



CLIMATE RESILIENT ISLANDS PROGRAMME

TONGA

SUMMARY

Community
Resilience
Profile

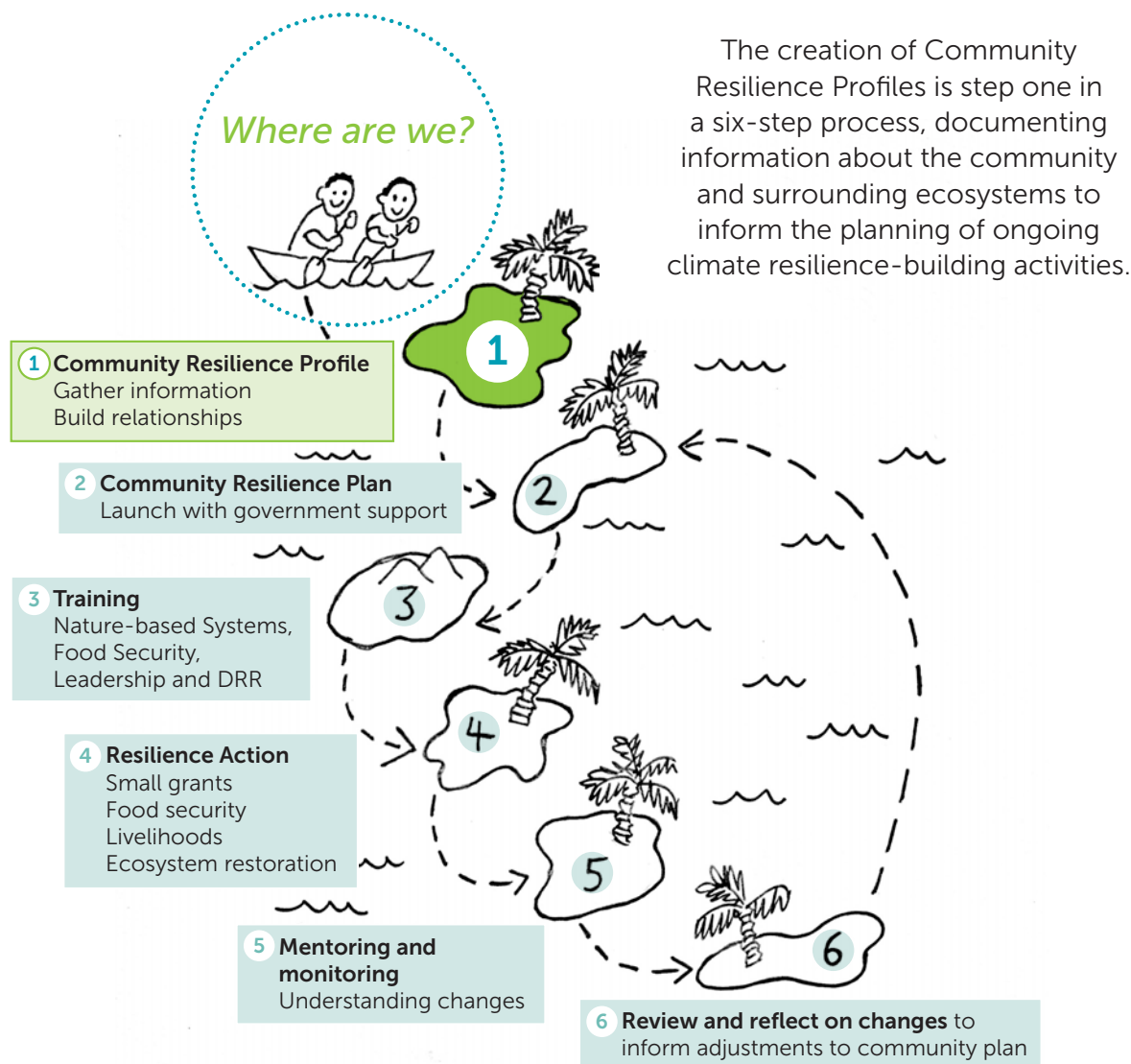


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ENVIRONMENTAL EDUCATION



NEW ZEALAND
FOREIGN AFFAIRS & TRADE
Manatū Aorere

This profile summarises information generated in 2022/23 by the Tonga communities in collaboration with Live & Learn Environmental Education as part of the Climate Resilient Islands programme, through the New Zealand Government Resilience Ecosystems for Climate Change Adaptation programme.



The creation of Community Resilience Profiles is step one in a six-step process, documenting information about the community and surrounding ecosystems to inform the planning of ongoing climate resilience-building activities.

Each community involved in the CRI programme has their own profile. For demonstration purposes this summary profile gives an overview of common knowledge about ecosystems, geographical setting, community skills, livelihoods and challenges found across the communities, displayed in similar format as the individual community profiles. The individual profiles contain Indigenous Knowledge and other information that is sensitive and the property of the communities themselves, therefore this summary minimises the potential to identify individual community data.

For more information go to: www.livelearn.org/climate-resilient-islands





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Introduction

Community Resilience Profiles are the result of partner communities thinking about and mapping their ecosystems and resilience¹.

The profiles contain general information on Tonga's ecosystems and livelihoods, and forecasts on food security and disaster response, especially regarding the effects of climate change and the specific impacts of climate change on each community.

They also contain details of local ecosystems, livelihoods, values, strengths, vulnerabilities, assets, organisation structures and Indigenous knowledge.

¹ The community activities done for this profile are based on the work of O'Connell, D, Maru, Y, Grigg, N, Walker, B, Abel, N, Wise, R, Cowie, A, Butler, J, Stone-Jovicich, S, Stafford-Smith, M, Ruhweza, A, Belay, M, Duron, G, Pearson, L, and Mehard, S 2019, Resilience Adaptation Pathways and Transformation Approach. A guide for designing, implementing and assessing interventions for sustainable futures (version 2), CSIRO



Each Community Resilience Profile consists of two main parts:



PART 1

Provides information on national and community-level ecosystems and nature-based systems for each community.



PART 2

Provides information on livelihoods, assets, what each community values, and their assessment of what resilience looks like for them.

The profiles also contain resilience pictures and vision statements that have been developed by each community to guide them as they work on climate resilience strategies.

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Tonga community summary



Community Resilience Vision and Picture

The following are examples of community resilience visions and supporting resilience pictures (with explanatory text).

Community resilience visions express where the communities want to be at the end of the CRI process and generally emphasise disaster preparedness, a revitalisation or restoration of traditional knowledge, secure and healthy water supplies and varied livelihood sources. (Community names have been removed to protect the privacy of knowledge-holders.)



Resilience Picture

The community's resilience picture stands for how strong the community will be 3 years from now. The house of 2022 shows that the family must work together, and the house of 2023 shows all groups of people in the community will work together, and the house of 2024 shows that all the leaders in every group in the community will unite.



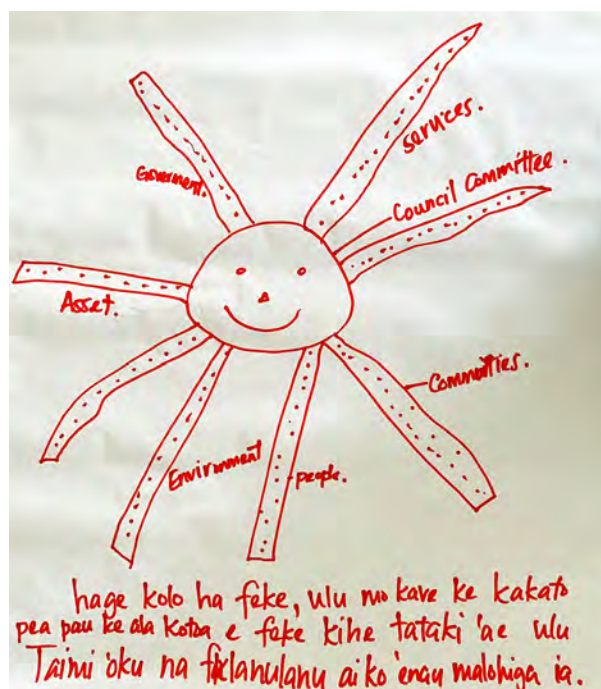
Resilience Vision

The community sees resilience as requiring:

- a safe causeway
- piggery fences
- a beautiful and clean community and tools to maintain it
- reliable fresh water supply
- better fishing tools
- a safe boat to maintain an SMA
- good agricultural equipment
- fully equipped hall as an evacuation centre
- improved skills for fishing and agriculture and weaving.

Resilience Picture

The community's resilience picture is of an octopus. The head represents the village council committee, the 8 tentacles represent the groups in the community. An octopus can change colour, to fit in with its surroundings, and the community's strength is being ready and able to adapt to any situation.

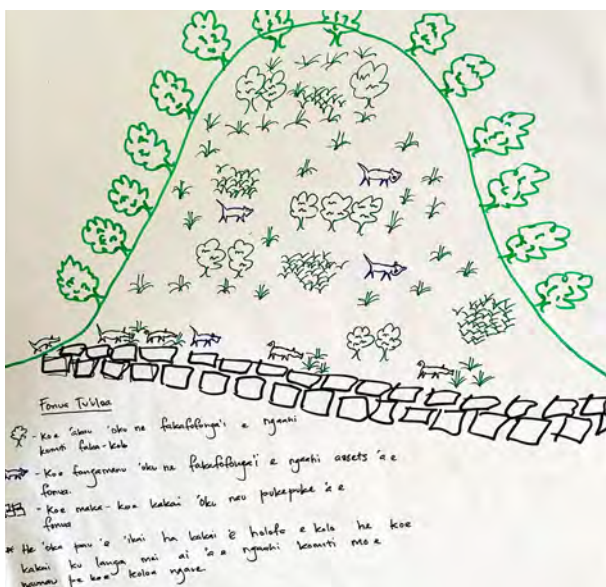


Resilience Vision

The community wants to strengthen water supplies, markets for weaving and crops, equipment for fishing and transport, training for youth, planting of trees for ecosystem restoration and income, and community unity.

Resilience Picture

The rocks shown in the resilience picture represent the people of the community; their role is to support the formation of the community. The environment and trees are the committees; their role is to manage the community's systems. The livestock and trees represent the assets in the community. If the trees and plants are cut down, the community will not last long and will end up destroyed by nature itself.



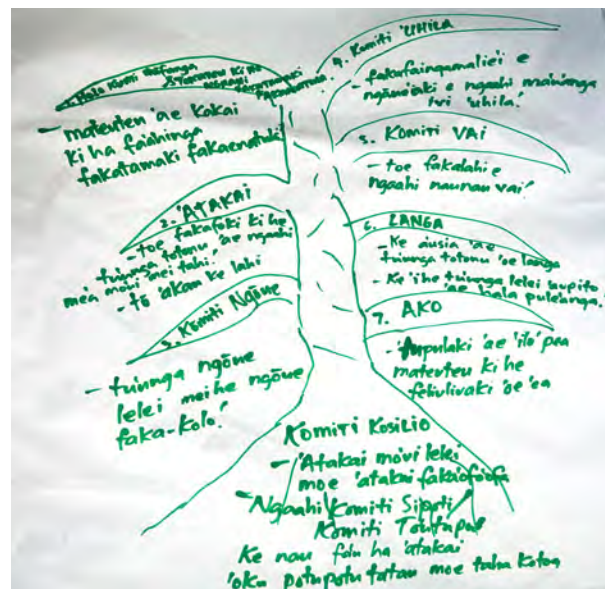
Resilience Vision

The community's vision for a resilient future looks like:

- water supply at all times and new water tanks
- a clean beach area with facilities
- every household with pigs and a pigsty
- a clean community.

Resilience Picture

The resilience picture represents people being well prepared for a disaster, through planning and an evacuation centre, coastal restoration, more productivity of crops, better access to electricity, improved water supply, roads and houses meeting good standards, increased education of climate change, and committees creating clean and safe spaces for young people.



Resilience Vision

The community's vision is to be a model community for the rest of Vava'u, with resilience in many areas, such as an attractive and popular historical site, a healthy and green community, streetlights for safety, well-resourced work and increased disaster preparedness.

Local Indigenous Resilience Knowledge and Stories



Communities documented their traditional knowledge. Below are examples that reflect common traditional knowledge in many Tonga communities.

People had several sources of income for their families; they grew varieties of tropical food, fruits and went fishing or raised livestock. There was no agricultural machinery; farming used slash and burn, and manual digging. Our meals were based on green leaves, taro leaves, and spinach, which made us healthy. Crops like yam and Futuna Taro were grown and saved for disasters. Men used kava plants as a natural pesticide.

In the process of making pandanus mats women used cassava flour to protect their mats from damage.

Ancestors knew medicinal plants and their specific healing abilities. Fragrant flowers were used with oils or harvested for garlands for special occasions or for decorating the church. They had the *tuitui*, *pipi* and *pako* that were used for bathing rather than using soap.

There is a type of yam, known as the *ufilei* in Tongan, that is remembered from the 1960s. The yam is a large size and is left in the plantation for potential times of famine.

There was less deforestation. People rarely cut down trees in the forest or in the middle of the community. The land was not eroded. The underground water did not taste salty.

The ancestors were able to manage their resources in the ecosystem, especially the pandanus for weaving, the *hiapo* for tapa making, and also their water during a drought to supply not only for their families but for their animals and plantations. The people in the past knew the type of crops to grow and that would withstand drought, like *manioko*.

Ancestors used knowledge from experiences to navigate and predict upcoming events and seasons. For instance, the scissor-tailed flycatcher bird indicated strong wind, rain and cloudy days. Ancestors anticipated cyclones by watching for wind directions and the appearance of clouds. Other warnings of coming cyclones are when the new leaf on the banana tree is slightly bending to the side, bees building their nests on low ground and millipedes climbing up the trees and resting there.

For disaster preparation, people used to add layers of coconut leaves to houses and bake foods to last for two days. They kept clean water in containers, and food was preserved, such as by marinating meat in salt and storing it in covered buckets or bins.

They had a strong support system, which meant that everyone was counted in one big family, even if they were not all related. For example, if a woman was giving birth, the whole community would take turns to visit and would bring along food or goods for the baby.

People worked together to pay for transportation to fishing areas. Everyone's fishing area was marked. People used to fish for white sea snakes, and sometimes travelled far for fishing.

The main livelihoods were fishing, growing tropical food using mixed crops in one plantation and selling banana and coconut. People had healthier diets and lived longer.

The ancestors knew that when breadfruit were in season there was an abundance of fish. People used to harvest the fish called *meai* by observing the sand bubbling up.



PART

1

Ecosystems and Climate

– Tonga Overview

Tonga consists of 176 coral and volcanic islands, 36 of which are inhabited by its population of about 103,000 people. The country's total area is 747km² across the subduction zone of the Indian-Australian and Pacific tectonic plates and near the Pacific Ring of Fire area, leading to significant seismic activity and tsunami risk. Forest covers only about 12.5% of land while agriculture takes around 43% and settlement areas, including roads and other infrastructure, is 43%.



TEMPERATURES AND RAINFALL:

Rainfall is affected by the South Pacific Convergence Zone and the El Nino Southern Oscillation and varies significantly throughout the country, from a mean rainfall on Tongatapu of approximately 1700mm to 2450mm on Niuafu'u. Around two-thirds of this falls in the wet season.

There is a warm wet season from November to April and a cooler dry season from May to October. The mean annual temperature is 24.5C, with extremes varying from 17-31C.



OCEANS:

Sea levels have risen about 6mm per year since 1993, much higher than the global average of 2.8-3.6mm.

8% of Tonga's total agricultural land is threatened by sea level rise. Up to 75% of Tonga's coral reefs are now threatened. Mangrove cutting has been banned, but still occurs, with severe losses in some places.



HABITAT DIVERSITY:

Volcanic islands have some of the most diverse remaining forests and still support large populations of birds and reptiles. But forests are being cleared for agricultural and residential use, depleted by forestry and threatened by invasive plants. Overfishing is a concern for marine diversity.



FRESHWATER:

Surface water is rare in Tonga, except on 'Eua and some other volcanic islands, leaving collected rainwater and, to a lesser extent, groundwater as the main sources of water.

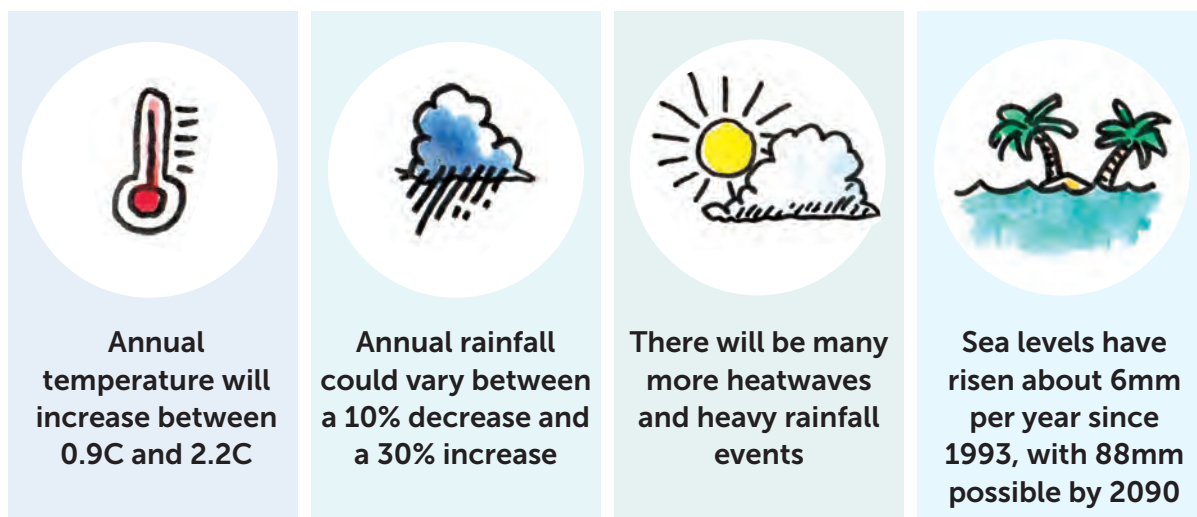
Regional and national climate change impact and forecasts

Tonga has likely experienced 0.7C of warming up to the 2011-2020 baseline period compared to the pre-industrial climate. It is warming at less than the global rate, with 2C global warming likely meaning 1.1-1.7C in Tonga. Mean temperature changes vary across Tonga, with Tongatapu warming slightly faster per year since 1949 than Ha’apai and Niuatoputapu, while Vava’u has decreased by a tiny amount.

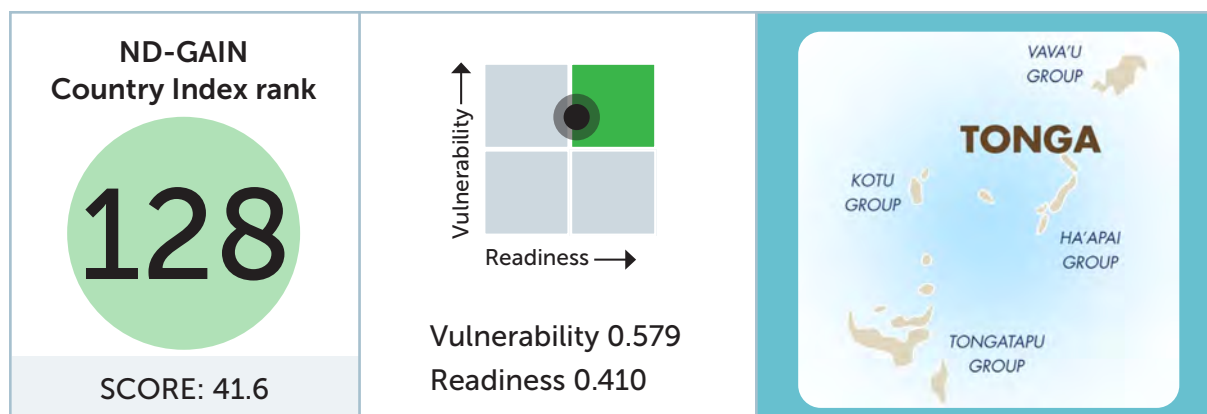
Winters may be getting wetter, while summers get drier. Tonga is also prone to drought, usually linked to the El Nino Southern Oscillation. Cyclones are also a significant concern.

Climate change forecasts vary significantly based on both the low- and high-emissions scenarios.

Depending on the specific scenario:



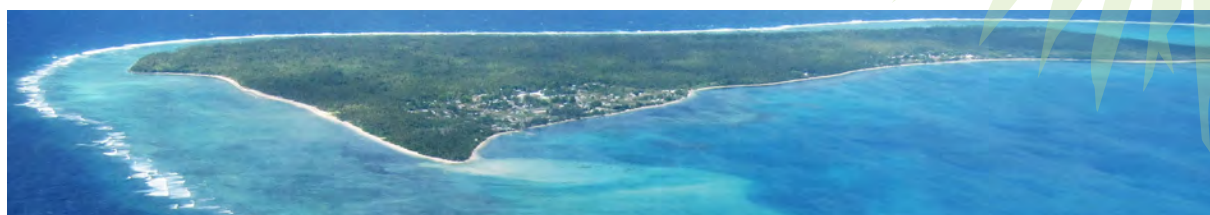
ND-GAIN² Resilience Ranking:



The high vulnerability score and low readiness score of Tonga places it in the upper-right quadrant of the **ND-GAIN Matrix**. Tonga is the 14th most vulnerable country and the 95th most prepared. More than 40% of the population is affected in a typical disaster year with economic losses equivalent to 14% of GDP.

2 A country's ND-GAIN index score is composed of a Vulnerability score and a Readiness score. Vulnerability measures a country's exposure, sensitivity and ability to adapt to the negative impact of climate change. ND-GAIN measures the overall vulnerability by considering vulnerability in six life-supporting sectors – food, water, health, ecosystem service, human habitat and infrastructure. <https://gain.nd.edu/our-work/country-index/rankings/>

Tonga National Climate Change Adaptation and Disaster Governance



Tonga is among the most disaster-prone countries in the world, with many hazards predicted to intensify with climate change.³

Tonga's **Emergency Management Act** (2007) provides the legal framework for all emergency and disaster risk reduction policies. The **National Disaster Council (Cabinet)** is the highest governing body with three national committees providing governance support: the National Emergency Management Committee, National Emergency Operation Committee and the National Recovery Committee. NEMO serves as the secretariat for committees together with the Act.

The Act mandates Tonga to develop emergency management plans at the National, District (islands) and Village levels which would then become the governing documents for emergency and DRR in Tonga. These plans are intended to be live documents to be reviewed annually and changed for new conditions.

Tonga is also following its **Strategic Roadmap for Emergency and Disaster Risk Management**, a joint product of the NEMO and National Emergency stakeholders, developed with input from NEMO, Tonga Police, Fire and Emergency Services and the Tongan military. It supports the implementation of the Strategic Development Framework 2015-2025, especially outcome F: *a more inclusive, sustainable and effective land and environment management, with resilience to climate change and risk.*

The most relevant village-level Disaster Risk Management Policy can be found in Sections 18 and 22 of the Emergency Management Act, which discuss District Emergency Management Committees and Village Emergency Committees.

Disaster management is provided by NEMO and Red Cross.

Town officers are often responsible for disaster coordination. The town officer takes responsibility for warning the community when news is given of imminent cyclones.

Eleven out of the fifteen communities do not have a functioning disaster committee. Only two communities have a documented disaster plan, apart from the creation of disaster kits. Disaster preparation is left to individual households, and this generally includes stockpiling of food. Most communities use the 72-hour package system for disaster preparation. This involves making a kit with food and medical supplies.

Seven out of fifteen communities have evacuation centres. These are often church buildings, and sometimes there is some tension because of differing denominations in the community.

Three communities noted a warning system that encompasses nearby communities also.

³ Source: Tonga Strategic Roadmap for Emergency and Disaster Risk Management 2021-2023, National Emergency Management Office, Government of Tonga

Tonga communities

Geography, population, ecosystems

Each community profile contains information about population, their geographical position, proximity to roads and other communities, and the surrounding topography. The following table lists all participating communities with relevant population details.

Community	Location	Population	Living with disability/elderly
Fotua	Fotua Island, Ha'apai	271	19
Ha'alaufuli and Ta'anea	Vava'u	1016	NA
Ha'ano and Muitoa	Ha'ano Island, Ha'apai	176	'some'
Holeva	Vava'u Island	130	NA
Houma	'Eua Island	326	'a few'
Koloa	Vava'u	142	NA
Lotofoa	Ha'apai	411	NA
Mata'aho	'Eua	266	10/10
Ohonua	'Eua	1248	'many'
Pangai	Ha'apai	Approx. 1000	NA
Pangaimotu	Vava'u	657	NA
Talihau	Vava'u	181	'some'
Tu'anequivale	Vava'u	403	'some'
Utulei	Pangaimotu, Vava'u	116	NA
Utungake	Pangaimotu, Vava'u	285	NA

Most communities are small, but there are three with populations above 1000. Within communities, population sizes vary, as some community members participate in regional seasonal work schemes or spend much of their time elsewhere for employment while still identifying as members of the target communities. In some communities, individuals have shifted to larger population centres but still identify as community members. Some communities, such as on 'Eua, have relocated relatively recently and do not reside on ancestral land.

Remote work schemes bring income into the communities, but they also affect communities negatively by removing especially young men and their associated labour. This is especially impactful

at planting and harvest times. Remote working opportunities tend to be labour jobs; limited education opportunities mean limited opportunities for professional positions.

Town officers are an important component of community management. Many of the communities have close relationships with nearby communities and share resources. There are usually multiple Christian church denominations in even the smallest communities. Generally, these work together to fulfil obligations. There are sometimes issues over the allocation of evacuation centres, which are generally in church buildings. There are a small minority of non-Christian religions such as Baha'i.

As Tonga is comprised of various island groups, most communities are in close proximity to the ocean. There are few communities in areas of elevated land. Many communities are in low-lying areas, or areas that are prone to erosion during heavy rain and storms. Erosion removes topsoil and damages roads. There is also significant coastline erosion, from storms and surges. Deforestation of mangroves and coastline vegetation has contributed to coastal erosion. In turn, stronger tides and storms have caused deforestation. Sand mining is also a significant cause of erosion in some areas, reducing natural buffer zones for coastal protection. Erosion also causes silting and pollution of marine waters, affecting fishing areas. Therefore, erosion is a key concern for most participating communities.

Water supplies are another key concern for Tongan communities. Most communities have indicated that water infrastructure is inadequate, in both capture and distribution of rainwater. There is increased saltwater contamination of groundwater sources. While there are both community and individual household water storage systems, cost of maintenance and decreased rainfall during the dry season are contributing to water shortages.

Community members are worried about the loss of local, traditional knowledge. The passing-on of traditions, which prolongs culture and brings peace and respect to the community members, is not being done adequately, and westernization is often blamed, although population movement of especially the younger generation is also a factor. There has been loss of Indigenous plants traditionally used for medicine, fragrance, hygiene, etc. Loss of knowledge tends to correspond with decline of natural ecosystems, and therefore a focus on housing and agricultural assets rather than those found in natural ecosystems (with fisheries being an exception).

Tapa cloth making and weaving are key cultural practices performed by women and have also been significant sources of income. Some communities use family contacts overseas for distribution. Otherwise, limited markets for handicrafts are a concern. These handicrafts are reliant on local natural resources, which are collected from around the community, primarily from pandanus and mulberry trees.

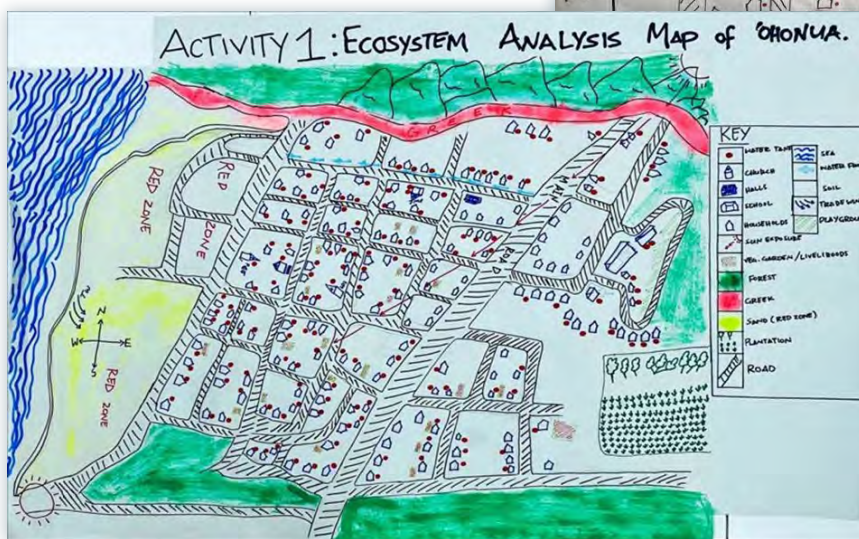
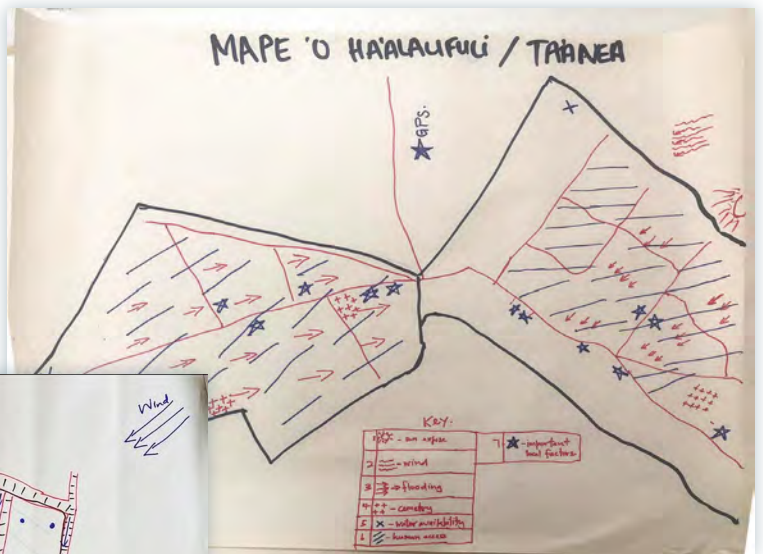
Agriculture is a major contributor to livelihoods. Plantations grow fruit trees, vegetables, root crops and coconut. Some of this produce is used for subsistence, some for markets. Kava and vanilla are grown for income. Agriculture is threatened by erosion of topsoil and decline in fertility. In some communities, due to the nature of surrounding soils, plantations are not in close proximity to villages. Access can be an issue when roads are rough. Sea fishing is also a contributor to both income and subsistence. Some communities have set up marine conservation areas to safeguard fish stocks.

The two major exports, squash and tuna, are both declining in performance. In total, 39% of agricultural land is vulnerable to drought and the ENSO effect; 8% to sea level rise and inundation; and 21% to soil erosion and loss of fertility.

There is a reduction in the variety of traditional crop species, particularly moving north from Tongatapu. Varieties of fruit trees have also declined and root crops even more so. However, the traditional cultivation shifting methods and the root crops still present provide some resilience to climate impacts. Tonga has identified crop diversification, introduction of new climate-friendly crop varieties and other agricultural resilience methods as key to their overall adaptation strategy.

Local Ecosystem Information

Communities were asked to draw maps of the community and surrounds and identify various ecosystem elements. The communities noted features of the community on the maps, such as roads, buildings, rivers and gardens.



They then mapped the following elements, making comments about the extent of community knowledge and how well the elements were functioning:

WATER AVAILABILITY



Most households have water tanks. Maintenance of water infrastructure is an issue, particularly rust from salt spray. There are piped water systems with groundwater. These are often brackish. Community/ church buildings have water tanks, but even so, storage is inadequate for dry times and communities must prioritise water distribution.

FLOODING



Most flooding occurs in low lying areas of the coastline. Communities, except for one, do not typically experience severe flooding. But erosion is a significant issue, caused by heavy rainfall, especially with lack of adequate drainage. Coastline erosion is also significant. There is sand mining and deforestation affecting coastlines.

HUMAN ACCESS



Main roads are consistently sealed and maintained, but secondary roads are mostly rough and affected by erosion, creating potholes and restricting access to plantations. Sometimes access is only by foot or bicycle, as only larger vehicles can negotiate the roads. Dust is an issue in dry weather for some.

WIND



During fair weather the winds are usually predictable, often from the southeast. Cyclones can come from any direction, but typically from the north is more destructive. Strong winds are often westerlies.

SOIL



Plantations are usually located in the areas of best soil. Coastline soil tends to be sandier. Erosion is an issue, as is declining soil fertility. Composting is not done regularly, and chemical fertilisers have replaced traditional methods generally.

SUN EXPOSURE



Most communities have long periods of sun exposure. Hot, dry conditions affect plantations. Tree cover in communities is limited.

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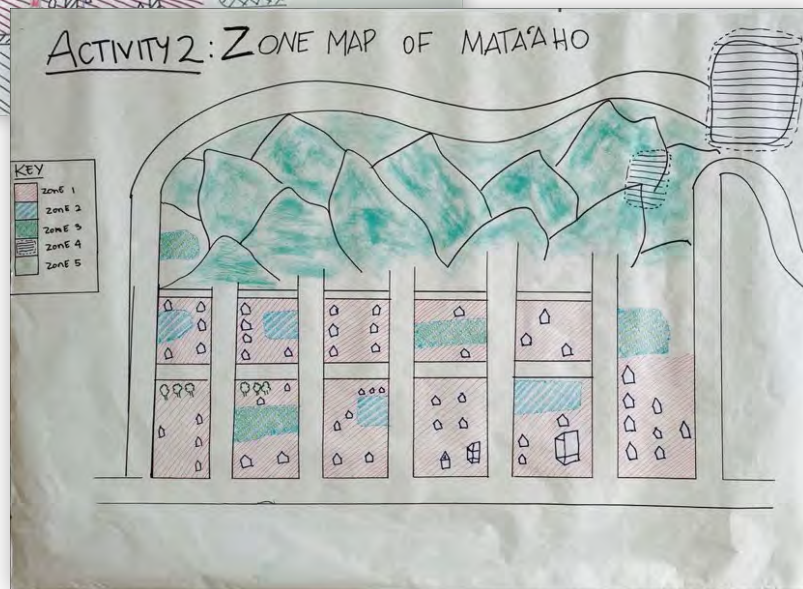
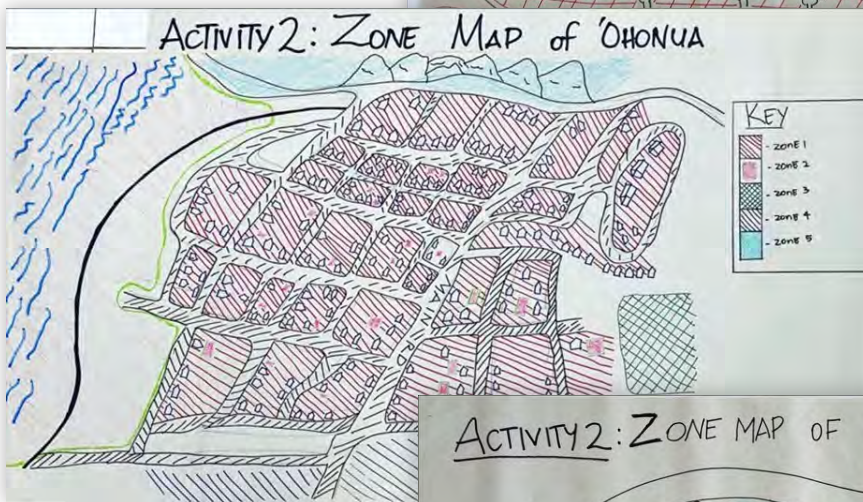
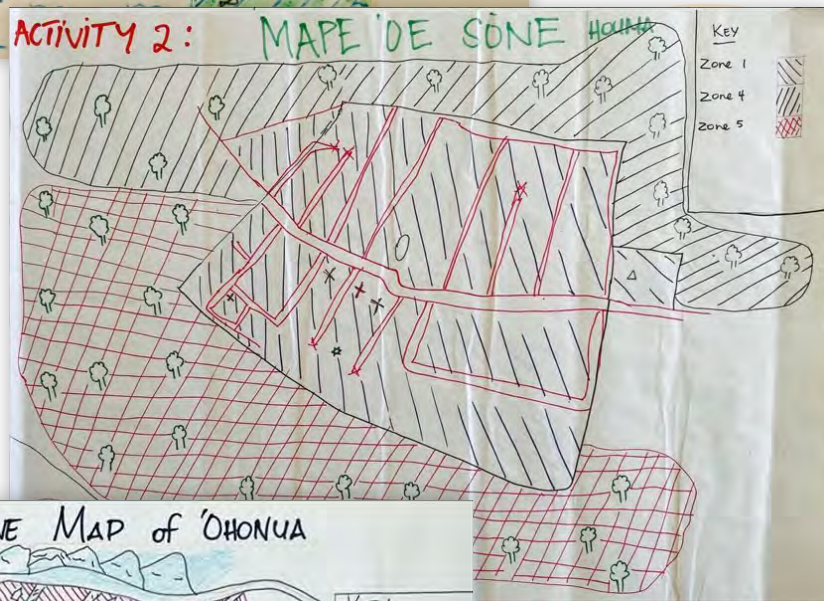
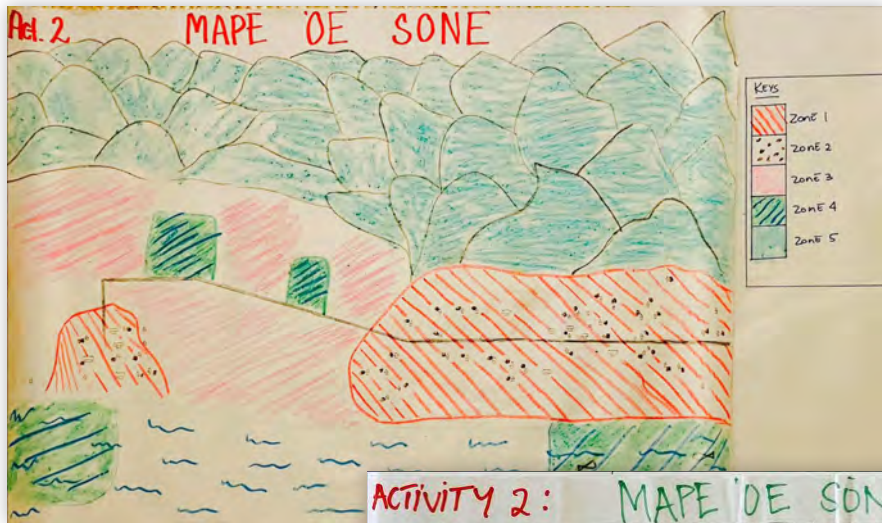


Cemeteries are the main sacred areas. Church buildings are often prominent.





Local Ecosystem Zones and Elements






Communities mapped various ecosystem zones, to establish varying uses of land surrounding the community, the strengths and challenges for key elements within the zones, and the transfer of resources from one zone to another. Communities reflected on how activities in one zone can impinge on what happens in another zone. Some community activities cover multiple zones, such as managing livestock, which can move between zones.

- **Zone 1** usually consists of houses, community buildings and roads. Community infrastructure may include wharf, shops, schools.
- **Zone 2** consists of food/vegetable gardens. There may be some livestock in this zone. Crops that only take a few weeks to mature are usually located closer to houses, in this zone. This zone is often visited daily.
- **Zone 3** is usually farmland/plantations, which is the largest zone. This is where crops and fruit trees are grown, though there may be some fruit trees in zone 2. Zone 3 can be distant to houses, requiring access by secondary roads or trails.
- **Zone 4** is generally bushland where cattle graze. Some communities listed marine environments in this zone, because they fish here, and they are sites of marine conservation areas in some communities. These areas need monitoring. Community members may catch wild animals or collect resources from bushland in zone 4.
- **Zone 5** consists of untouched forest, mangroves or ocean. Some communities did not list a zone 5.
- There is a connection between zone 3 and zone 5, as due to increase in population growth, some villages are looking to expand their farmland and areas for growing crops to the parts of the village that haven't been used before (zone 5). Expansion of zone 1 also impinges on zone 2.
- Zone 2 and 3 are particularly vulnerable to natural disasters. Farmland and gardens are damaged in some communities by roving livestock or wild animals. Lack of fencing is an issue in these areas.
- Households are generally responsible for looking after their own property and land, particularly their own plantations, gardens, and yards. Any issues that occur in a mismanaged zone will be guided by town officers with assistance from the Ministry of Lands.



The following table contains a list of ecosystem elements that are found across the communities. Communities identified what the elements are important for, how they are maintained, and how they are threatened.

Ecosystem element	Important in which system web?	How this element is strong	How this element is vulnerable or threatened
<p>FOREST/TREES</p> 	<p>Natural Environment</p> <p>Livelihood</p> <p>Health</p>	<ul style="list-style-type: none"> • Trees not cut down. • Soil is good 	<ul style="list-style-type: none"> • There are invasive species and loss of medicinal plants, possible threat if deforested. • Logging
<p>WATER SOURCE</p> 	<p>Natural Environment</p> <p>Livelihood</p> <p>Health</p>	<ul style="list-style-type: none"> • Needed by the community at all times • Community maintains infrastructure • Tanks donated by international aid 	<ul style="list-style-type: none"> • Problems with water supply not always running • Water scarcity is common in village due to only one spring • Not enough pressure from pump • Lack of water tank capacity • Groundwater brackish
<p>PLANTATION/ FOOD GARDENS</p> 	<p>Growing food</p> <p>Natural Environment</p> <p>Livelihood</p> <p>Health</p> <p>Kinship</p>	<ul style="list-style-type: none"> • Most families in the community rely on their plantation harvest to be sold out locally or exported. • Harvest from plantations is used for family, church, and community functions. • A source of food for animals that roam the plantations. 	<ul style="list-style-type: none"> • Not enough funds for equipment • Cyclones damage • Long period without rain, and inadequate water storage to water plantations • Hotter temperatures • Lack of labour prevents maintenance • Declining crop diversity • Animals damage
<p>LIVESTOCK</p> 	<p>Livelihood</p> <p>Natural Environment</p>	<ul style="list-style-type: none"> • Source of income • Manure for plantations 	<ul style="list-style-type: none"> • Wandering around, lack of fences • Lack of water and shelter

Ecosystem element	Important in which system web?	How this element is strong	How this element is vulnerable or threatened
SOIL 	Natural Environment Livelihood Health Kinship	<ul style="list-style-type: none"> • Used for plantation and gardening • Naturally good, fertile soils in places • Some fertilizers used 	<ul style="list-style-type: none"> • Drought and sun heat has caused dryness in the soil and plants are dying. • No composting • Erosion
FISH STOCKS 	Livelihood Natural Environment	<ul style="list-style-type: none"> • Good livelihood for the community especially those who rely on this source • Cultural occasions 	<ul style="list-style-type: none"> • Alterations to marine environments such as causeway • Increased temperatures • Overfishing
OCEAN 	Natural Environment Growing food	<ul style="list-style-type: none"> • Provides livelihoods 	<ul style="list-style-type: none"> • Sand mining affecting coastline • Pollution, especially plastic waste, affecting the coastline • Cyclones create erosion • Unsustainable fishing methods
PANDANUS 	Livelihood	<ul style="list-style-type: none"> • Pandanus can be planted once and last from generation to generation. • The leaves are the only thing needed for weaving and leaves rejuvenate. • Weaving gives good income. 	<ul style="list-style-type: none"> • Women value it, but men and youth neglect it and don't see its importance. • Income compared to time in making
MULBERRY TREES <small>(USED FOR TAPA MAKING)</small> 	Livelihood Natural Environment Kinship	<ul style="list-style-type: none"> • Used by families in the community for special occasions such as weddings, birthdays and other traditional activities. • Source of income 	<ul style="list-style-type: none"> • Damaged by wild animals • Damaged by climatic events • Time consuming



Timeline of important events

Communities wrote out timelines of events that were significant for the community.

In Tonga, significant events included the following:

2022 – Eruption of Hunga Tonga Hunga Ha’apai, ash affected water supplies

2022 – Covid-19 outbreak

2020 – Covid-19 lockdown, no school, loss of income, no transport, lack of goods

2018 – Cyclone Gita

2014 – Drought

2012 – Drought

2010 – Cyclone Renee

2001 – Cyclone Waka, destroyed houses and plantations, disease outbreaks

1993 – Tsunami in Vava’u

1989 – Tsunami in Vava’u

1988 – Tsunami in Vava’u

1982 – Cyclone ‘Aisake/Isaac – some lives lost

1977 – Earthquake, some damage to property

Food Seasonal Calendar

Traditional Months	Activities / Indicators of the season
1. Lihamu'a (November – December)	<ul style="list-style-type: none"> • First traditional month • Time of cyclone warnings • Warm season • Best time to plant yam and taro • Trees grow buds • Banana planting • Harvesting of mullet ('otule) • Harvest of sea urchin
2. Lihamui (December – January)	<ul style="list-style-type: none"> • Warm season • Fruiting season • Fragrant flowers bloom • Good time for fishing • Harvest of sea urchin
3. Vaimu'a (January - February)	<ul style="list-style-type: none"> • Beginning of rainy season • A good time for planting flowers and vegetables • Sufficient water supplies for both humans and animals • Harvest of hoputo, sea urchin, kulapo
4. Vaimui (February - March)	<ul style="list-style-type: none"> • Latter half of the rainy season • More rain and wind can cause fungal diseases in vegetation • Cyclone season continues • Harvest of sea urchin
5. Faka'afumo'ui (March - April)	<ul style="list-style-type: none"> • Cyclone season continues • Yams start producing secondary tubers that are good as seedlings • Planting of mulberry
6. Faka'afumate (April - May)	<ul style="list-style-type: none"> • Plants stop producing new growth. (e.g. breadfruit, taro, yam) • Crop maturity, and harvest is coming
7. Hilinga Kelekele (May - June)	<ul style="list-style-type: none"> • Best time of harvesting yam
8. Hilinga Mea'a (June - July)	<ul style="list-style-type: none"> • Best time for harvesting pandanus leaves for weaving and planting • Harvest time for yams, and families continue to feed on their crop harvest

Traditional Months	Activities / Indicators of the season
9. 'Ao'ao (July - August)	<ul style="list-style-type: none"> • Cold weather, so they forbid cutting of yam tubers as seedlings for planting because they will rot • Good time for planting vegetables • Weaving of hard pandanus mats are stopped for the time being • Fishing of snapper • Planting pandanus • Planting of vegetables, banana, kumala, cassava
10. Tanumanga (August - September)	<ul style="list-style-type: none"> • Yam seedlings planted • Fishing of snapper • Planting of Pele leaves, banana, cassava, kumala
11. Fufunekinanga (September - October)	<ul style="list-style-type: none"> • New vegetative plant growth
12. 'O'oa ki fangongo (October - November)	<ul style="list-style-type: none"> • Good time for making tapa mats/clothing • Mostly sunny • Times where water and food are beginning to be lacking, so locals use water and food resources wisely • Harvest of pineapple
14. 'Uluenga (November – December)	<ul style="list-style-type: none"> • Yam crop tubers develop, and their leaves are yellow due to long periods of sunlight • Lack of water and food crops • Good season for fishing (rich in seafood)

Comments on seasonal calendar

- Women do traditional weaving at most times of the year, but one type using hard pandanus leaves is done in the warmer months.
- Towards the end of the traditional year, water supplies are lacking, and residents need to use stored water from church, hall, etc.
- The months of May to July are the perfect time for planting the yam seedlings. But there are earlier yams that can be harvested before the main harvesting time. Yams need much care while growing, requiring much labour.
- Leafy vegetables, breadfruit, taro, cassava, and coconuts are a few crops that are harvested at any time

of the year as soon as they mature. They are available all-year round and take only a few months to mature.

Changes to seasonal calendar

- There used to be a specific time when trees bore fruits but now mangoes, mandarins and breadfruit bear fruit at unusual times and throughout the year.
- There has been a reduction of sea species due to change in temperature (feke, ika, fingota).
- Fishing needs to be done further out from shore.
- Cyclone impacts are more intense.
- Temperature is slightly increasing, and winter and summer seasons last longer than usual.
- Rainfall is decreasing.



PART

2

Livelihood Information

Tongan communities in CRI engage in agricultural and fishing activities for subsistence and income. Plantations and ocean contribute the majority of resources that contribute to the physical and financial wellbeing of communities.

Women collect handicraft resources locally and make cloth, paper and other handicrafts, and run households. There are some community members in more formal employment, and some using overseas job programs. Overseas seasonal work has the advantage of providing higher incomes, but it draws labour, especially that of young men, from the community. Some families receive money from relatives who have moved overseas. For some communities, this is a significant source of money; in others it is only minor. Women at times also rely on relatives overseas for markets for their handicrafts.

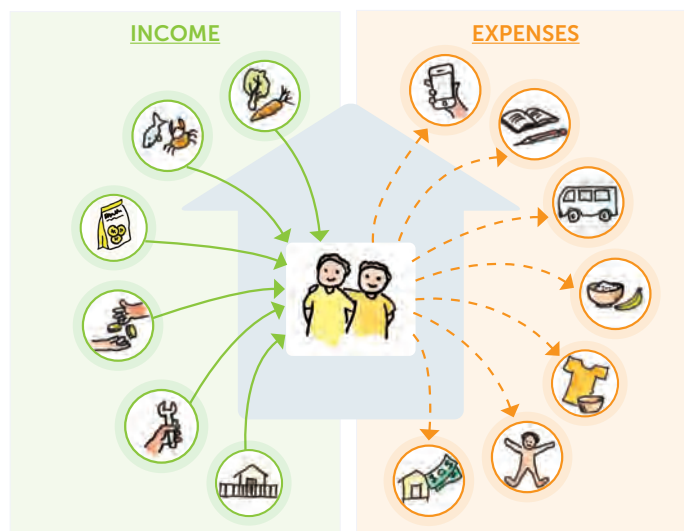
While in the past root crops were the major product of agriculture, some communities have switched to growing more mulberry for paper, as this provides more income. Kava, vanilla, and noni are produced as cash crops. Although plantations feature as sources of income, food security remains an issue, as households spend highly on food.

Climate change is the most significant threat to agricultural sustainability. Floods, increased prices, increasing temperatures, and scarcity of managed land are threats. Soil fertility is declining, and therefore there is a need for more composting and other soil rejuvenation methods. There are longer dry periods and less overall rainfall, with effects on both crops and livestock. Soil is also declining due to erosion. Threats to fishing are unsustainable fishing practices and lack of fishing gear. There has been a loss of fish species. The existence of some marine conservation areas in some communities is a means of addressing this.

Forest products gathered include firewood, timber and fruits, and materials for handicrafts. There is some collection of coastal foods such as shellfish. Community members have traditionally collected medicinal plants. Usage of these has declined for cultural reasons and also because the plants themselves have become rarer.

While the communities have livestock, lack of adequate fencing means livestock can disturb plantation crops.

LIVELIHOOD	LIFE	WELLBEING
Handicrafts, livestock, vegetables and fruit, formal employment, fishing, overseas work	Water, soil, house, transport, DRR, electricity, ocean, school	Church, handicrafts, family, relatives o/s, community groups, sport



How does your household get income?

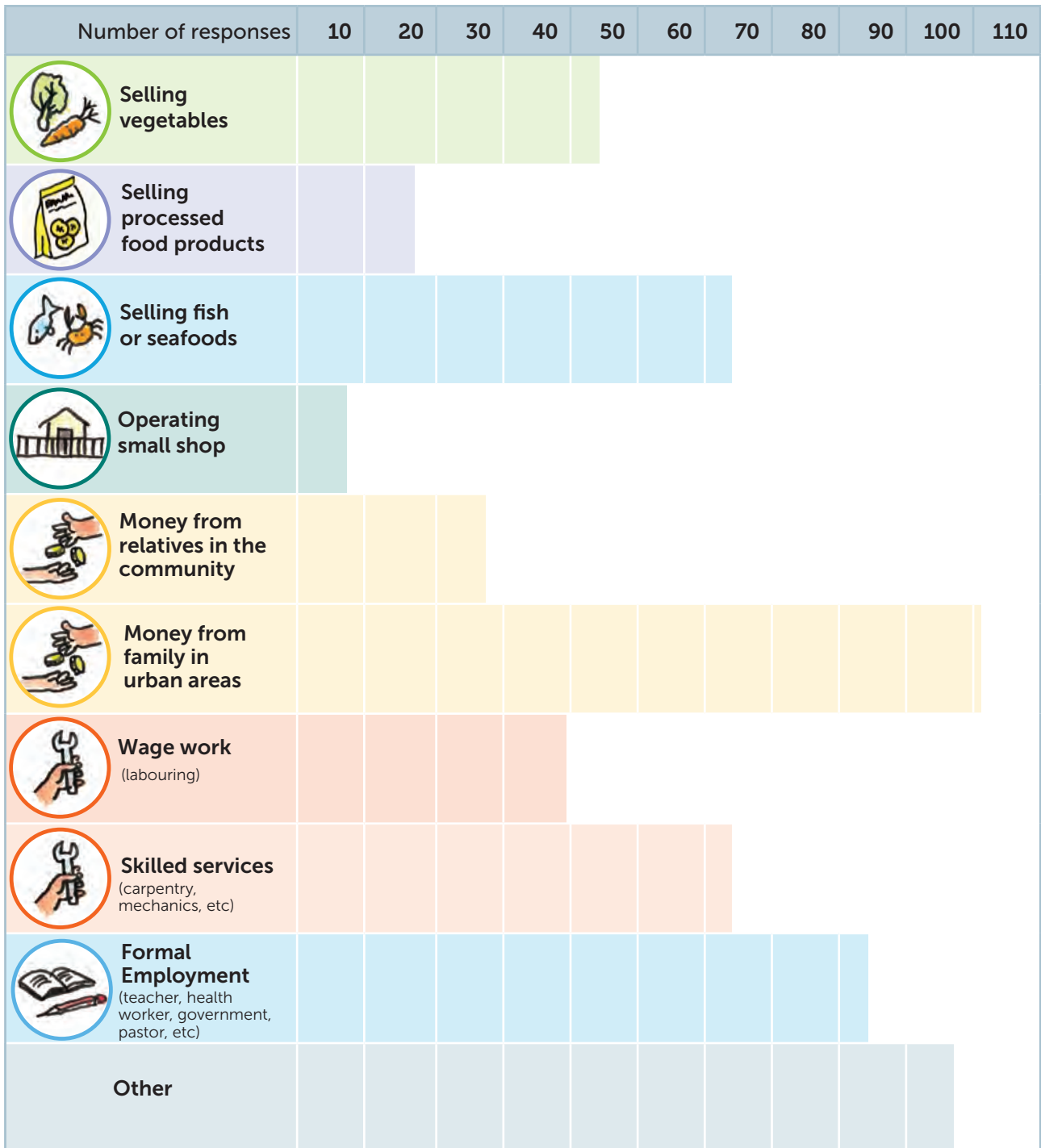
Mulberry trees for paper and pandanus are grown in plantations, as well as root vegetables such as yam, taro and cassava. Timber, kava, vanilla, noni and other fruit are grown as cash crops in plantations. Other crops include coconuts and leafy vegetables.

They sell handicrafts and mats. For some communities, this is a significant source of income but is dependent on availability of markets. Fishing is a major activity for the men in some communities, and selling fish and seafood is significant. While most communities are near the ocean, in other communities fishing is practised by only a minority of community members. Women often participate in gathering shellfish at the shore.

The community members raise livestock – chickens, pigs and cattle. These are important for subsistence, income and for cultural obligations.

Seasonal overseas work is important for income in Tonga. The highest source of income is money from relatives overseas, indicated by 101 households, followed closely by 'other' (99 households), which consists mostly of handicrafts such as weaving and paper making, and formal employment, which may also include seasonal work overseas.





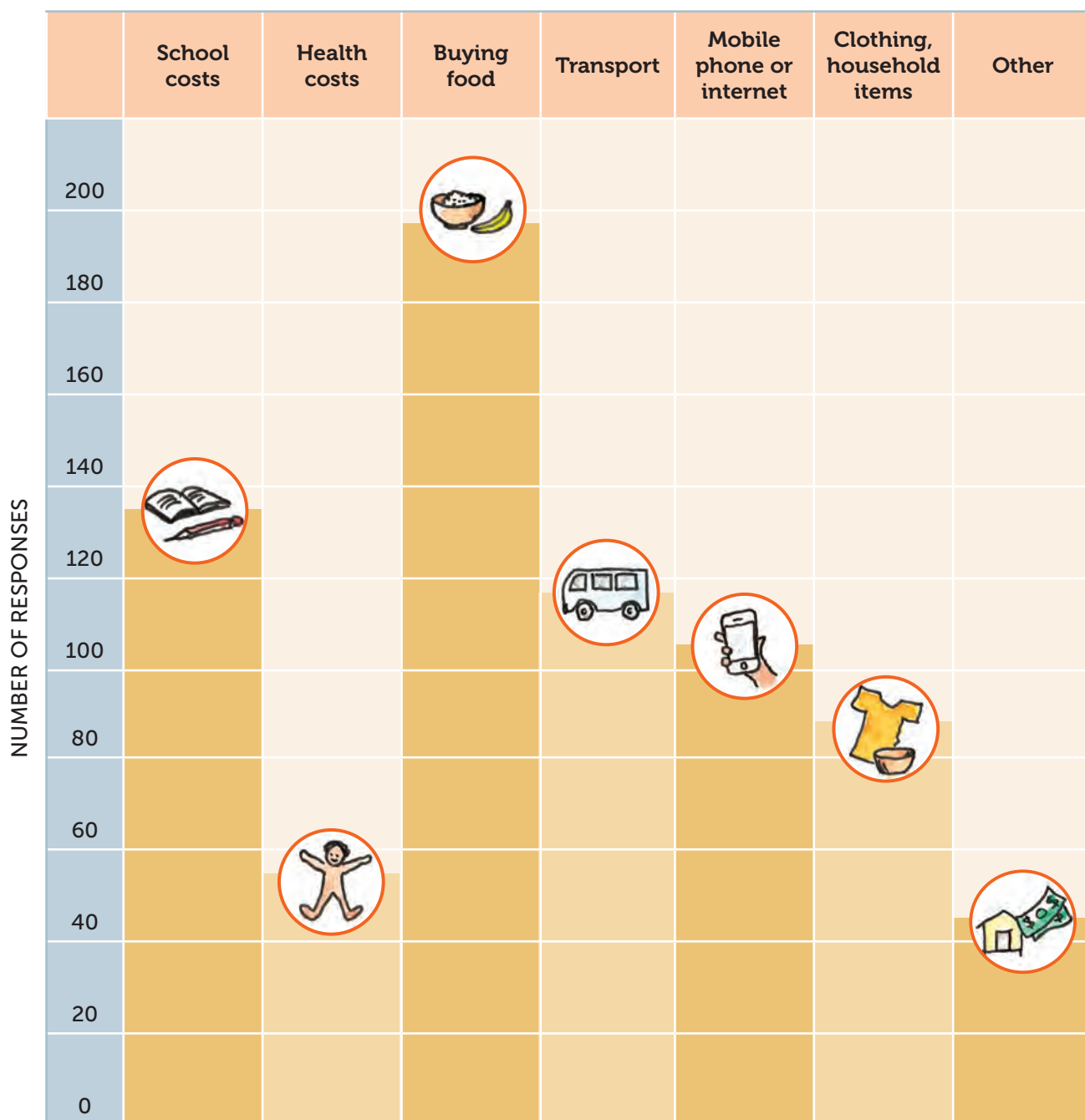


Household spending

Households report spending the most money on food, with 195 households reporting it as their highest cost. The next highest cost is school, followed closely by transport. High spending on food indicates a decline in subsistence agriculture. Spending on food often includes processed, imported foods.

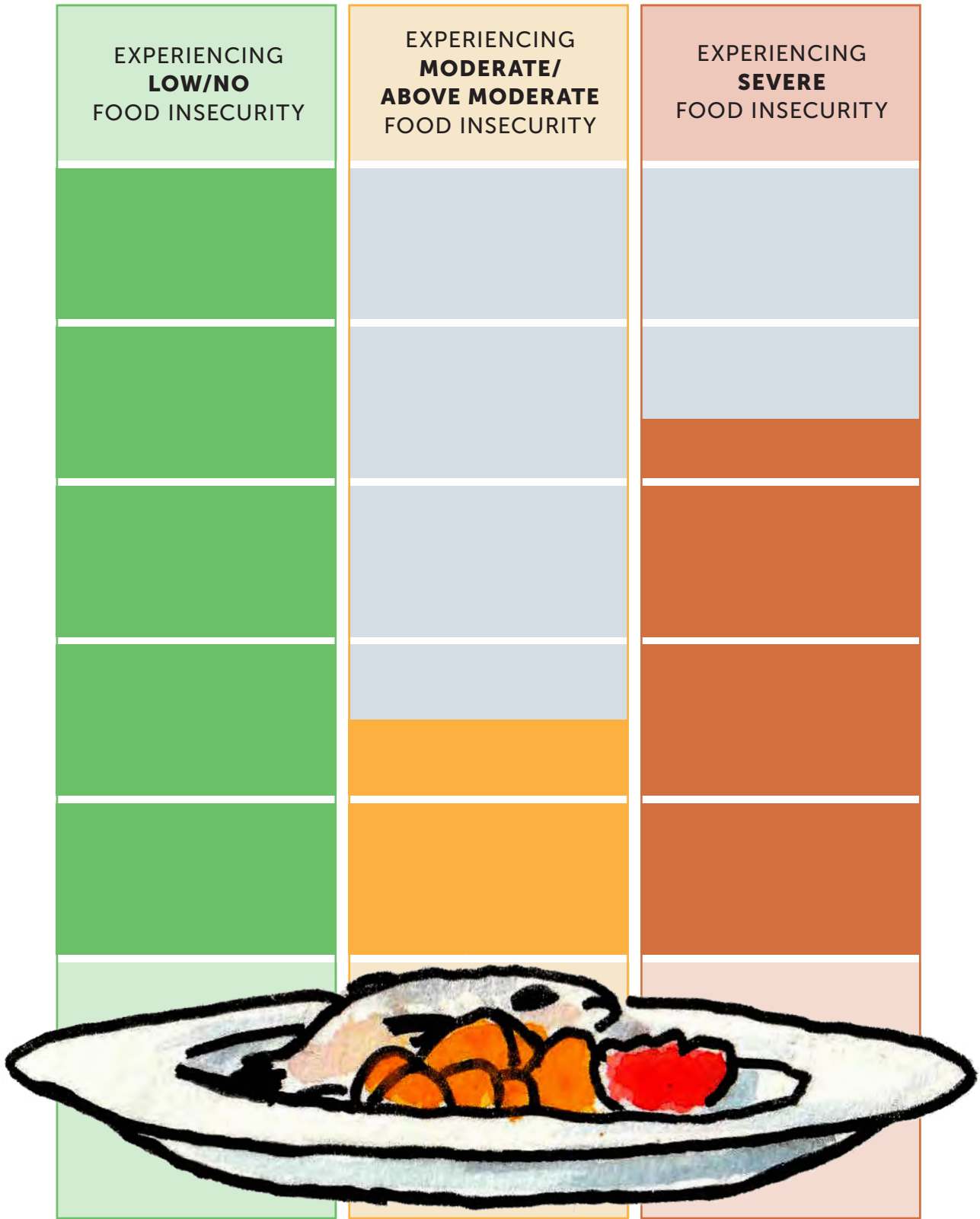
'Other' usually indicates community and church obligations and utilities such as electricity and piped water supplies.

WHAT DOES YOUR HOUSEHOLD SPEND MONEY ON?



Twenty percent of households meet over 81% of their food needs from gardens, farm and sea. 26% of households meet 61-80% of their food needs from gardens, farm and sea. 27% of households meet 41-60% of their food needs from gardens, farm and sea.

Food Insecurity Experience



Tongan communities have, on average, a moderate level of food insecurity, but there is an unequal distribution across and within communities, and between the island groups. In all three island groups, the lowest totals were in the moderate food insecurity category.

Of the 243 households surveyed, 125 (roughly half) were found to be experiencing low to no food insecurity. There were 73 households who answered 'no' to every question, indicating that more than half of the households in the 'low to no' category experienced no food insecurity. There were 36 experiencing moderate food insecurity and 82 experiencing severe food insecurity. While the number of households experiencing no food insecurity is encouraging, there are differences at the individual household level, linked to income and availability of land for agriculture.

Of the three island groups, Vava'u reflects the national averages, with the highest number of households (46 out of a total of 83) sitting in the 'low/no' food insecurity group, but the number of households in the 'severe' category is roughly double the amount in the 'moderate' category.

Ha'apai has the highest average food insecurity. While there are similarly low numbers of households in the 'moderate' category, there are 43 households listed in the 'severe' category, out of a total of 81. There are 27 households in the 'low/no' category, and 11 households that answered 'no' to every question, indicating no food insecurity.

Communities on 'Eua island (part of the Tongatapu group) have the highest percentage of households in the low food insecurity category (52 households), while the moderate and severe categories have similar numbers (13 and 14, respectively). 'Eua therefore has the highest food security, which may be linked to access to and health of gardens and plantations, although there is still disparity within communities.

The prevalence of imported, processed foods (indicated by high spending levels on food, and anecdotally) may contribute to higher food security, but a negative effect of this is the increase of non-communicable diseases.



Community Resilience Indicators

The following are indicators of how the communities consider themselves to be resilient. The indicators are taken from Tonga CRI communities and are common across communities.

Knowledge



- Knowledge of Tongan language and culture
- Traditions of working land
- Making paper and handicrafts
- Disaster preparedness
- Protection of the forest
- Soil protection for plantations
- Maintenance of water supply
- Sustainable fishing methods
- Know-how to run own business.

Physical Security



- Communication with latest technology
- Good sanitation
- Good water supply
- Solar power
- Good transport and road access
- Solid houses, resilient to storms
- Land not eroding
- More than 2 incomes
- Regular money from relatives overseas
- Modern varieties of crops
- Regular markets for produce
- Bush allotment.

Connections



- Attending church
- Community working together
- Sharing Tongan culture
- Family
- Access to government services.

Community Risk Summary ³

Overall resilience indicators:

1. Two or more livelihoods
2. Safe location of house and land free from erosion
3. Safe and adequate water supply
4. Enough land for agriculture
5. Maintenance of Tongan culture in handicrafts.

Across CRI Tonga communities, the trend for resilience is largely upward, meaning there are more households considering themselves as meeting the above resilience indicators than ten years ago.

However, in 12 out of 15 communities, less than 50% of households currently see themselves as resilient. In one community more than half of households view themselves as in the 'worst off' category. In some communities the number of households in this category has not shifted. Recent natural disasters have negatively affected communities' resilience levels. Household costs, including water and electricity, are also seen as negatively affecting resilience.

Households with stable incomes are usually able to increase their resilience. But lack of reliable or multiple incomes is a key factor for resilience. Although agriculture has become less stable, this has been moderated by income from overseas. Resilience tends to be viewed more as relating to income and assets rather than ecological health.

Attitudes to income coming from relatives overseas is mixed. While some communities see this as contributing to their overall resilience, others view reliance on relatives overseas as an impediment to long-term resilience.

Risk a combination of three things - Vulnerability, Exposure and Weather/Climate Change.

The summary below shows some of the vulnerabilities reported by communities, the physical exposure to hazards they are experiencing, and the climate change impact they are already experiencing.



Vulnerability

- Rely on ocean for fishing income
- Rely on plantations and soil for crops
- Some members leave community for work
- Markets not always available
- Not enough water storage for dry season
- Houses not cyclone or storm proof
- Lack of fishing or agricultural equipment and seeds
- Many households still recovering from impact of disasters
- Intermittent electricity supply
- Loss of traditional knowledge
- Rely on relatives for money
- Elderly or people with disability needing care

Exposure

- Low-lying situation
- Water storage can be contaminated by saltwater
- Soil gets eroded
- Limited land for plantations or any expansion
- Back roads not well maintained
- Only one access road
- Long distance from markets
- Housing near coast and susceptible to storm damage
- Forest trees taken for timber
- Declining fish stocks

Climate Change

- Increase in frequency and intensity of cyclones
- Coastal inundation and saltwater intrusion
- Changed rainfall patterns
- Tsunami threat

⁴ Source: https://www.ipcc.ch/site/assets/uploads/2018/03/SREX_Full_Report-1.pdf

Community Priority Values & Assets

Communities in Tonga typically value the plantations and gardens that provide them with food and income, consistent water supply and adequate water storage, secure housing and coastal areas free from erosion. They also value transport for access to schools, plantations and employment, church and other community buildings and equipment for agriculture and fishing.

Connections, such as in churches, and maintenance of traditional knowledge for the production of handicrafts are also highly valued.

The table below contains examples of assets communities listed in their individual profiles, as well as the risks to these assets and strengths. Communities were asked to assess and rate the risks to assets (with 3 indicating the asset to be most at risk). The assets in this table are deemed to be most at risk (rated a 3), and affected by vulnerability, physical exposure and the impacts of climate and weather events.

ASSET / STRENGTH OF VALUE TO COMMUNITY	HOW IS THIS VULNERABLE?	HOW IS THIS EXPOSED?	IMPACT OF CLIMATE OR WEATHER EVENTS?	WHAT IS THE RISK? (1, 2, 3)
Water Resources	<ul style="list-style-type: none"> • Some gutters are too old and weak. • Tanks not big enough. • Rusty roof (used for collecting rainwater) • Old water pump results in water leaking. 	<ul style="list-style-type: none"> • Expensive water supplies and tools to fix and store sufficient water. • Close to the sea which makes underground water salty • Tanks in unprotected area 	<ul style="list-style-type: none"> • Strong Wind • Cyclones (water tanks are damaged) • Saltwater blown onto roofs, making them rusty 	3
Plantation and Farmland	<ul style="list-style-type: none"> • Some crops have low productivity with insufficient rain or drought. • Near shore, have poorer soils. 	<ul style="list-style-type: none"> • Some plantations are located close to the sea – salty rain and winds. • Low-lying areas are swampy. • Wandering animals can damage. 	<ul style="list-style-type: none"> • Strong wind • Saltwater blown onto plantations • Heavy rain or drought affects yields • Flooding • Cyclones 	3

ASSET / STRENGTH OF VALUE TO COMMUNITY	HOW IS THIS VULNERABLE?	HOW IS THIS EXPOSED?	IMPACT OF CLIMATE OR WEATHER EVENTS?	WHAT IS THE RISK? (1, 2, 3)
Housing	<ul style="list-style-type: none"> • Old and poorly structured • Rusty roofs • Gutters inadequate 	<ul style="list-style-type: none"> • Located close to sea, only a little above sea level. • Exposed to flood at times of heavy rainfall. • Exposed to cyclone winds 	<ul style="list-style-type: none"> • Heavy rainfall • Strong wind (cyclones) 	3
Ocean	<ul style="list-style-type: none"> • Households rely on for food and income, threat of pollution from rubbish 	<ul style="list-style-type: none"> • Declining fish stocks due to temperature and overfishing 	<ul style="list-style-type: none"> • Temperatures will increase affecting fish stocks, cyclones can damage boats 	3
Coastal Area	<ul style="list-style-type: none"> • Low coastal area. • Lack of community service for the coastal area. • Not enough trees to hold soil 	<ul style="list-style-type: none"> • Next to sea, low-lying • No tree/ mangrove plantings to protect. 	<ul style="list-style-type: none"> • Storm surges, floods, erosion 	3

Disaster Risk Reduction participation

In many of the communities participating in CRI there are disaster committees listed, but eleven out of the fifteen communities do not have a functioning disaster committee. Only two communities have a documented disaster plan, apart from the creation of disaster kits.

Disaster preparation is often coordinated by the town officer. This usually involves warning of imminent cyclones. Otherwise, preparation is usually at the individual household level, and this generally includes stockpiling of food. Most communities use the 72-hour package system for disaster preparation. This involves making a kit with food and medical supplies.

Seven out of fifteen communities have evacuation centres. These are often church buildings, and sometimes there is some tension because of differing denominations in the community.

Recent volcano ashfall and cyclones have shown that there is a further need for planning for post-disaster response and recovery.

Community Management Groups

Communities have many committees to oversee community operations. There are usually committees for women (sometimes this is for handicraft production) and water, and often an overarching community council/committee. They operate with varying degrees of success. Some are nominal and are not meeting regularly or at all. Population movements also affect the successful operation of committees.

Church groups are also prominent in communities. Other committees listed include the following:

- youth committee
- Red Cross committee
- community police night watch committee
- agricultural committee
- community development committee
- natural disaster committee
- infrastructure committee
- education committee
- electricity committee
- SMA [marine conservation zone] committee
- environment committee.

The following table contains examples of community ecosystem elements from across the communities, who is responsible for management, and the strengths and challenges of management.

ELEMENT	HOW MANAGED?	STRENGTHS AND CHALLENGES
<p>WATER SUPPLY</p>	<ul style="list-style-type: none"> • Water committee • Individual households 	<p>Strengths:</p> <ul style="list-style-type: none"> • Funded from NGOs and families. • Receive help from the Tonga Water Board to any water issues <p>Challenges</p> <ul style="list-style-type: none"> • Lack of funds. • Lack of storage capacity. • Lack of knowledge and skills to maintain or fix water resources. • Groundwater is contaminated by seawater. • Lack of cooperation in the community

ELEMENT	HOW MANAGED?	STRENGTHS AND CHALLENGES
PLANTATION	Individual households Agricultural committee (chairperson is the town officer)	Strength: committee is able to provide agricultural information Challenges: <ul style="list-style-type: none"> • Damage by cattle and pigs due to having no fences to protect. Not good accessibility of vehicles to plantation. • Declining soil fertility and lack of resources to improve
LIVESTOCK	Individual households	Strength: sustainable livelihood for the community Challenge: no fence to have them kept in a particular area
COASTAL AREA AND OCEAN	Community committee	Strength: in some communities there is an ocean management area which is working towards conservation. Challenges: <ul style="list-style-type: none"> • Erosion and loss of coastal vegetation • Management of marine species is hard because many of the marine species are already depleted. • Zoned areas are affected by heavy rain flooding and eroding the area. • Enforcing the conservation area is sometimes difficult, locals and others break restrictions on fishing
SOIL	Individual households	Strength: animal manure provides fertilizer, good natural soil Challenges: no coordinated community effort for improvement, lack of funds for purchasing fertilizers
TRADITIONAL CRAFTS	Women Committee	Strength: women committee supports handicrafts and makes good income. Challenge: need an overseas market.
FOREST	Community	Challenges: The forest is damaged by both wild pigs and domestic pigs. Lack of fencing. Forest trees removed for more agricultural land.
ROADS	Government Individuals	Strength: provide accessibility to bushland. Government maintains main roads. Challenges: paths are eroded, and main roads have potholes. Local communities must maintain minor roads, and lack of equipment to do so.

Next Steps

Climate resilience can be defined as⁵:

The ability of social-ecological systems to absorb and recover from climatic shocks and stresses, while positively adapting and transforming their structures and means for living in the face of long-term change and uncertainty.⁵

We think about how three different things are combined when working with climate resilience⁶:

absorptive capacity, adaptive capacity, transformational capacity
(symbolised in the programme by the coconut palm, crab and butterfly).

These three capacities relate to the levels of challenges communities face and the changes required to meet these challenges.



ABSORB



ADAPT





TRANSFORM

5 Mitchell, A., 2013 Risk and Resilience: From Good Idea to Good Practice, OECD Development Co-operation Working Paper No 13

6 Adapted from *Assessing and Monitoring Climate Resilience. From Theoretical Considerations to Practically Applicable Tools - A Discussion Paper*, GIZ 2014





Community Resilience Profiles are being used to develop **Community Resilience Plans**, which contain practical resilience strategies based on the 'absorb, adapt, transform' framework. This is part of the process being used in the Climate Resilience Islands Programme to build resilience to climate change impact.

Based on the information communities provide in the profiles, priorities for communities are established, and a process of applying targeted strategies for resilience building of local resources and skills is initiated. This process is unique to each community, responding to their unique challenges and strengths. Priorities for strategic actions are those with a Nature-based Solutions focus, and those that incorporate the use of Indigenous and traditional knowledges. The process is monitored, and adjustments are made to the plans as the process of building resilience continues.



*Climate Resilient Islands
aims to strengthen community resilience
and adaptive capacity to the impacts of
climate change through nature-based
solutions working with rural communities in
Vanuatu, Fiji, Papua New Guinea, Tonga, and Tuvalu.*

*The project is a New Zealand
Ministry of Foreign Affairs and Trade
initiative implemented by
Live & Learn Environmental Education.*