water security in Tonga. MORDI's commitment to evaluating and reporting on projects supports this gap; however, expanding the breadth of reporting beyond assessment of implementation, to measure long-term impacts, will enable more effective identification of remaining gaps, and opportunities for implementation improvement.

MORDI's reporting, while thorough, demonstrates the limitation of reliance on organisational reporting to understand the status of water development in specific areas. There is need for broader research that is cognisant of the total water picture. Going forward, CDP analysis should be used as one of these measures.

Lack of interagency data sharing is a key finding of this case study. Greater data sharing would enable implementers to assess overall progress towards key targets, and support aid efficiency. Development of digital infrastructure to support this data sharing needs to be a priority action area for the GoT. In the interim, there should be increased effort by implementers to share data, including project evaluations, community plans (CDPs, CRPs, WASH plans), and implementation data.

4.9.2 Recommendations in Summary Form

1. **Village Water Committees**
   Strengthen VWCs through targeted capacity building, resourcing, meaningful incentives, and intervillage collaboration to handle training and routine maintenance.

2. **Water Safety**
   Shift focus from physical resource delivery to increasing water safety through ongoing training, regular roof/gutter and tank cleaning and chlorination, first-flush devices, widespread bacterial testing, and VWC-led public health education.

3. **Sustainability**
   Move beyond one-off provision; establish reliable local supply chains for tanks and materials and avoid creating dependency on external or disaster-triggered support.

4. **Systems Thinking**
   Promote understanding of water-source interdependence (reticulated, household,

community) and embed systems-thinking discussions into CDP development and WASH planning.

5. **'Eua Water Plant**
   Rebuild public and interagency trust in the reticulated supply through transparent water testing, plant tours, clear communication, and coordinated TWB–TPH–VWC efforts.

6. **Inclusion of Women**
   Continue and deepen prioritisation of women in all project stages, with particular emphasis on training them in system maintenance and repair.

7. **CDPs and SDGs**
   Recognise CDPs as powerful participatory tools that advance SDG6 and provide community-centred baselines for research and evaluation.

8. **Evaluation and Data Sharing**
   Expand evaluation beyond implementation metrics to long-term impact; prioritise interagency data sharing (evaluations, CDPs, WASH plans); and develop digital infrastructure for it.

4.10 Future Research

The goal of the operational recommendations made above (Section 4.9) is to improve outcomes of water-development projects in Tonga, based on findings of the field work and case study. This section, in turn, suggests useful avenues for future research. Undertaking research to develop the knowledge-base in any of the five following areas would further advance this goal.

Due to a lack of research to evaluate water projects in Tonga and specifically on 'Eua, this research took a broad focus, identifying gaps and opportunities across the water sector. Future research should focus on assessing and refining solutions to these more specific gaps and opportunities to improve approaches to water development.

Importantly, this research was based in 'Eua, centred around its water system and the development priorities of its communities. While it seems likely that findings will be relevant across Tonga (and potentially other PICTs), further research to delineate those findings that are specific to 'Eua's context is encouraged.

Future research to further support evidence-based development is recommended. Specifically five areas have been identified for further research:

1. Water use: Assessment of water use on ’Eua to identify the cause of the significant usage volumes indicated by TWB. Analysis of reticulated-water usage through comparisons of household meters and water-plant output may indicate whether this reported usage is linked to household use or network loss.
2. *E. coli* contamination: Identification of the most likely source(s) of microbial contamination and factors which may exacerbate or mitigate *E. coli* contamination in Tongan water tanks. This research should have a pragmatic focus, identifying appropriate solutions to direct future development of protective drinking-water collection systems in Tonga.
3. Tank lifetime: Assessment of the probable lifetime of water tanks in Tonga’s climate, and modelling to predict replacement requirements across Tonga.
4. Data sharing: Research to support the development of effective digital infrastructure, and processes to enable greater sharing of data and insights between government and NGOs in Tonga. Progress in these capabilities would contribute to more effective, coordinated efforts towards SDG6 in Tonga.
5. Opportunities for CDP use: CDPs have significant capacity as a source of data for community-based research. CDPs from islands across Tonga should be assessed to understand how water projects have impacted SDG6 priorities across a range of Tongan contexts.

4.11 Limitations

As the sole researcher on this project there was risk I might overinterpret or misinterpret data. To mitigate this risk, all interpretations were cross validated with MORDI implementers to strengthen reliability and contextual accuracy. Further as I am a Pālangi, this collaboration with MORDI was further required to ensure that I did not overlook or misinterpret critical nuance due to lack of cultural awareness.

As part of this partnership, most interviews were conducted with a MORDI implementer present, either as a translator or a liaison. This may have influenced participant responses and limited the accuracy of the data. This risk was minimised through data triangulation, these interviews contributing only part of the overall data picture.

Attribution of outcomes was another challenge. The close timing and nature of water-security projects completed by key organisations (LLEE, MEIDECC and MORDI) led to results that cannot be clearly disaggregated or attributed clearly to one project or another.

Finally, analysis was constrained by limited data availability on some topics. Due to a lack of water-quality data for ’Eua and formal M&E by LLEE and MEIDECC organisations, analysis relied heavily on interviews with key individuals.

4.12 Conclusion and Link to Wider Thesis

This case study was conducted to contribute to addressing both Objectives 1 and 2: To analyse the use of intervention entry points in Tongan WASH development projects, and to develop tools to support appropriate selection and use of entry points in Tongan WASH interventions (Section 1.4).

In-line with the research approach, in order to prioritise direct benefits for research participants, there were two focuses for assessment:

1. To provide actionable recommendations to MORDI and key partners, to strengthen future approaches to water security projects; and
2. To gather data to enable comparative analysis of findings from this case study and the narrative review, in order to validate and refine review findings.

The comparative assessment of organisational approaches and the recommendations presented in Sections 4.8 and 4.9 respectively, were fed into the overall recommendations provided to MORDI, and other key partners in the Tongan development sector, to directly influence the conduct of future water-tank distribution projects, in ’Eua and other Tongan islands.

All three organisations assessed as part of the organisational-approach comparison targeted place-based communities to conduct projects on ’Eua. Therefore, alongside the wider case study findings, this comparative assessment directly contributed to the evaluation of the use of place-based communities as intervention entry points for WASH development in Tonga.

Direct assessment of these interventions with place-based communities highlighted use of intervention approaches and community organising tools (such as community WASH plans and CDPs), demonstrating that these can be applied to manage limitations and capitalise on opportunities. This was a significant finding, as it provides actionable solutions for WASH

development practitioners, and suggests that through further research, tools and approaches may be also identified to support WASH development through alternative intervention entry points.

As identified in Section 3.8, the key limitations restricting literature review findings were a result of the need to extrapolate from reporting focused on other aspects of implementation. By directly exploring the impact of utilising place-based communities as an entry point in this case study, such limitations could be avoided. By triangulating these case study findings with those of the literature review, assessments can be validated and refined to further develop the assessment of intervention entry points presented in Chapter 3 (further explored in Chapter 6).

The use of the five-factor assessment framework developed by McNamara et al. (2020), to conduct analysis of organisational development approaches, further contributes to its appraisal for use in the Tongan WASH context. Assessment of the framework's performance in this context is explored in Chapter 5.

Chapter 5: Evaluation Framework

5.1 Introduction

At the outset of this research, an informal scoping review was conducted to identify an appropriate assessment tool to anchor project assessments. Such tools are valuable for multiphase research (like that conducted in this thesis), the clear assessment parameters enabling direct comparison of findings across different research phases, ultimately supporting the development of coherent overall findings. Further, beyond the research at hand, aligning research with a validated assessment tool supports findings to be understood and utilised within wider community-based Pacific WASH development research.

In this informal scoping review it became apparent that a “gold standard” assessment tool for Pacific WASH development was not available. Rather, most assessment approaches appeared to be project specific, responding directly to the implementers’ objectives. Few larger scale assessments have been conducted; however, both Nelson et al. (2021) and Clarke et al. (2014) have produced work to contribute to this space. Neither research team utilised a specific framework, instead using inductive thematic analysis to build a picture of implementation impacts. A further key study was undertaken by McNamara et al. (2020) who conducted assessment of community-based climate adaptation initiatives in the Pacific. On initial appraisal, the assessment framework developed to conduct these assessments (Table 2.1) appeared to be applicable to the present research context.

Given the established benefits of having a recognised standard assessment tool within a sector, a key objective of this research became utilising and conducting formal assessment of this existing framework to contribute to the development or refinement of such a standard.

5.1.1 Purpose

The purpose of this chapter is to contribute evidence to address Objective 2: To develop tools to support appropriate selection and use of entry points in Tongan WASH interventions (Section 1.4). In particular, this chapter responds to Point A: Critically appraise a framework for evaluating community-based Pacific WASH development projects.

This chapter begins by establishing the requirements of an effective assessment framework in the Tongan WASH development context, before exploring the adaptations made to the assessment framework developed by McNamara et al. (2020) for use in this research.

The methods used to measure framework performance are then described, leading to the presentation of the semiquantitative assessment criteria presented in Table 5.3. These criteria are then used to conduct the assessment of the framework's performance, first in a literature-review context and then in a field-research context.

The framework's performance across these contexts is then summarised to provide recommendations for its further use and refinement.

5.1.2 Framework Requirements

Stoler et al. (2023) argued that there needs to be a shift away from narrow WASH indicators, such as diarrhoeal disease incidence and presence of facilities, towards more human-centred impacts, such as perceived water security and ease of childcare. This approach is one echoed by Tongan NGOs such as MORDI and LLEE, whose assessment focus is on the lived impacts of projects. However, as many implementers still report on these more "narrow" indicators, it was important that these findings could also be captured in this research.

This assessment model therefore needed to be broad enough to capture the range of impacts resulting from WASH projects. Further, the breadth had to be sufficient to be relevant across the WASH intervention space, not limited to specific types of communities or specific WASH elements. A further challenge for the framework was the need to be applicable across a range of data sources, and capture information regarding both the process and outcomes of interventions. The data assessed in this research was varied, and included research reports, nonacademic funder reports, interviews, and CDPs. This assessment framework needed to be flexible enough to accommodate this range. Balanced with this necessary breadth was the need for the framework to be narrow enough to enable useful comparisons between projects.

5.1.3 Framework Application and Adaptation

Shown in Table 2.1 (p. 27), McNamara et al.'s (2020) framework utilises five key evaluation components: appropriateness, effectiveness, equity, impact, and sustainability, providing a working definition and justification for inclusion for each.

Designed to assess a range of community-based climate adaptation projects, McNamara et al.'s framework was not specifically developed to target WASH interventions. However, WASH is inherently linked to climate pressures, particularly in areas that rely on rainwater harvesting.

Tonga's WASH environment (as for many Pacific Island countries) is specifically challenged by climate pressures; at various times in the past 10 years, the Kingdom has experienced

extended periods of drought and flooding, tsunami, volcanic eruption, and tropical cyclones. These climate events impact across the WASH system, damaging infrastructure, and contaminating water sources, posing particular challenges to drinking-water security (Hadwen et al., 2015). WASH development projects located in Tonga are therefore inherently linked to climate adaptation. As such, McNamara et al.'s (2020) assessment tool was determined to be an appropriate starting point.

Reflective of the pragmatic ontological perspective this research is founded on, this framework was adapted for use in this research: definitions were simplified, and key questions were added to guide the use of the five components (shown in Table 5.1). This was done to support application in WASH environments, to standardise the assessments made within each factor, and to support accessibility for nonacademics. The final factor was critical, as part of this research included providing this assessment framework to implementers and exploring with them, through interviews, how their organisation's approach impacts each component.

Table 5.1

Framework Components for Adaptation/Intervention Success and Their Short Definitions as Used in this Study, Adapted From McNamara et al. (2020)

Component of adaptation success	Short working definition	Related questions
Appropriateness	Relevance, suitability and fit of the project in the community context	How suitable is the intervention for the community? In the social and cultural context, does it seem appropriate or inappropriate, relevant or irrelevant, legitimate or illegitimate?
Effectiveness	The success of the project in achieving intended outputs, the direct results, both products and social benefits	Has the project achieved the intended objectives? Were the outcomes a direct result of the intervention?
Equity	Capacity for the project to include all members of the community in both activities and outcomes, particularly marginalised groups	Do the benefits of the intervention extend equally to all people or groups within the community? Are some people or groups left out, or are the benefits widely felt?
Impact	The wider effects of the project, both direct and indirect, intended and unintended, whether positive or negative	Did the project result in any unintended outcomes? Were any outcomes seen to have a wider effect than expected?
Sustainability	The extent to which project activities and outcomes have been maintained post-project lifecycle	Have the project outcomes been maintained? Has the project been designed to support sustainability once the project life cycle ends? Will the project be resilient to climate events?

5.2 Appraisal Methodology

Critical appraisal of the framework's performance utilised a systematic methodology. The framework's performance was assessed against set criteria, exploring its utility in both a literature-review context and a field-research context. The criteria used included five components, designed to capture the key framework requirements identified in Section 5.1, considering both capacity to effectively and reliably evaluate projects, and practicality for use within the research context. Each of these five components is described and its inclusion justified in Table 5.2.

Table 5.2

Framework Assessment Criteria Components Described and Justified for Inclusion

Factor	Description	Justification for inclusion
Comprehensiveness	Does the framework capture all relevant aspects of project success and sustainability, including both processes and outcomes?	Given the breadth of data included in this research, both primary, and second use and across various contexts, the framework must be sufficiently comprehensive.
Distinctiveness	Are the framework's components distinct and nonoverlapping, enabling data to be clearly categorised?	To enable effective project assessment, categories must be sufficiently distinct, and these distinctions easily understood.
Flexibility	Can the framework accommodate diverse project types, outcomes, and metrics across different contexts?	Essential given the breadth of data included in this research.
Ease of application	Is the framework practical? Can it be communicated simply and applied alongside intervention entry-point groupings?	To be usable this framework must integrate with the intervention entry-point groupings. To enable both effective data collection in the field-phase and communication of findings to implementers, the framework must not be overly complicated.
Support for decision making	Does the framework enable researchers to draw actionable conclusions?	The framework is intended to scaffold an actionable tool to guide future implementation planning for effective intervention entry-point use.

The systematic evaluation of the framework's performance was conducted across these five factors and given a semiquantitative performance score for each factor, of low, medium or high.

5.3 Framework Assessment

In this research, the assessment framework was applied to two different research contexts: the literature review, and the field research-interview assessment of organisational approaches. Both had specific nuances and challenges. The performance of the assessment framework in each context is graded, using the established assessment table, and further explored below.

5.3.1 Literature Review

The literature review made use of the adopted framework to look across a range of WASH interventions. It utilised a range of publications, both primary and grey literature, including funder reports and other key documents not written for the purpose of further research. Once separated into their respective entry-point groupings, the information from these documents was categorised within the framework to enable comparisons to be drawn. The performance of the framework in this context is shown in Table 5.3.

Table 5.3

Assessment of the Framework Performance in the Literature Review Context

Factor	Description	Performance score (low/medium/high)
Comprehensiveness	Does the framework capture all relevant aspects of project success and sustainability, including both processes and outcomes?	High
Distinctiveness	Are the framework's components distinct and nonoverlapping, enabling data to be clearly categorised?	High
Flexibility	Can the framework accommodate diverse project types, outcomes, and metrics across different contexts?	Medium
Ease of application	Is the framework practical? Can it be communicated simply and applied alongside intervention entry-point groupings?	High
Support for decision making	Does the framework enable researchers to draw actionable conclusions?	Medium

Reasons for Each of the Scores Assigned:

Comprehensiveness. When used in the literature review context, McNamara et al.'s (2020) framework was found to be highly comprehensive (see Table 2.1): there were no data identified that could not fit under one of the five components. Further, the framework was appropriate to capture a range of outcomes, including both final outcomes and process aspects.

Distinctiveness. Further, the framework components were sufficiently distinctive. There was minimal overlap in what information could be applied to each category, and the description questions provided effective guidance as to what data should be included under which component.

Flexibility. The breadth of the five components also facilitated an appropriate level of flexibility, enabling varied sources and metrics to be captured. These included both quantitative and qualitative findings, and broader project evaluations with both academic and nonacademic focus. In particular, the inclusion of "impact" was significant, providing the opportunity to acknowledge unintended or indirect effects of projects. This also captured the concept of benefit persistence, an element of sustainability that is highly relevant in WASH development (Clarke et al., 2014). This supported flexibility in determining which project aspects are important and enabling the impact of both process and outcomes to be considered. A limitation of this breadth is the inability to assess raw data. Explored more fully below, the openness of the "effectiveness" component requires that more detailed project-analysis criteria be applied alongside the framework to enable full and fair assessment of project effectiveness. However, it seems that this framework could be effectively paired with such criteria.

Ease of Application. Importantly, for this research, it was easy to apply the framework alongside the intervention entry-point groupings for comparison.

Support for Decision Making. The framework was suitable to code detailed individual project assessment information to support comparison and therefore decision making. As such, it was effective within this research, which focused on higher level project comparisons. However, the lack of specificity, particularly under effectiveness, results in reduced guidance, and a greater requirement for subjective assessment by researchers as they draw comparisons, and determine relative performance within the framework. This less constrained form of assessment supports researchers to prioritise certain impacts based on their preferred definition(s) intervention success.

As such, the useful application of this framework in its presented form is likely restricted to high-level comparisons like those conducted in this research. Where it is to be used for direct project assessment, specific criteria should be applied alongside it to enable more detailed analysis.

Such detailed analysis within Tongan community-based WASH development should be drawn from the *Pacific Impacts Analysis Methodology Guide.* Produced by SPREP (2022) this guide details assessment tools that can be applied to specific interventions to enabling more specific assessment. Comparing these to McNamara et al.'s (2020) framework, all recommended assessment areas for determining success are included, while sufficient breadth is maintained to enable comparison of a variety of intervention types. However, unlike these tools, while behaviour change can be included under effectiveness, it is not referred to specifically in the framework. Given the strong link between behavioural change and sustainability of WASH interventions, such specific reference may be appropriate.

5.3.2 Field Research: Interview Assessment of Organisational Approaches

In the fieldwork, the adopted framework was used to examine a group of interventions undertaken by three key agencies (MORDI, LLEE, and MEIDECC), to improve access to water tanks in Tonga. In this research phase, data to enable the assessment of organisational approaches were collected through seven interviews with local implementers from the three different organisations, and from analysis of key documents provided by the relevant organisations. The performance of the framework in this context is shown in Table 5.4.

Table 5.4
Assessment of the Framework Performance in the Case-Study Context

Factor	Description	Performance score (low/medium/high)
Comprehensiveness	Does the framework capture all relevant aspects of project success and sustainability, including both processes and outcomes?	High
Distinctiveness	Are the framework's components distinct and nonoverlapping, enabling data to be clearly categorised?	High
Flexibility	Can the framework accommodate diverse project types, outcomes, and metrics across different contexts?	Medium
Ease of application	Is the framework practical? Can it be communicated simply and applied alongside intervention entry-point groupings?	High
Support for decision making	Does the framework enable researchers to draw actionable conclusions?	High

Reasons for Each of the Scores Assigned:

Comprehensiveness. McNamara et al.'s (2020) adapted framework (Table 2.1) was effective within the case-study context as it supported broad exploration of key intervention design elements without imposing unnecessary limitations. During interviewing, the breadth of the components was notable, each encouraging respondents to explore different areas of their project. All interview responses were able to be captured within the framework.

Distinctiveness. As in the literature review, all information could be included within the framework without overlap. The guidance questions were critical for this, ensuring that the interview respondents and I had a common understanding of the distinctions.

Flexibility. The flexibility of the framework was thoroughly tested through the case-study context. The framework enabled useful analysis when applied to the direct assessment of a project with a range of both quantitative and qualitative data without any identified limitations. While most components were also effectively applied to the assessment of implementer approaches, lacking such specific project detail and data, the capacity to identify impacts was limited. Inherently difficult to predict or identify without specific exploration, the assessment of indirect impacts was typically overlooked by implementers; when probed, many struggled to identify relevant examples. To fairly measure this component, such broad assessments should be supported by direct assessment of impacts associated with specific projects. As such, overall, the flexibility of this framework was assessed as moderate.

Ease of Application. The simplified definitions and guidance questions were included to clearly establish the focus of each component and increase accessibility. This worked as intended; the framework was easily communicated and understood by interview respondents from a range of backgrounds and successfully applied to a range of project elements. Further, the framework provided an effective structure for semistructured interviewing. It successfully guided conversation and introduced relevant topics without imposing barriers or stilting story telling.

Support for Decision Making. All interview responses were deductively coded against the framework to support comparison across organisations. This was an effective approach, clearly highlighting the individual impact of different project elements without tying them too closely to the overall project impacts. As such, use of this framework encouraged the free comparison needed to support optimisation of project elements without pitting organisations against each other.

5.4 Limitations and Potential for Future Work

The key limitation of this appraisal is that it was undertaken by me, a solo researcher, based on experience through one research project. As such, it is likely that some strengths and limitations of the framework were either (a) not tested through this research project, or (b) not identified by me. The development of assessment criteria to appraise the framework's performance aimed to minimise the influence of researcher bias on findings; however, it is recommended that the framework is used and critiqued further through a range of research contexts and by a range of researchers to support its refinement.

Future work to formally recognise an assessment framework for Pacific WASH development projects would be a valuable contribution to improving coordination and efficiency across the sector. The adapted framework presented in this thesis (Table 5.1) would be an appropriate starting point; however, such recognition should be driven by consensus among experienced practitioners and experts in the field.

5.5 Conclusion

Overall, the adapted framework of McNamara et al. (2020) performed well in the two research contexts negotiated in this work. It was broadly appropriate for assessments of both literature and field findings, and critically, enabled relevant conclusions to be drawn.

The framework appears to be less suited to the direct assessment of individual projects, the components too broad to measure the necessary detail for such assessment. To be viable as an assessment framework for an individual project, the components should be supported by a tool which specifies appropriate success metrics in the project context. In many cases, these will also include financial or economic considerations that are specific to each project.

However, the framework appears to be highly appropriate for drawing comparisons across projects, this lack of detail orientation enabling diverse projects to be fairly compared while maintaining their specific success metrics. This was seen to be beneficial in the WASH development environment where project assessments vary in focus and level of detail.

While this framework has been utilised and assessed in the context of community-based WASH interventions, providing a solid baseline assessment, it seems likely that its utility may extend to research interests beyond community-based projects.

5.7 Link to Overall Thesis

This chapter responds to Objective 2: To develop tools to support appropriate selection and use of entry points in Tongan WASH interventions. In particular this chapter responds to Point A: Critically appraise a framework for evaluating community-based Pacific WASH development projects (Section 1.4). Utilising performance analysis from the application of such a framework to assess community-based WASH interventions in Tonga, this chapter contributes to the development and refinement of an accepted standard assessment framework for measuring the success of such projects.

The five-factor assessment framework developed by McNamara et al. (2020) has been adapted and used throughout both the literature review and field-research phases of this research and graded for performance in both contexts.

The findings from this assessment provide some validation for the assessments conducted in this research, suggesting that the tool used to guide analysis of implementation success and implementer approach are sufficiently robust and specific to generate valid findings.

Given the positive appraisal of this assessment framework, the five components of intervention success have been maintained in the final discussions of this research presented in Chapter 6, and therefore inform the findings presented in the IEPT-SWOT (Table 6.1).

Chapter 6: Bringing It Together

6.1 Introduction

This chapter brings together the findings from the narrative review and case study, presented in Chapters 3 and 4 respectively, to further develop the initial comparative assessment of intervention entry points presented in Chapter 3 (Table 3.1).

Analysis in this chapter continues to focus on place-based communities; however, this focus expands in Section 6.3 to provide a more detailed exploration of each entry point in the IEPT-SWOT.

6.1.1 Purpose

The purpose of this chapter is to summarise the evidence developed through this research project to address Objective 1: To analyse the use of intervention entry points in Tongan WASH development projects. Then the development of the IEPT-SWOT (Section 6.3) responds to Objective 2: To develop tools to support appropriate selection and use of entry points in Tongan WASH interventions (Section 1.4).

This chapter begins by describing the approach, structure, and scope of this comparative analysis. Findings are then presented, followed by an assessment of opportunities to optimise each of the five components of adaptation success in a place-based community context (McNamara et al., 2020).

The focus of the analysis then expands to again consider all four intervention entry points addressed in this research, bringing the research findings together to develop the IEPT-SWOT (Section 6.3).

6.1.2 Approach to Entry Point Comparison

The narrative review (Chapter 3) identified the four intervention entry points addressed in this thesis and provided initial assessment of their capacity to support successful community-based WASH development in Tonga. A key outcome of this review was the semiquantitative ranking of intervention entry-point performance (with scores of high, medium, or low) across the five components of adaptation success developed by McNamara et al. (2020) (Table 3.1).

The case study then field tested these ideas, focusing on the place-based community entry point (Chapter 4). Working with organisations on the ground throughout the field research phase highlighted realities of development work that were overlooked when assessing the literature. These are, firstly, factors that may constrain which entry points are available to a project team,

such as resource availability, existing implementer-community relationships, and funder requirements; secondly, the complexity of projects, particularly those aiming to achieve a range of outcomes; and finally, the utilisation of tools and approaches (CDPs, WASH plans etc.) to manage the inherent limitations of entry points (Section 3.6).

Ultimately, through this process, it became evident that for use in planning of specific development projects (as distinct from summarising across them), the simple high–medium–low ranking approach lacks necessary nuance, providing an overly simplistic and potentially misleading picture. Instead, to be useful for implementers, any planning tool needs to be adaptable to the context of a project as a first priority.

For this reason, a strengths and limitations analysis was used to assess the performance of approaches taken by the three agencies that undertook water tank projects in ’Eua in 2020 (Table 4.5), continuing to work within the adapted framework from McNamara et al. (2020). In this chapter, this assessment approach is extended to a full strengths, weaknesses, opportunities, and threats (SWOT) analysis to develop the IEPT-SWOT (Table 6.1).

6.1.3 Scope: Place-Based Communities

This comparative analysis of research findings is focused on place-based communities as an intervention entry point with evidence from the case study enabling refinement of initial assessments based on the narrative review.

6.1.4 Structure

As discussed in Chapter 5, the adapted framework from McNamara et al. (2020), was found to be appropriate for assessment of Tongan WASH development projects. Therefore the five components of adaptation success provide the structure for the comparative analysis of findings from the narrative review and the case study, presented in Sections 6.2–6.6, and are maintained within the structure of the IEPT-SWOT (Table 6.1).

The findings of this comparative analysis are organised by themes, identified inductively. Each concludes by identifying opportunities to best support the components of adaptation success in interventions.

Section 6.3 then presents the IEPT tool, a SWOT analysis that addresses each of the four identified entry points, establishing, in greater detail, opportunities to both manage the risks resulting from the use of each (or multiple) entry point(s), and maximise the benefits. Building on the semiquantitative rankings developed in Chapter 3 (Table 3.1), this tool provides a summary

of the strengths, limitations, opportunities, and threats for each intervention entry point in relation to each of the five components of adaptation success, as established in the adapted assessment framework from McNamara et al. (2020).

6.2 Comparative Analysis

This study found place-based communities to be a commonly accessed entry point for Tongan WASH development projects (Section 3.4). I posit that this frequency is due to Tonga's village structure and leadership, the presence of clear village divisions, each with elected leadership, providing what seems like a natural platform to host such projects. However, evidence from the literature review suggests that interventions with place-based communities see significant limitations restricting the success and sustainability of projects (Section 3.4.4). Case-study evidence enabled refinement of this assessment, demonstrating the potential utility of this entry point when supported by tools and strategies to meet acknowledged limitations (Section 4.8).

The following analysis brings together the evidence from the narrative review and case-study research, to identify ways of working within a place-based community entry point to best support the components of adaptation success in interventions, addressing each component in turn.

6.2.1 Appropriateness

Appropriateness within Tongan WASH projects utilising place-based communities as an entry point is influenced by both the level of cohesion within the target community and the relationship between the community and the project.

Community Cohesion. Cohesion within a place-based community impacted both the capacity for broad interventions to be received and experienced equally across a community's population, and the ability for a project team to accurately assess and accommodate relevant community dynamics. Accurate assessment of community priorities and how these priorities differ across population groups is critical to designing appropriate interventions. This is particularly relevant when working with place-based communities, which may encompass individuals from a range of age groups and social and economic situations. Therefore, community diversity, particularly that which is poorly understood by implementers, is identified in the literature review as a key challenge to intervention appropriateness. This underscores the importance of avoiding the assumption that geographical proximity equates to shared priorities.

In the literature review, this limitation was seen to be overcome when implementers acknowledged the potential for diversity within the recipient community. Such acknowledgement led to appropriate interventions being designed for such diverse communities, appealing to

broad, common beliefs, such as the need to protect the ocean environment, a notion which is widely accepted in the Pacific (Westoby et al., 2020). The case study identified this same phenomenon. Intervention appropriateness was a strength identified across implementing organisations, because all focused on improving water security (widely acknowledged as a critical development area in Tonga) and did so through the use of rainwater catchment systems, (the preferred source of drinking water, and a widely accepted technology) (Section 1.3.2).

Where such common-held beliefs are unavailable or incompatible with a project's goals (as may be the case for more innovative WASH projects or projects addressing other WASH components), the case study further demonstrated the capacity of community co-design tools (such as CDPs and community WASH profiles) to support understanding of how priorities differ within a recipient community, and to support the design of interventions to accommodate this diversity (Section 4.8.1).

Recipient Community and Project Relationship. The literature review highlighted community ownership as a key factor supporting the development of highly appropriate projects, capable of responding to a community's specific physical and social circumstances. This idea is supported by case study findings that highlight the impact of an intervention's starting point (starting with an intervention, or with a recipient community). Comparisons of implementer organisations demonstrate that both approaches can be successful, each offering benefits and limitations.

Where implementers first identified a recipient community, and then designed a project to respond to the community's specific needs and circumstances (often through co-design processes), projects could be better targeted and ultimately more socially acceptable. However, this approach was seen to limit the capacity for interventions to introduce new ideas and technologies, so may limit the appropriateness of interventions for a community's physical context and specific needs.

Conversely, larger government projects and international aid organisations were typically seen to begin with a project and then identify appropriate recipient communities. The key limitation of this approach is that in selecting appropriate communities (in this inevitably "top-down" way), implementers may overlook nuances that have profound impacts on the way a community (or sectors within a community) will accept and respond to a project. However, such an approach may be more likely to support the introduction of innovative solutions that are more appropriate to the community's needs.

Innovative Solutions. This concept was not explored through the literature review. However, case study findings highlight both the importance of innovative solutions in WASH development, and the specific challenges to implementing these within community-based development.

The acceptance of innovative solutions was found to be limited by lack of trust and acceptance of unfamiliar solutions by communities. This was not seen to limit water-tank projects on ’Eua, as collecting rainwater in plastic tanks at a household level is widely accepted as an appropriate solution among recipient communities. However, given that further WASH development may require the adoption of innovative solutions (particularly given the intensity and frequency of extreme weather events in the region), this is an important consideration. Case study findings further identify that projects designed alongside a recipient community, while more likely to be accepted by that community, are unlikely to utilise such innovative solutions, instead being typically limited to what has already been seen by or used within the community. Therefore, there is a risk of a trade-off between ensuring interventions are socially appropriate and ensuring interventions are appropriate for the relevant physical context.

As such, for complex situations, or for circumstances where typical solutions will have limited success, projects with greater external input have merit. Within the case study, MORDI demonstrated approaches to facilitate the introduction of such innovative solutions within a co-design approach. MORDI saw success through both encouraging new research to develop evidence-based solutions for specific community circumstances and encouraging communities to trial innovative technology. However, it is possible that a significant component of this success was contingent on MORDI’s existing relationships with their recipient communities. This ability to leverage existing relationships would be unavailable to less established project teams.

Community Ownership. Community ownership of projects is a further key component influencing intervention appropriateness. When successfully achieved, increased ownership is seen to lead communities to take control of projects, adapting plans throughout the implementation period to support appropriateness and overall success. The literature review did not identify any interventions with place-based communities that benefited from this type of project ownership. However, the case study identified that MORDI attempts to develop such ownership in this context through recipient contributions. Currently there is a lack of evidence to measure the impact of this approach. Such research may provide guidance to strengthen

community ownership, and therefore appropriateness, within projects with place-based communities.

Opportunities. The key limitations identified for appropriateness in interventions with place-based communities are driven by community diversity and implementers' limited awareness of this diversity. While tools and strategies may be utilised to manage this risk, evidence from the literature review suggests that intervention appropriateness may be better supported through the use of faith-based or institution-based intervention entry points. Where appropriateness cannot be sufficiently supported, these alternative intervention entry points could be accessed alongside or instead of place-based communities to meet these gaps.

6.2.2 Effectiveness

Evidence from the literature review shows effectiveness of place-based interventions is contingent on communities' diversity and implementers' ability to recognise and respond to that diversity. Case study findings support this. Projects that utilise community co-design tools achieve greater effectiveness due to increased understanding of needs and capacities within recipient communities. This results in the delivery of a greater number of functional tanks, more appropriate selection of recipient households, and the inclusion of targeted maintenance training. Effectiveness is further enhanced by organisational collaboration, with LLEE demonstrating the benefit of agile organisations (like itself) working alongside less flexible, large-scale implementation projects, to meet overlooked community needs on the ground.

Project Goals. Notably, the literature review identified that although interventions with place-based communities may be effective in their own right for the introduction of community resources (gardens, sports grounds, water tanks), they are unlikely to be effective for changing beliefs and attitudes. Case study findings reinforce this—while water tanks are effectively delivered through this entry point, maintenance training and public education to support water-safety behaviours has limited success.

Literature review findings suggest that given the breadth of place-based communities, projects aimed at changing beliefs and behaviours may be more effective if targeted at more defined community groupings through alternative entry points (such as faith-based communities or institution-based communities).

Awareness of the Community. The literature review highlights that projects are more successful when the approach is flexible, and thus more able to respond to the specific needs of

the community. Case study findings support this, identifying co-designed projects as more effective. Such projects benefit from increased understanding of community needs and capacities, which enable more effective identification of appropriate recipient households. Further success has been seen when organisations remain responsive to the community throughout implementation, providing additional resources (guttering materials, installation support, maintenance training) on an ad hoc basis to enhance overall project success. This highlights both the heightened risk of high-level interventions being disconnected from the practical needs of a community, and the potential benefits of specifically resourcing teams on the ground to meet these gaps when implementing high-level interventions.

Governance and Responsibility. Literature review findings identify that projects are more effective where approaches are less rigid, and community leaders are encouraged to adapt projects to local conditions and integrate resources with existing community activities. The case study findings support this conceptually but also highlight the significant burden this model puts on communities. For example, where water tanks are provided without auxiliary equipment to install them or relevant training to support their maintenance, these resources must be developed or procured in order to achieve the larger project goals. Importantly, these limitations were seen despite the established position of VWCs. In projects without such established governance groups, these challenges may be more significant.

Opportunities. Where community needs are better understood, projects are likely to be more effective. The utilisation of co-design tools can support such awareness. Alternatively, greater implementation flexibility such as the provision of ad hoc support throughout an implementation may effectively address community needs not identified in planning phases.

Place-based communities, while effective for provision of communal resources, have limited capacity to successfully alter beliefs or behaviours. Utilising faith-based communities or institution-based communities as alternative entry points may better support such project goals.

Similarly, connection with local institutions or faith-based organisations may reduce the burden projects place on village governance bodies. Where appropriate, intentional development of capacity and provision of resources to support project adaptation should be included in project designs.

6.2.3 Equity

Literature review findings also indicate that the diversity of place-based communities poses challenges to equity, the societal power imbalances present in these communities requiring

intentional action to support equitable outcomes (Section 6.1). Projects with these communities are therefore vulnerable to elite capture and the exclusion of minority and disadvantaged groups. This is particularly relevant for project planning in Tonga where social factors such as age, gender, and marital status impact whose opinion is heard and valued, and who may participate in which activities (Good, 2012). These risks are evident in case study findings also, where elite capture and personal bias influence which villages are included in projects and which households receive water tanks from those projects.

Elite Capture. Literature review findings identify elite capture as a particular challenge for implementation teams undertaking co-design processes with community groups, and teams undertaking consultation with representatives from communities. The case study supports these findings, noting that a community's inclusion in government WASH projects is influenced by the engagement of district and town officers, and their capacity and willingness to advocate for their community. Further, the distribution of tanks within some projects was poorly managed, with some higher priority households being overlooked (Section 4.8).

Risk of elite capture is further identified as a risk to fair priority setting and project planning and is linked in both the literature review and case study to the high levels of diversity within place-based communities. These risks are highlighted through the case study by the clear differences seen between the CDP responses from each demographic group (Section 4.7).

However, case study findings demonstrate the capacity of tools such as CDPs and household surveys to successfully manage these risks, supporting representative priority setting and fair resource distribution.

Barriers to Participation. Beyond priority setting, literature review evidence shows that even when projects are relevant and acceptable for the whole community, physical, social, and socioeconomic barriers may still limit participation. This is supported by the case study, where under all projects assessed, some households have been excluded due to their houses being deemed inappropriate water catchments (due to roof height or quality). The case study also demonstrates how creative solutions may manage this risk, MORDI's establishment of a water supply network to combat this exclusion is presented as a possible solution. However, the effectiveness of this network remains unclear.

The management of such barriers relies on implementers' capacity to anticipate, or identify, and respond to these barriers. Particularly for implementers who are community outsiders, or those

with limited understanding of the diversity within the village community, this is likely to be a key challenge, leading to unrealistic project expectations.

Despite these equity limitations, literature review findings suggest that the impacts of exclusion from direct participation in place-based interventions may be lower than in interventions through other intervention entry points.

Literature suggests that, providing that projects are based on shared priorities and targeted at village level resources, project outcomes should benefit the entire population. Case study findings support this, as regardless of whether households are included in distributions, the increase in village tanks alongside the increase in household tanks within the village ultimately increases the community's capacity for water collection and therefore their water security. However, at the household level, day-to-day impacts of such development may be minimal.

Opportunities. Management of equity risks in projects with place-based communities requires implementation teams to understand the power imbalances and diversity of social positions (gender, age, income, power position, etc.) that exist within the target community and to anticipate how these may lead to barriers to participation in the planning and delivery of development projects.

It is likely, particularly for non-Tongan implementers, that some nuances will be overlooked. Working alongside local organisations and community leaders throughout project planning and implementation may support greater community understanding. For such implementers, working alongside faith-based and institution-based organisations where diversity may be more easily captured may better support awareness and therefore better promote equity.

Where projects accurately identify and support development priorities common across a village community, even where barriers limit the participation of some community members, some project benefits may still be experienced. The promotion of representative priority setting is therefore critical to manage equity risks; this may be supported by use of tools such as CDPs and household surveys.

6.2.4 Impact

Negative Impacts. Literature review findings indicate that prevention of unintended negative impacts is supported when implementers are highly aware of the needs and desires of their target community, both those common to all community members, and those held by distinct sectors.

As such, interventions with place-based communities were found to be at high risk of causing unintended negative impacts through lack of alignment with community needs or desires, with little inherent protection for cultural safety. Case study findings do not support this, demonstrating that such risk can be successfully managed through the use of community co-design tools such as CDPs and community WASH plans and through consultation with community leaders. However, the projects assessed in this case study were all developed by Tongan organisations and centred around a widely accepted solution (rain-water tanks). As such, while these interventions had limited risk to cultural safety, it seems valid that, under different circumstances, this risk could be present.

Positive Impacts. Beyond preventing negative impacts, community co-design tools are seen in the case study to lead to indirect positive impacts for participating communities. For example, the development of community WASH plans and community risk profiles, while created to support the implementation of the case study project, remain in the community as a resource available to support future WASH development, either by the community, or by other implementers. Similarly, by utilising the CDPs, MORDI's project demonstrates the use of these tools for the community and for other implementers, strengthening the evidence base to support use of these co-design tools in the Tongan development sector.

Further, MORDI's project teams worked closely with VWCs. In some villages this required these groups to be established. Whether the VWC was newly-formed or preexisting, training was conducted in all villages to develop the skills of VWC members. The development of these groups supports community WASH management and development beyond the specific lifetime of the project.

Community Consultation. Literature review findings link indirect negative impacts to decisions being made without recipient community involvement and without the engagement of key community gatekeepers and leaders—particularly when determining ongoing management and leadership of projects. These findings are reinforced in the case study, where it is clear that by working closely with recipient communities, and utilising existing community leadership and organisation structures (district officers, town officers, VWC), project teams effectively manage risks to cultural safety.

Opportunities. Increased awareness of community dynamics, needs and desires will directly impact the risk that an intervention will cause both unintended impacts (positive or negative). Given the diversity of place-based communities, this risk should be a key

consideration for project teams operating through this entry point, particularly those from non-Tongan contexts. Implementing community co-design tools such as CDPs and community WASH plans will support alignment with community desires, reducing the risk of unintended impacts. Similarly, working alongside community insiders, such as key gatekeepers and leaders, may support greater awareness of community dynamics, enabling such impacts to be anticipated and avoided.

Restricting interventions to solutions and processes that are common and widely accepted in an area may further limit risk to cultural safety and other unintended impacts from projects with place-based communities.

6.2.5 Sustainability

Literature review findings indicate that sustainability can be a key challenge for interventions with place-based communities, identifying low capacity for maintenance and programme adaptation as key limiting factors. This is supported by case study findings; however, assessment of implementer approaches identified opportunities to manage these limitations including: shifting the focus of projects to plan for sustainability elements, reducing the expectations a project has for uncompensated and unresourced individuals, and establishing resilient governance structures.

Community Ownership. Literature review findings identify that when leveraged appropriately, community ownership can support a sense of shared responsibility for an intervention and its outputs. This sense of responsibility encourages ongoing investment of community resources and efforts to adapt project elements to support ongoing project success. This capacity to adapt project elements as the community's situation changes, or as the project moves through different phases, is essential to long-term sustainability.

Literature review findings indicate that interventions with place-based communities do not typically achieve such community ownership. This is supported by case study findings, with organisations reporting lack of community ownership as a key challenge, resulting in tanks being poorly maintained or left uninstalled within villages. MORDI's project specifically aimed to develop community ownership and capacity through recipients' financial co-payment and participation in implementation. However, while individual households may take ownership over their individual tank, ensuring it is properly installed and maintained, there tends to be a lack of collective ownership over the project as a whole. This limits the capacity for the village community to support ongoing maintenance training and to further develop the project.

Literature review findings suggest that key limiting factors may be a lack of community cohesion and lack of appropriate project governance. The case study indicates that a further important factor is the way the project is framed by implementers, and which aspects of the project they focus on. All implementing organisations analysed in the case study focus primarily on tank delivery and installation, rather than systems to support sustainability (such as maintenance training and tank-network expansion). Increased focus on sustainability aspects may support greater community ownership.

Analysis of case study evidence suggests project framing is an important factor influencing project sustainability. Framing a project as a long-term solution rather than a one-off fix (both in communications with communities and in planning by implementers) may encourage systems thinking, where projects are supported to move through phases, with the end point being an ongoing maintenance and replacement phase. Ensuring project framing is set to encourage sustainable development might include supporting access to supply chains and ongoing training support, be that from aid organisations or other communities, to enable ongoing independent development.

Project Governance. Lack of appropriate project governance was identified as a limiting factor for community ownership and sustainability. Literature review findings identify that within place-based communities, appropriate governance structures may not exist, or may be impacted by Tonga's high migration rates, which disrupt continuity and knowledge transfer.

The case study supports these findings. While VWCs exist in each village conceptually, many are inactive and need reestablishing before projects can begin. The VWCs' role in the sustainability of these projects is limited, as household tanks sit outside of their mandate. As a result, while VWC members may have the capacity to provide support to maintain projects, these activities are not integrated into standard operations or supported by resourcing or infrastructure. Alternative entry points could be accessed instead of or alongside place-based communities to meet these limitations.

Project Maintenance. Literature review findings identify that projects with place-based communities are challenged by limited project resilience and capacity for maintenance activities. This lack of project resilience is driven by diffuse responsibility (linked to governance challenges). The impact of this diffuse responsibility is seen through comparisons with place-based community projects that embed governance within local organisations. Such projects have greater long-term sustainability, as the organisation of activities to maintain projects falls

clearly within the responsibility of a nominated individual or group that is appropriately resourced and compensated.

These findings are supported by the case study. As noted, the focus of the assessed organisations is the provision of the water tanks as a physical resource. While some organisations provide maintenance training, processes are not established to maintain skills and motivation, or to source required materials beyond the implementation period. Case study findings further highlight the high expectations project teams have of community committees or dedicated individuals to sustain projects without support or compensation.

Opportunities. Key to increasing sustainability of projects is bringing sustainability to the forefront in project planning and implementation, including consideration of how a project will need to adapt to maintain relevance and effectiveness and how this will be supported both during the project's funded lifetime and beyond this period. Such framing should encourage consideration of long-term resourcing and training.

Specifically resourcing and planning to support long-term governance is important to reduce the burden projects place on village communities. Possible solutions might include embedding governance in other community divisions such as local institutions or faith-based organisations to support continuity of activities and appropriate resourcing.

6.3 Intervention Entry-Point Planning Tool

6.3.1 The Tool

The proposed planning tool, which has been tailored for use in any one of four intervention entry points, is provided in Table 6.1.

Building on the semiquantitative rankings developed in Chapter 3 (Table 3.1), this tool provides a summary of the strengths, limitations, opportunities, and threats for each intervention entry point. Analysis was informed by the five components of intervention success set out in the assessment framework adapted from McNamara et al. (2020).

Utilising a SWOT approach, the intention of this tool is to encourage consideration of the relative merits of each entry point. Recognising that entry point options may be restricted for some projects, this analysis provides guidance as to how implementers can engage communities through each of the entry points to best support the goals of their intervention. Accordingly, for each available intervention entry point, this tool emphasises strengths that could be built upon,

weaknesses that may require mitigating, opportunities that could be leveraged, and threats that should be recognised and managed.

Informed by evidence drawn from the literature review and case study, assessment of the place-based intervention entry point draws on the most developed evidence base. It is recommended that further research is conducted to similarly develop the evidence base to support refinement of the remaining entry points.

Notably, this SWOT assessment does not support the use of intervention-initiated communities as an intervention entry point, illustrating its poor performance across the five components of intervention success. Despite these findings, literature review findings demonstrate that this is a commonly accessed entry point for development in Tonga. This research indicates that interventions through this entry point should be carefully considered and only pursued with good reason and well-developed mitigation strategies to meet the limitations of this entry point. Given the tendency for interventions to work through this entry point, further research should be conducted to identify tools and approaches to mitigate the associated risks, or otherwise to conclusively deter development through this entry point.

Table 6.1

The Intervention Entry Point Planning Tool (SWOT Analysis)

Components	Intervention Entry Points			
	Intervention-Initiated	**Place-based**	**Institution-Based**	**Faith-Based**
Strengths	**Broad scale:** Can mobilise large groups; supports introduction of infrastructure and local resources.	**Broad scale:** Mobilises large groups; supports introduction of infrastructure and local resources. **Appeal to shared beliefs:** High appropriateness and effectiveness. **Equity**: If linked to a public space, exclusion from benefits is less likely. Governance: Existing elected village committees may be well placed to support projects.	**Community membership identification:** Enables understanding of community divisions and common views. Supports design of appropriate programmes. **Behaviour change**: Integration with existing structures aids introduction/socialisation of new ideas. **Local ownership**: Tools and approaches are more readily adapted by communities; facilitates sensitive topics. **Access to knowledge**: Builds on previous programmes and existing communication channels; cultural guidance enhances cultural safety. **Influence**: School authority figures (teachers/admin) act as effective role models. **Project maintenance**: Institutional structures support ongoing activities. **Governance**: Access to existing, resilient governance systems.	**Community membership identification:** Supports understanding of social divisions and common beliefs. **Cohesion**: Interventions aligned with shared understandings improve cultural safety. **Influence**: Religious leaders act as strong role models. **Contact**: Predictable meetings support communication. **Cultural safety**: Faith-based institutions effectively translate WASH messages into culturally aligned forms. **Governance**: Access to resilient governance systems. **Elite capture mitigation**: Strong links to disadvantaged groups reduce exclusion risks.
Weaknesses	**High diversity**: Ambiguity limits implementers' understanding of divisions, reducing effectiveness; Interventions unlikely to support all community members; ineffective for altering beliefs and attitudes. **Community ownership:** limited natural ownership which limits willingness of communities to contribute resources. **Cultural safety**: Approval often sought at higher government level; limited local knowledge; may bypass gatekeepers. **Equity**: Limited understanding of divisions increases risk of exacerbating inequalities. **Project maintenance:** Weak ownership and responsibility; limited resource investment. **Governance**: Project-specific structures vulnerable to migration; weak continuity mechanisms; existing governance limited.	**High diversity:** Unlikely to be appropriate for all community members. **Broad scale:** Limited effectiveness for altering beliefs and attitudes, or for introducing innovative solutions. **Equity**: Limited understanding of divisions so reduced capcity to manage equity risks; may exacerbate existing inequities. **Cultural safety**: Heightened risk when approval was sought at higher government level; limited local knowledge; may bypass gatekeepers; weak inherent cultural protection. **Community ownership:** Low ownership reduces adaptive implementation and sustainability. **Community Capacity**: Reliance on community committees or dedicated individuals creates strain. **Maintenance**: Weak ownership limited ongoing investment and adaptation. **Governance**: Exisiting governance is limited and often poorly resourced; project-specific governance is unsustainable, lacking systems to naturally transfer responsibility and leadership.	**Limited population-wide effects:** School-based outcomes limited without family buy-in due to low youth influence. **Delayed impact**: Benefits may only emerge when youth participants gain influence later in life. **Equity between institutions:** Outcomes vary depending on institutional leadership priorities.	**Equity**: Impacts may remain confined to the congregation; scaling to all religious groups in an area is resource-intensive.
Opportunities	**Infrastructure**: Suitable for development of local assets (e.g., gardens). **Flexible implementation:** More adaptable implementations can meet diverse emerging needs - mitigating low community awareness. **Parnerships:** Partnering with community organisations for cultural guidance and steering. **Community planning tools:** utilise co-design tools such as CDPs and community WASH plans to identify diversity and guide responsive development. **Framing**: Combat sustinability risks by planning interventions as long-term projects not one-off solutions; focus on sustainability elements (maintenance training, future procurement options).	**Flexible implementation:** More adaptable implementations can meet diverse emerging needs - mitigating low community awareness. **Community awareness:** Work with community gatekeepers to support identification and management of diversity risks. **Broad scale:** Interventions were successful when they focused on common-beliefs and took a broad-scale approach (marine environment protection). **Framing**: Combat sustinability risks by planning interventions as long-term projects not one-off solutions; focus on sustainability elements (maintenance training, future procurement options). **Governance partnerships:** Embedding governance within local institutions / faith-based organisations will support continuity and resourcing. **Innovation**: incorporate exploration of innovative solutions into community planning. **Community planning tools:** utilise co-design tools such as CDPs and community WASH plans to identify diversity and guide responsive development.	**Utilise alternative institutions:** Hospitals and health centres may create wder population impacts than schools while continuing to benefit from respected status, supported governance, and high awareness of community needs; **Combat elite capture:** Working with institutions serving disadvantaged groups reduces exclusion. **Behavioural change:** Strong alignment with cultural and social norms supports the introduction of new behaviours, ideas, and innovative solutions. **Governance:** Resilient governance is supported by the continuity and funding of such organisations, where development activities and objectives a clear, projects that stop can be reactivated. **Flexible implementation**: Focusing on intervention goals>activities enables utilisation of local knowledge, projects can be adapted to be responsive to the community.	**Behavioural change:** Faith-based institutions can communicate WASH messaging in culturally aligned ways, effective for introducing new behaviours, ideas and innovative solutions. **Governance**: Resilient governance is supported by the continuity and funding of such organisations, where development activities and objectives a clear, projects that stop can be reactivated. **Flexible implementation:** Focusing on intervention goals>activities enables utilisation of local knowledge, projects can be adapted to be responsive to the community.
Threats	**Unexpected diversity:** May lead to failure, introduce risks to comunity, or exacerbate existing inequities. **Elite capture**: Most vocal groups may dominate decision making. **Cultural safety risks**: New governance structures may disrupt local power dynamics. **Governance risks**: Bringing multiple small communities together may create conflict.	**Unexpected diversity:** Limited anticipation of barriers risks poor planning (risk heightened when projects are lead by community outsiders). **Elite capture**: Most vocal groups dominate decision making. **Cultural safety risks:** Introduction of governance structures may undermine existing community governance. **Innovation trade-offs**: ensuring interventions are socially appropriate may limit capacity to embrace innovative solutions which may be more appropriate for the community's physical environment. **Capacity burdens:** Co-design and leadership expectations may strain communities, especially where governance is weak and where a high volume of projects are operating.	**Elite capture:** High risk of further excluding already marginalised individuals. **Inter-community dynamics**: Working with select institutions may heighten inter-community tensions. **Community capacity**: Interventions may fail where maintenance demands exceed community capacity.	**Inter-community dynamics:** Working with select faith groups may heighten inter-community tensions. **Community capacity**: Interventions may fail where maintenance demands exceed community capacity.

6.4 Limitations

The key limitations impacting analysis in this chapter were driven by the scope of this research project. Firstly, this analysis was conducted by a solo researcher; a lack of collaboration in the analysis phase increases the risk of researcher bias influencing findings. This was minimised through collaboration in the case study phase but could not be entirely mitigated within the scope of a master's project.

Secondly, this analysis was informed by evidence drawn from a literature review, focused on all four entry points; and a case study, focused on only the place-based community entry point. As such, while assessment of the place-based intervention entry point drew on a developed evidence base, assessment of the remaining three entry points (intervention initiated, institution based, and faith based) was drawn primarily on evidence from the literature review. As such, some nuance or detail may not have been identified.

6.5 Conclusion and Link to Wider Thesis

This chapter is a culmination of the evidence developed through this research, bringing together findings from the literature and field research to produce an overall assessment of the use of intervention entry points in a Tongan WASH development context.

This comparative analysis contributes to addressing both Research Objectives 1 and 2: To analyse the use of intervention entry points in Tongan WASH development projects, and to develop tools to support appropriate selection and use of entry points in Tongan WASH interventions (Section 1.4).

Reflective of the pragmatic ontological perspective driving this research, the analysis undertaken in this chapter and the IEPT-SWOT are focused on the practical application of intervention entry points, intended to support implementers to utilise these research findings to optimise future community-based Tongan WASH interventions.

Chapter 7

7.1 Introduction

Responding to the lack of evidence to support improved impact and sustainability for WASH development interventions in Tonga, this thesis theorised that the way an intervention conceptualises community, and intends to work with that community, may be a critical element impacting intervention success.

Overall, research findings support this view. Bringing the context of an intervention into the foreground, evidence from the literature demonstrates strengths and weaknesses for each intervention entry point, indicating the need to match these strengths and weaknesses with the goals and resources of an intervention. Case study evidence brings these initial findings into a real-world context, refining initial assessments and identifying tools and approaches to overcome entry-point limitations and capitalise on opportunities to best support sustainable community-based WASH development in Tonga.

This chapter provides an overview of key research findings before revisiting the research aim and objectives. The chapter concludes by acknowledging limitations, making recommendations for future research and identifying implications for future development work.

7.2 Overall Summary

Analysis provided in Chapter 1 established the research gap, finding that despite a high volume of community-based WASH development activities, research into Tonga's interventions indicate that impacts are largely minimal and unsustainable. This informed the development of this research, which explored opportunities to increase the impacts and sustainability of WASH development through approaches to community engagement.

The research philosophy guiding the research presented in this thesis was presented in Chapter 2. This philosophy, alongside analysis of researcher positionality and methodology development, established the context for the analysis provided throughout this thesis.

The narrative review, presented in Chapter 3, identified the four intervention entry points explored in this research. Following analysis of entry-point challenges and opportunities, this chapter culminated in the presentation of a semiquantitative comparison of entry-point performance in relation to the five components of adaptation success as defined in the adapted McNamara et al. (2020) framework. Clear differences were found in the performance of the entry points, and each was seen to pose both challenges and opportunities to development

teams. By exploring these challenges and opportunities, it was possible to identify key considerations for intervention success such as the importance of prioritising the maintenance of activities and outcomes beyond the intervention lifetime. Findings highlighted the importance of resilient governance and resourcing to support longevity of outcomes. Ultimately, what became clear was that the goals of the intervention are critical in determining which entry point(s) will best support adaptation success.

The ’Eua case study, detailed in Chapter 4, was the field-research phase. This provided the opportunity to field test and refine literature review findings from Chapter 3, with a focus on the place-based community entry point. Overall, the case study broadly supported literature review findings, similarly recognising the significant impact of entry-point selection on the success of a project. Analysis of place-based entry points in Chapter 3 identified a number of limitations for intervention success, primarily driven by high community diversity. By directly investigating this entry point through field research, the case study identified approaches and community organising tools (such as community WASH plans and CDPs) that can be applied to manage these limitations and capitalise on opportunities. This was a significant finding, as it provides actionable solutions for WASH development practitioners, and suggests that through further research, tools and approaches may be also identified to support WASH development through alternative intervention entry points.

The detailed analysis of MORDI’s 2020 ’Eua water project conducted in Chapter 4 also enabled the development of specific recommendations to further support water security on ’Eua and to enhance future water security projects delivered by MORDI and similarly motivated organisations (Section 4.9.2).

In both the literature review (Chapter 3) and field research (Chapter 4), extensive use was made of the adapted McNamara et al. (2020) framework. It was noted that very little work has been done to establish a systematic assessment method that could be applied across Pacific WASH development projects, and so field testing of this framework would be valuable in its own right. The next part of the work (set out in Chapter 5) therefore focused on assessing how well the framework itself performed, evaluating its performance and validity as a framework for assessing Pacific WASH interventions. This analysis was motivated by a desire for a recognised common assessment framework to support comparative assessment of WASH development projects in Tonga, and therefore stronger coordination and learning across the sector. This appraisal drew on evidence from application of the assessment framework in both the literature review context and the case-study context. In general, it performed very well. Its success in

these contexts led to the recommendation of this framework for further use in the assessment of Pacific WASH interventions.

Chapter 6 brought together evidence gathered through the literature review and case study. Comparative analysis provided an overall assessment of the evidence to support effective use of intervention entry points in Tongan community-based WASH development. This chapter was designed to provide actionable guidance to support implementers to plan successful interventions in this context. As such, to increase accessibility of findings, the chapter concluded with a SWOT analysis of each entry point (Table 6.1). The intended use for this table is not to dictate solutions but rather to encourage critical thinking that brings the use of intervention entry points into the foreground as a key planning decision for development projects.

The primary aim of this research was to improve the evidence base guiding effective and sustainable community-based WASH development in Tonga, and this aim was achieved. The work could be divided into two main areas:

1. Assessment of the use of intervention entry point in Tongan WASH development projects.

This analysis was conducted through a narrative review of the existing literature, and then through a case-study project assessing water security projects on ’Eua.

2. Development of two tools to support appropriate selection and effective use of entry points in Tongan WASH interventions.

The first of these was the assessment framework for evaluating community-based Pacific WASH development projects. Adapted from McNamara et al. (2020), this framework was taken from an adjacent context (the assessment of climate adaptation projects in the Pacific). This framework’s performance was assessed in both literature-review and field-research contexts and deemed effective for use across the Pacific WASH development sector. The second tool was the IEPT-SWOT. This tool incorporates (via SWOT analysis) the challenges and opportunities associated with each entry point, intended to support critical consideration of entry points in the planning of Tongan WASH development interventions.

7.3 Limitations

Research addressing intervention entry points, both conceptually and in applied contexts, is limited. Similarly, there is a paucity of research to assess the outcomes of WASH development

projects in the Pacific. This restricted the evidence base available to inform the literature analysis conducted in this thesis and therefore the insights that could be drawn.

These limitations were overcome through the conduct of the case study, enabling both the validation and refinement of initial findings. However, given this research focus is in its infancy, the findings presented should be viewed as a starting point only, with further research required.

The tools developed in this thesis (for assessment and planning) are intended to support implementers to meaningfully engage with the concept of entry points and to identify solutions to manage limitations that may be present when using an entry point in project context.

As these tools are developed from limited evidence, they are not designed to dictate but rather to encourage critical consideration. As further evidence is generated, these tools should be critiqued and refined to support the development of a strong evidence base to support evidence-based WASH development in Tonga.

7.4 Recommendations for Future Research

Research in this thesis has focused on the exploration of the place-based community entry point. Further field research should be undertaken focusing on the remaining three entry points to enable similar validation and refinement.

The realities of development work may restrict the intervention entry points available for projects. Thus the introduction and appraisal of tools and approaches to optimise development through each entry point in different WASH contexts is essential to support improved WASH development.

7.5 Implications for Future Development Work

The research presented in this thesis indicates that the success of community-based WASH development projects is strongly influenced by their entry points into the community. As such, I recommend that implementation teams are critical of the setting of their intervention, shifting practice to view the context of an intervention as a key design decision that needs to support a project's specific goals, rather than a pragmatic or funder-driven decision.

This shift requires implementation teams to critically consider how the community has been conceptualised in their intervention, and how their chosen entry point will impact their implementation. The IEPT-SWOT can be used to guide these considerations and support the identification of tools and strategies that can be implemented to optimise intervention success in the chosen context.

Ongoing improvement within the WASH development sector relies on the development of a strong evidence base. This requires practitioners to conduct thorough project assessments and to publish these assessments. To support stronger coordination and learning across the sector, these assessments should utilise a common assessment framework such as the adapted five-factor framework presented in this thesis (McNamara et al., 2020).

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Appendices

Appendix A: Policy Brief

devnet
THE AOTEAROA NEW ZEALAND INTERNATIONAL DEVELOPMENT STUDIES NETWORK

New Zealand Postgraduate Development Field Research Award

Policy Brief

2025

Kiera Nelson | Master of Health Science | Massey University

Progress Towards SDG6 on 'Eua, Tonga: Review of the MORDI Tonga Trust project to enhance disaster preparedness for water security

Summary:

- Enhancement of water security in line with the objectives of SDG6 is a key policy priority for the Kingdom of Tonga. Over the years this has led to a range of water development initiatives, each with its own benefits and challenges. For the island of 'Eua, one of the most significant was a large-scale rainwater tank installation project implemented in 2020 by the NGO *Mainstreaming of Rural Development Innovation Tonga Trust* (MORDI).

- This research, carried out in collaboration with MORDI, examined the performance of that project five years on, while considering relevant factors including changes in community attitudes and priorities, complementary work carried out by two other agencies, and upgrades to 'Eua's reticulated drinking-water network.

- Overall, our research indicates positive progress towards water security in 'Eua as a result of MORDI's water project. However, further progress is required to achieve SDG6. Several recommendations have been made to MORDI for both consolidating the benefits of existing work, and developing future projects. Some high-level findings of the research are that self-sufficiency, including pathways for ongoing resource procurement and training, should be prioritised as an integral part of the development; Community Development Plans (CDPs) are a key resource to inform project design and evaluation across agencies; plans for implementation assessment should be determined in the design-phase; and aid efficiency would greatly benefit from increased data transparency and sharing among government agencies and NGOs in Tonga.

The Development Issue

Access to safe water is a fundamental human right, essential for health and development. It is the focus of the United Nations' Sustainable Development Goal 6: *to ensure availability of sustainable management of water and sanitation for all*. This is a key challenge for the Kingdom of Tonga. In 2022, Tonga reported some of the lowest rates of access to safely managed water and sanitation in the world, at 30% and 34%, respectively (United Nations 2024).

As a key development priority for Tonga, significant work and expenditure has aimed to enhance water security through improvements to rainwater harvesting (household and community), expansion of groundwater access, and development of water treatment capabilities. However, despite this focus, the effect of these projects on water security remains poorly characterised due to limitations in evaluation and data sharing (Government of Tonga 2024).

To understand the opportunities and barriers in the delivery and evaluation of water security projects, this research focused on the island of 'Eua as a case-study. 'Eua is an island located approximately 20 km southeast of Tongatapu, home to approximately 5,000 people, divided into two districts and 15 communities.

Figure 1. Map to indicate the relative position of 'Eua to Tongatapu.

Since 2020, 'Eua's communities have been the recipients of projects to enhance water security delivered by: Mainstreaming of Rural Development Innovation Tonga Trust (MORDI), Live and Learn Environmental Education (Live and Learn), Tonga's Ministry of Meteorology, Information, Disaster Management, Environment, Climate Change and Communications (MEIDECC), and Sione's Foundation. MORDI, Live and Learn, and MEIDECC's projects focused on household rainwater catchment systems, while Sione's Foundation improved the performance of the treatment plant for the reticulated network.

Water sources on 'Eua typically differ by use. Drinking water is primarily drawn from tanks connected to household roof catchments, while water for other uses is primarily drawn from the reticulated supply. This division is typical of communities across Tonga. However, while most Tongan communities rely on groundwater for reticulated supplies, 'Eua's reticulated network utilises a combination of surface water and groundwater (being one of the few Tongan islands with access to fresh surface water). As such, unlike most reticulated supplied in Tonga, 'Eua's supply is not impacted by high salinity.

MORDI is a key NGO contributing to community development in Tonga. Supporting community-driven development, the cornerstone of MORDI's approach is Community Development Plans (CDPs). These plans identify priority areas for community development and the related opportunities and barriers. Developed with each community through participatory processes, priorities are negotiated first within each community's demographic groups (women, men, youth) and then as a whole community. These processes ensure that these plans are representative of the community.

The Research

This research aimed to assess the impacts and effectiveness of MORDI's 2020 'Eua water resilience project and associated work undertaken by Live and Learns, and MEIDECC, and to identify strengths and limitations of the approaches taken by these agencies with reference to progress towards SDG6 on 'Eua. Actionable recommendations to consolidate gains and strengthen future approaches were then developed.

Prioritising the views of community members, CDPs were used as a key source of information. Progress towards water improvement on 'Eua was measured by comparing 'Eua's 2019 CDPs (developed prior to water project implementation) and 'Eua's 2025 CDPs (developed post water project implementation). These CDP findings were then supported and further contextualised through semi-structured interviews with community members, local implementers, and key public service personnel from health, government and utilities.

Findings

Changes to the position of water within the development priorities of 'Eua's communities from 2019 to 2025 are shown in Tables 1 and 2. Table 1 shows the change in the prioritisation of water in the CDPs as set by each demographic group in 'Eua's 15 communities, while Table 2 shows the change in the prioritisation of water in the final CDP for each community.

Table 1. The changes in the prioritisation of water within community priorities as set by each demographic group in each community in 'Eua.

	'Eua Changes in Water Priority in CDPs 2019 - 2025			
Whole Island by Group	Year	Water listed as Top Priority	Water listed in Top 3 Priorities	Water listed as Any Priority
'Eua Women's groups	2019	53% (8/15)	93% (14/15)	100% (15/15)
	2025	20% (3/15)	53% (8/15)	67% (10/15)
	Change	▼ 33%	▼ 40%	▼ 33%
'Eua Men's groups	2019	27% (4/15)	87% (13/15)	93% (14/15)
	2025	13% 2/15)	47% (7/15)	73% (11/15)
	Change	▼ 14%	▼ 40%	▼ 20%
'Eua Youth groups	2019	13% (2/15)	47% (7/15)	67% (10/15)
	2025	0% (0/15)	27% (4/15)	47% (7/15)
	Change	▼ 13%	▼ 20%	▼ 20%

Table 2. The changes in the prioritisation of water in the final CDP for each community.

Whole Island	Year	Water listed as Top Priority	Water listed in Top 3 Priorities	Water listed as Any Priority
'Eua Communities	2019	47% (7/15)	80% (12/15)	100% (15/15)
	2025	13% (2/15)	67% (10/15)	93% (14/15)
	Change	▼ 34%	▼ 13%	▼ 7%

These results demonstrate clear progress towards addressing water issues in 'Eua's communities. However, water's continued presence within priorities highlights that further work is required to achieve water security in line with SDG6. CDP comments along with interview responses identified the following key gaps and opportunities.

Gaps and Opportunities

Water Safety

Aligned with SDG6, the goal of MORDI's project, and indeed all water projects across Tonga is to support the provision of safe water. To date, physical resource delivery at the household level (tanks, gutters, tank stands) has been the focus of water security projects. Less focus has been given to ensuring the safety of these water supplies.

Lack of attention to water safety is highlighted by an Asian Development Bank (ADB) study. Their Village Water Committee Pilot Report identified bacterial contamination, using *E.coli* as an indicator, in rainwater tanks to be alarmingly high in 2023. While this report only measured tanks on Tongatapu,

Tonga Public Health (TPH) assert that these findings can be extrapolated across Tonga. ADB and TPH attribute these high levels of contamination to declines in water safety practices, such as cleaning of water systems (tanks and gutters), TPH suggesting that the reduction in waterborne disease outbreaks across Tonga (the last occurring in 2015) has led to complacency.

While MORDI and Live and Learn have delivered maintenance training as part of implementation, limited on-going training and support has reduced long-term effectiveness. Tonga Public Health identified health literacy as a key limitation, suggesting that while many community members are aware of recommendations for water system maintenance, and to boil water for children and elderly people, understanding of the importance of these measures and their impact is lacking. External support (training, and community tank maintenance) is limited due to lack of resourcing for Tonga Public Health.

Sustainability

For long-term effectiveness, interventions need to focus on capacity development to support self-sufficiency. MORDI recognises this, intentionally building community ownership in projects through co-design, co-payment, and by working in partnership with town officers and Village Water Committees (VWCs). However, increased focus on developing sustainable systems may better support communities to provide regular training and continue to support improved water access. For example, supporting the development of reliable supply systems between 'Eua's communities and suppliers in Tongatapu may help to overcome barriers to accessing repair materials.

VWCs are a valuable, yet under-utilised resource for 'Eua's communities. Collaboration between VWCs, Tonga Water Board and TPH is a key opportunity. With targeted capacity building and resourcing, VWCs could effectively address many of the identified community-level training and routine maintenance gaps. However, lack of engagement from VWC members is a key limitation, It is likely that increasing engagement and output will require meaningful incentives.

A further finding identified through our research was that the use of disaster response assets (such as The Tonga National Youth Congress tank cleaning) during peacetime needs to be carefully considered and well communicated to ensure it does not disincentivise the development of sustainable approaches to routine maintenance.

Equity

Equity appeared to be a strength of water projects delivered on 'Eua, supported by implementer's adherence to strict inclusion criteria that prioritised the most in-need households. However, further focus on the inclusion of women is recognised as an opportunity. Their typical role in the household results in increased awareness of water supply issues and increased availability during times of water system malfunction. Targeted capacity building for women is likely to support greater maintenance and sustainability of systems.

Systems thinking

While CDPs identified that additional water tanks are still required on 'Eua, a notable finding was that many reports of insufficient tanks reflect a growing desire for households to have more than one tank to increase resilience to droughts. This is indicative of the low trust communities have in the improved water treatment plant. This distrust highlights weak coordination between Tonga Water Board and other public services involved in Tonga's water system.

Systems thinking is essential to resilient water development (resilient to weather events and disasters). Water resilience on 'Eua is supported by capacity across the water system (reticulated supply, household catchments, and community facility catchments). However, for these systems to effectively increase perceived water security, widespread understanding of water source capacities and trust in those sources is essential.

Data and evaluation

Overall, there is a lack of data to track progress toward water security in Tonga. MORDI's commitment to evaluating and reporting on projects is a move towards addressing this gap. However, expanding the breadth of reporting beyond implementation assessment to measure long-term impacts on elements of SDG6 (e.g. water security and quality) will enable greater identification of remaining gaps and opportunities for implementation improvement. To ensure these findings are representative of community perspectives, going forward, CDP analysis should be included as one of these measures.

Lack or insufficiency of interagency data sharing was a key finding of this research. Greater data sharing would enable implementers to assess overall progress towards key targets, and support aid efficiency. Development of digital infrastructure to support this data sharing needs to be a priority action area for the Government of Tonga. In the interim, increased effort by implementers to share data including; project evaluations, community plans, and implementation data is required.

Recommendations

A range of recommendations have been made to MORDI with a view of maximising the benefits of both existing and future initiatives. These include:

1. Ensure that projects aiming to improve water access have an explicit focus on practices supporting safe drinking water alongside the delivery of physical resources.

2. Public health education to support system maintenance and water safety practices in communities (including the chlorination of community supplies) is currently challenged by limited capacity in Tonga Public Health. Explore how Village Water Committees may be supported to address this gap.

3. Investigate ways to improve the frequency of bacterial water testing of 'Eua's water tanks (household and community), to assess water contamination. Better data in this area would both characterise the scale of the public health issue and serve as a valuable resource for VWCs, and TPH, to motivate safe water practices.

4. Encourage mutual support between Village Water Committees. Explore how collaboration between committees may be facilitated to encourage knowledge sharing and greater engagement, and ultimately strengthen capacity.

5. Continue to support and develop the use of Community Development Plans (CDPs). This research demonstrated the utility of CDPs for research and evaluation. Developed through inclusive co-design processes, CDPs are a representative reflection of community priorities and perspectives. Therefore, to support community-centred development, organisations should be encouraged to utilise these plans for project evaluation, and development research.

Limitations and Further Research

Due to a lack of research to evaluate water projects in Tonga and specifically on 'Eua, this research took a broad focus, identifying gaps and opportunities across the water sector. Future research should focus on assessing and refining solutions to these more specific gaps and opportunities to improve approaches to water development.

Importantly this research was based in 'Eua, centred around their water system and the development priorities of their communities. While it seems likely that findings will be relevant across Tonga, further research to delineate those findings that are specific to 'Eua's context is encouraged.

Specifically three areas have been identified for further research:

1. Water conservation is an emerging topic on 'Eua as water becomes more available. Current water use data indicates that significant volumes are being drawn from the reticulated supply. Analysis of water usage is encouraged. This should include comparisons of household meters and water plant output to indicate whether this volume is linked to true household use or network loss, enabling appropriate remediation steps to be determined.

2. Currently, lack of interagency data sharing limits aid efficiency. Research to support the development of effective digital infrastructure, and processes to enable greater data sharing and shared insights, would contribute to more effective, coordinated efforts towards SDG6 in Tonga.

3. CDPs have significant capacity as a source of data for community-based research. CDPs from other Islands should be assessed to understand how water projects have impacted SDG6 priorities in other Tongan contexts.

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ANNEX 1

Prior to the research commencing, this research was self-assessed as low risk using the Massey University Human Ethics Committee checklist and evaluated by peer review. The MUHEC were notified about the project (Massey University Ethics Notification Number 4000030317). The author of this report is responsible for the ethical conduct of this research, which was conducted in accordance with the principles of privacy, informed consent and harm avoidance.

If you have any concerns about the ethical conduct of this research that you want to raise with someone other than the researcher, please contact Massey University Human Ethics by email: humanethics@massey.ac.nz.

Appendix B: Ethics Approval

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

14/03/2025

Dear: Kiera Nelson

Re: Low Risk Notification - 4000030317 - Sustainability of community-based aid interventions: a case study of the 2020 'Eua Water Tank project with MORDI Tonga Trust.

Thank you for submitting a low risk notification for your research/teaching/evaluation.

This email is to acknowledge receipt of the low risk notification and to inform you that the details of your project have been recorded in our database for inclusion in the annual reports to the Health Research Council Ethics Committee (HRCEC) and the Massey University Research Committee (URC).

You may proceed with your research, though it is advisable to provide a couple of weeks before commencing, as all low risk notifications are checked for completeness and clarity by a Research Ethics Advisor. You may be contacted if your application is incomplete and/or further clarification is required.

The low risk notification for this project is valid for a maximum of three years.

Please notify me if situations subsequently occur which cause you to reconsider your initial ethical analysis.

If a sponsoring organisation, funding authority (e.g., the Health Research Council) or a journal require evidence of ethical approval from a Human Ethics Committee (with an approval number), you need to complete a full Massey University Human Ethics application to be reviewed and approved by one of our Human Ethics Committees. Applications must be submitted and approved prior to the commencement of the research.

Please note that travel undertaken by students must be approved by the supervisor and the relevant Pro Vice-Chancellor and be in accordance with the Policy and Procedures for Course-Related Student Travel Overseas. In addition, the supervisor must advise the University's Insurance Officer.

If you have any concerns about the conduct of this research that you want to raise with someone other than the researcher(s), please contact the Research Ethics Office, email humanethics@massey.ac.nz. "

Please include the following statement on all public documents (e.g., information sheet, consent form) related to your project:

> ***This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.***
>
> ***If you have any concerns about the ethical conduct of this research that you want to raise with someone other than the researcher(s), please contact Massey University Human Ethics by email: humanethics@massey.ac.nz.***

I wish you all the best in your research, teaching or evaluation activities and appreciate your thoughtful consideration of ethics principles and practices.

Ngā mihi nui,

Professor Tracy Riley
Acting Chair, Research Ethics Chair's Committee

Research Ethics Office, Research and Enterprise
Massey University, Private Bag 11 222, Palmerston North, 4442, New Zealand T 06 951 6841; 06 951 6840
E humanethics@massey.ac.nz; animalethics@massey.ac.nz; gtc@massey.ac.nz

Appendix C: Participant Information Sheet

Sustainability of community-based aid interventions: a case study of the 2020 ‘Eua Water Tank project with MORDI Tonga Trust.

Lead Researcher: Kiera Nelson | Masters Student from Massey University, New Zealand

Study Site: Tonga

Supported by: MORDI Tonga Trust

Contact: +64 [redacted]

Ethics ref: 4000030317

You are invited to take part in a study assessing rainwater harvesting tank projects in Tonga. The focus of this work is to assess the rainwater harvesting project delivered by Mainstreaming of Rural Development and Innovation Tonga Trust (MORDI TT) on ‘Eua. You have been identified to provide information about the delivery of either this project, or similar projects by organisations external to MORDI TT. Whether or not you take part is your choice. If you don’t want to take part, you don’t have to give a reason, and it won’t affect any future participation in projects. If you do want to take part now, but change your mind later, you can stop the study at any time.

This Participant Information Sheet will help you to decide if you would like to take part. It sets out why we are doing the study, what your participation would involve, and what would happen after the study ends. We will go through this information with you and answer any questions you may have. You do not have to decide today whether or not you will participate in this study. Before you decide you are welcome to talk about the study with other people, such as family and friends.

If you agree to take part in this study, you will be asked to sign the Consent Form on the last page of this document. You will be given a copy of both the Participant Information Sheet and the Consent Form to keep.

This document is seven (7) pages long, including the Consent Form. Please make sure you have read and understood all of the pages.

VOLUNTARY PARTICIPATION AND WITHDRAWAL FROM THIS STUDY

Being part of this study and answering any questions is voluntary. If you choose not to be part of the study you will not be disadvantaged in any way. If you decide now to be part of the study and then later change your mind that is okay and we will remove the information you have provided from the study.

WHAT IS THE PURPOSE OF THE STUDY?

This study will assess the 2020 ‘Eua Island Water Tank Project conducted by MORDI TT. It will look to understand how it was implemented, what went well, and what could be done differently next time, and how it has changed since it was completed in 2020.

It also looks to understand how other groups deliver rainwater tank projects, and if this is different from MORDI TT, why delivery is different.

The aim of the study is to understand which parts of the project continue to work well and should be repeated, and which parts should be changed next time. This knowledge will contribute to organisations like MORDI TT, helping them to plan better projects to support water for Tongan communities.

HOW IS THE STUDY DESIGNED?

This study will speak to up to five (5) people from the ‘Eua Island community who have been involved in the 2020 MORDI TT water tank project. It will also speak to up to five (5) people from MORDI TT or other implementing organisations who have been involved in Tongan Water Tank projects.

Research will look like conversations where we talk about the relevant water tank project and your experience with it. After this conversation, I will check that I have properly understood what you have said, and you will have the opportunity to correct me. While we speak I will record the conversation and later transcribe it so that I can check parts back later. You may request a copy of this transcript.

WHO CAN TAKE PART IN THE STUDY?

Participants are chosen because their experience with the project, either in 2020 when it was completed or since then, will help us to understand more about the project, its delivery, maintenance, governance or other part. Additional participants will be included to provide information about the delivery of rainwater tank projects by other organisations in Tonga.

All participants will be aged over 18 and be able to consent to being part of the research.

If you would like to conduct the research in Tongan that is okay, we will make a translator available.

WHAT WILL MY PARTICIPATION IN THE STUDY INVOLVE?

Participation in this study will involve being part of a conversation over no more than two (2) hours. I anticipate we will do this in one day however this can happen over multiple days. The research team of at least two people will travel to you to have this conversation and can do so when you are available.

The audio of this interview will be recorded on a secure device. I will then transcribe this audio and delete the recording. Once I have the transcription I will come back to you to check that you are happy with what was said and okay for it to be used in the research. You may request a copy of this transcript.

WHAT ARE THE POSSIBLE RISKS OF THIS STUDY?

I do not expect any risks because of your participation in the study. Anything you share will be kept confidential and any information you provide can be kept anonymous.

WHAT ARE THE POSSIBLE BENEFITS OF THIS STUDY?

The benefit of this study is that by sharing your experience and knowledge, projects in the future can be more effective, helping Tonga to move towards greater water security.

WILL ANY COSTS BE REIMBURSED?

As a participant you will not incur any costs, the research team will travel to you and can meet at a time that suits you.

WHAT WILL HAPPEN TO MY INFORMATION?

During this study the researchers will record information about you and your study participation. Such as your name, family, and role in the community. The audio from your interview will be recorded on a secure device and transcribed. Once transcribed the recording will be deleted, this transcription will be kept by the research team. This information will be stored securely on a locked laptop and only the research team will have access to it. At any time you may request a copy of this information. You cannot take part in this study if you do not consent to the collection of this information.

Identifiable Information

Identifiable information is any data that could identify you (e.g. your name, date of birth, or address). Only researchers will have access to your identifiable information.

De-identified (Coded) Information

To make sure your personal information is kept confidential, information that identifies you will not be included in any report generated by the researchers. Instead, you will be identified by a code. A list will be kept linking your code with your name, so that you can be identified by your coded data if needed.

The following groups may have access to your coded information which will be sent and stored in New Zealand:

- The research team
- Regulatory or other governmental agencies worldwide.

The results of the study may be published or presented, but not in a form that would reasonably be expected to identify you.

Security and Storage of Your Information.

Your identifiable information, interview recording and transcript will be held securely on a locked laptop during the study. The interview recording will be deleted once the transcript is made. All other information will be kept for no longer than one year, deleted once the final research report has been written.

Risks

Although efforts will be made to protect your privacy, absolute confidentiality of your information cannot be guaranteed. Even with coded and anonymised information, there is no guarantee that you cannot be identified.

Rights to Access Your Information.

You have the right to request access to your information held by the research team. You also have the right to request that any information you disagree with be corrected.

If you have any questions about the collection and use of information about you, you should ask the researcher.

Rights to Withdraw Your Information.

You may withdraw your consent for the collection and use of your information at any time. If you withdraw your consent, your study participation will end. If you agree, information collected up until your withdrawal from the study will continue to be used and included in the study.

WHAT HAPPENS AFTER THE STUDY OR IF I CHANGE MY MIND?

If at any point during the study you change your mind and want to withdraw please contact the lead researcher on the contact details on this information sheet. If you approve, data collected up to when you withdraw will be used however if requested before the end of the study period on May 01 this can be removed.

CAN I FIND OUT THE RESULTS OF THE STUDY?

The results of this study will be published in July 2025. At this time a summary of the study results can be provided to you if say that you would like to receive this on the consent sheet below. The complete study report will be available online and a link will be provided in this summary. The results will also be included in a larger research report which will be published in March 2026, again, if requested this report will be provided to you and the online link made available.

WHO IS FUNDING THE STUDY?

This study is being funded by The New Zealand Ministry of Foreign Affairs and Trade and The New Zealand Defence Force. However, neither group will have access to your information.

WHO HAS APPROVED THE STUDY?

This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the ethical conduct of this research that you want to raise with someone other than the researcher(s), please contact Massey University Human Ethics by email: humanethics@massey.ac.nz.

WHO DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS?

If you have any questions, concerns or complaints about the study at any stage, you can contact:

Kiera Nelson, Lead Researcher

+64 [redacted]

[redacted]@gmail.com

If you want to talk to someone who isn't involved with the study, you can contact an independent health and disability advocate on:

Phone:	0800 555 050
Fax:	0800 2 SUPPORT (0800 2787 7678)
Email:	advocacy@advocacy.org.nz
Website:	https://www.advocacy.org.nz/

You can also contact the health and disability ethics committee (HDEC) that approved this study on:

Email:	hdecs@health.govt.nz
Phone:	0800 400 569 (Ministry of Health general enquiries)

Appendix D: Participant Consent Form

Consent Form

Sustainability of community-based aid interventions: a case study of the 2020 ‘Eua Water Tank project with MORDI Tonga Trust.

Please tick to indicate you consent to the following

I have read the Participant Information Sheet, or have had it read to me in a language I understand, and I fully comprehend what it says.		
I have been given sufficient time to consider whether or not to participate in this study.		
I have had the opportunity to use a legal representative, family support or a friend to help me ask questions and understand the study.		
I am satisfied with the answers I have been given regarding the study and I have a copy of this consent form and information sheet.		
I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time.		
I consent to the research staff collecting and processing my information.		
I consent to my information being sent overseas.		
If I decide to withdraw from the study, I agree that the information collected about me up to the point when I withdraw may continue to be processed.	Yes ☐	No ☐
I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study.		
I know who to contact if I have any questions about the study in general.		
I understand my responsibilities as a study participant.		
I wish to receive a summary of the results from the study.	Yes ☐	No ☐

Declaration by participant:

I hereby consent to take part in this study.

Participant's name:

Signature:	Date:

Declaration by member of research team:

I have given a verbal explanation of the research project to the participant, and have answered the participant's questions about it.

I believe that the participant understands the study and has given informed consent to participate.

Researcher's name:

Signature:	Date:

Appendix E: Semistructured Interview Documents

Community Members

Questions – Semistructured for community
The aim is for interviews to be conversation style, so open ended.

1. How were you involved with the 2020 MORDI water tank project? **Na'e anga fefe ho'o kau ki he poloseki tufa tangike vai ko ia na'e fakahoko 'e MORDI 'I he 2020?**
   - Did your family receive a water tank? ***Na'e lavemonu ho famili ha tangike vai?***
   - Did you attend the CDP development meeting? ***Na'a ke kau ki he ngaahi fakataha ki hono fa'u e palani langa fakalakalaka e kolo?***
   - Did you or family help to set up the tanks? ***Na'e tokoni ho'o famili ki he fokotu'u e tangike vai?***
2. What did the community think of the project? ***Ko e ha e vakai pe fakakaukau 'a e kakai homou kolo ki he poloseki tufa tangike vai?***
   - Were tanks a good option? ***'Oku ke pehe ko e tangike vai ko ha me'a lelei taha eni?***
3. How do you use the tank water, what about the rest of the community? ***Ko e ha fua e ngaahi me'a 'oku ke faka'aonga'I ki ai ho tangike vai?***
   - Drinking? ***Inu?***
   - Cleaning? ***Fakama'a pe fō***
   - Showering? ***kaukau***
   - Cooking? ***Feime'atokoni***
4. Are the tanks still working? ***'Oku kei ngaue lelei pe e tangike vai?***
   - Are they easy to maintain? ***'Oku faingofua pe hono tauhi mo tokanga'i?***
   - Who does this? ***Ko hai 'oku ne tokanga'i mo tauhi e tangike vai?***
   - Who teaches people? ***Ko hai 'oku ne ako'i e kakai ki hono tauhi e ngaahi tangike vai?***
   - If something was damaged who fixes it? ***Ka ai ha maumau ki he tangike vai ko hai 'oku ne fakahoko ngaue ki hono fakalelei'i?***
   - Have you used any of the guides? **Kuo ke ngaue'aki ha taha 'o e ngaahi tohi fakahinohino ki hono tokanga'I mo tauhi ho ma'u'anga vai?**
5. How have the tanks changed water for your community? **'Oku anga fefe 'a e tokoni 'a e ngaahi tangike vai na'e tufa ki he ma'u'anga vai homou kolo?**
   - How you get it ***Anga / founga e ho'o ma'u e vai***
   - How much you use ***Lahi e vai 'oku faka'aonga'i***
   - Cost ***Mahu'inga (fakapa'anga)***
   - Do you worry about water? ***'Oku ke fa'a lotosi'I, hoha'a pe tala'a fekau'aki moe vai?***
6. Was anyone in the community left out? ***Ne 'i ai ha ni'ihi e kolo ne 'ikai kau ki he tufa tangike?***
7. Do you think anything else needs to be done on 'Eua for drinking water? **'Oku ke pehe nai 'oku toe 'iai ha me'a 'oku fiema'u ke fakahoko 'I 'Eua ni fekau'aki mo e ma'u'anga vai inu?**
8. Do you think MORDI could do anything better / different? ***'Oku ke pehe 'oku 'i ia ha ngaahi founga ngaue 'oku lava ke fakahoko ke toe lelei ange pe ha toe fa'ahinga ngaue makehe 'e fakahoko 'e he MORDI?***

Tonga Public Service Workers

Questions – Semi-structured for Community implementers
The aim is for interviews to be conversation style, so open-ended.

1. How were you involved with the 2020 MORDI water tank project?
2. What was the motivation behind the project?
   - What were the intended outcomes
3. How suitable was the project for the community?
   - How were the plans made?
   - Social context?
   - Cultural context?
   - What criteria was used to decide which households received support?
4. How effective was the project?
   - Has the project achieved intended outcomes?
   - Were the outcomes a direct result of the project?
5. Equity: What was done to support involvement of all community members?
   - Women, youth, elderly, disabled groups, other minorities
6. Did any of the communities have to be worked with differently?
   - E.g. ‘Ohonua with its different reticulation network?
7. Was there anything that changed the plans?
   - New information came up?
   - New needs identified?
   - Did you identify outcomes (pos/neg) that you didn’t expect?
8. How did the training process work?
   - Is there ongoing training?
   - Were the guides used?
   - Water management training?
9. How are tanks maintained?
   - If something was damaged who fixes it?
   - How do check-ups by MORDI work?
   - Is water treatment encouraged? Chlorination?
10. 5 years on what parts of this project have been maintained
    - Have some areas required more input?
11. Is the project resilient? If an event were to occur drought / natural disaster, do you think that the community would have enough drinking water?
12. Do you think MORDI could do anything better / different?

External (Non-MORDI) Implementers

Questions – Semistructured for external implementers
The aim is for interviews to be conversation style, so open-ended.

- What kind of water projects does your team work on?
- How do water tank projects get initiated?
  - CDPs?
  - National Strategy?
  - Funding made available?
- What criteria do recipients have to meet to get a tank?
  - Or how do you decide?
  - If at a community level, how are numbers and sizes decided?
- How does the implementation process go?
  - Step by step
- How do you make sure the project is suitable for the community?
  - Social context?
  - Cultural context?
- How effective have previous projects been?
  - Has the project achieved intended outcomes?
  - Were the outcomes a direct result of the project?
- Equity
  - What is done to support involvement of all community members
  - How are women encouraged to engage?
  - How are elderly encouraged to engage?
  - How are disabled people encouraged to engage?
  - How are other minority groups supported?
- In previous implementation has there anything that changed the plans, or changed the way you operate?
  - New information came up?
  - New needs identified?
  - Something else works well / doesn't work?
  - Did you identify outcomes (pos / neg) that you didn't expect?
- Do you provide / support training for maintenance?
  - Is there ongoing training?
  - Were the guides used?
- How are tanks maintained?
  - If something was damaged who fixes it?
  - Who is responsible?
  - Are there any check-ups by your org?
  - Do you encourage water treatment? Chlorination?
- Do you think water tank projects could do anything better / different?

MORDI Implementers

Questions – Semistructured for MORDI implementers
The aim is for interviews to be conversation style, so open ended.

- How were you involved with the 2020 MORDI water tank project?
  - Did you attend the CDP development meetings?
  - Were you involved in training?
  - Have you been back since?
- How suitable was the project for the community?
  - Social context?
  - Cultural context?
- How effective was the project?
  - Has the project achieved intended outcomes?
  - Were the outcomes a direct result of the project?
- Equity
  - What was done to support involvement of all community members
  - How were women encouraged to engage?
  - How were elderly encouraged to engage?
  - How were disabled people encouraged to engage?
  - How were other minority groups supported?
- Was there anything that changed the plans?
  - New information came up?
  - New needs identified?
  - Did you identify outcomes (pos / neg) that you didn't expect?
- How did the training process work?
  - Is there ongoing training?
  - Were the guides used?
- How are tanks maintained?
  - If something was damaged who fixes it?
  - How do check-ups by MORDI work?
  - Do you encourage water treatment? Chlorination?
- Do you think MORDI could do anything better / different?

Framework for Implementers

Table E.1

Components of Adaption/Intervention Success and Their Short Definitions, Adapted From McNamara et al. (2020)

Factor	Short working definition	Related question	This project
Appropriateness	Relevance, suitability and fit of the project in the community context	How suitable is the intervention to the community? In the social and cultural context, does it seem appropriate or inappropriate, relevant or irrelevant, legitimate or illegitimate?	
Effectiveness	The success of the project in achieving intended outputs, the direct results, both products and social benefits	Has the project achieved the intended objectives? Were the outcomes a direct result of the intervention?	
Equity	Capacity for the project to include all members of the community in both activities and outcomes, particularly marginalised groups	Do the benefits of the intervention extend equally to all people or groups within the community? Are some people or groups left out, or are the benefits widely felt?	
Impact	The wider effects of the project, both direct and indirect, intended and unintended whether positive or negative	Did the project result in any unintended outcomes? Were any outcomes seen to have a wider effect than expected?	
Sustainability	The extent to which project activities and outcomes have been maintained post-project life cycle.	Have the project outcomes been maintained? Has the project been designed to support sustainability once the project life cycle ends? Will the project be resilient to climate events?	