CLIMATE RESILIENT ISLANDS PROGRAMME

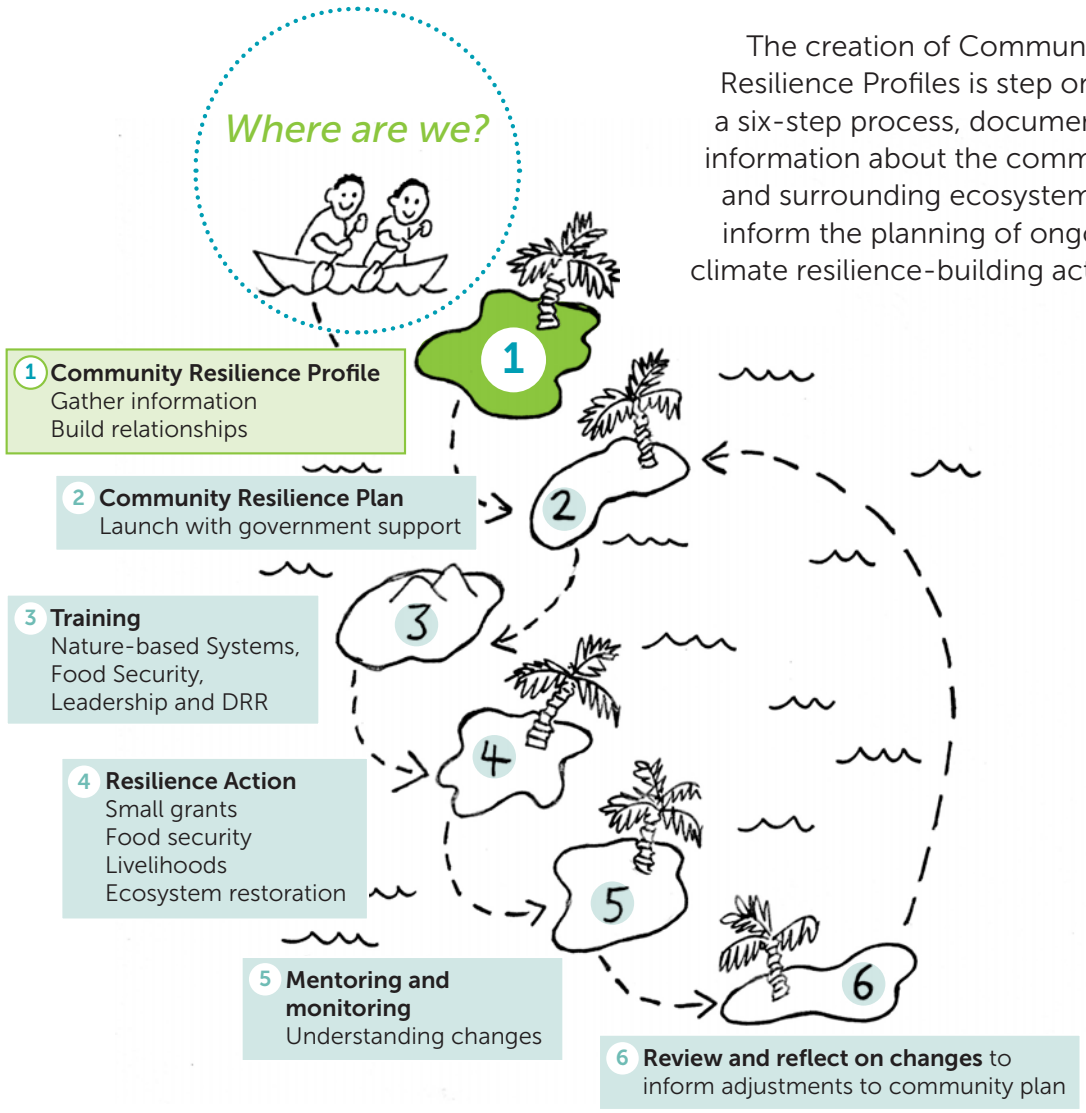
TUVALU
SUMMARY

Community Resilience Profile

live & learn
ENVIRONMENTAL EDUCATION

NEW ZEALAND
FOREIGN AFFAIRS & TRADE
Manatū Aorere

This profile summarises information generated in 2023 by the Tuvalu 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**

live & learn
ENVIRONMENTAL EDUCATION

NEW ZEALAND
FOREIGN AFFAIRS & TRADE
Manatū Aorere

Contents

TUVALU

Introduction

Community Resilience Profiles are the result of partner communities thinking about and mapping their ecosystems and resilience[1].

The profiles contain general information on Tuvalu'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:

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

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.

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.

Tuvalu community summary

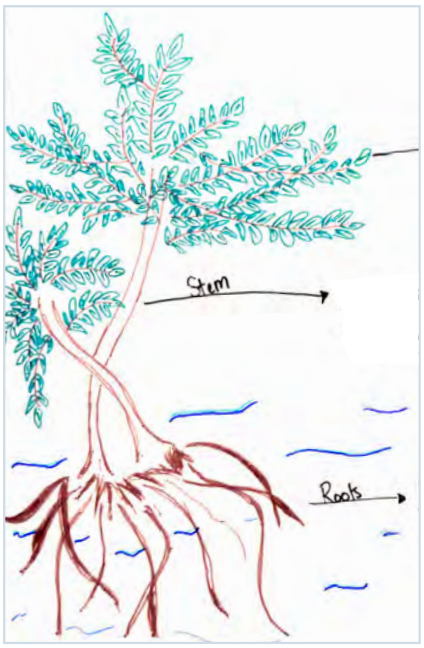
Community Resilience Vision and Picture

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 roots of the mangrove represent the traditional knowledge of the people The stem of the mangrove tree connects the roots of traditional knowledge to the leaves that symbolize the people and the branches that represent the various people groups that make up the community.

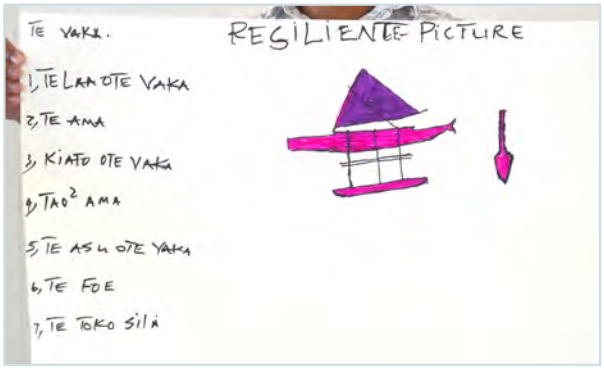


Resilience Vision

- *We will work together in new ways, and utilizing the traditional, old ways.*
- *We will build the resilience of our future generations and land through hard work.*
- *Our resilience will protect us from the impacts of climate change.*

Resilience Picture

The canoe is strong, unique and useful, and all of its parts contribute to its resilience. But if one part is weakened, its effectiveness decreases. Working together as a community helps strengthen resilience, but if some within the community are disadvantaged, the whole community's resilience will be affected.



Resilience Vision

- *Food security: The community can strengthen food security, possibly by using communal land.*
- *Strengthen the marine environment, possibly through restoration of coral areas, as coral bleaching has been observed.*
- *New income sources: the community can enhance tourist opportunities with ideas such as tourist attractions near new airstrip.*
- *Conservation of coastal areas to reduce erosion of coast, possibly through mangrove planting.*

Resilience Picture

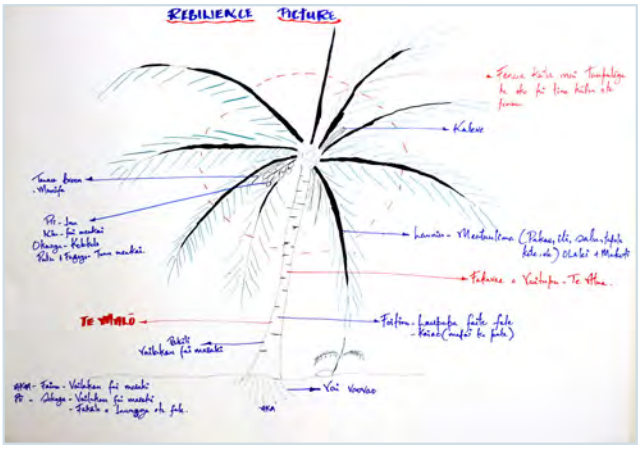
The roots, the bark, the trunk core, and the leaves all play different roles, together producing the beautiful and precious coconut fruit. The coconut fruit resembles the resilience of the community, and the parts of the tree represent the groups that come together, such as government, NGOS and community groups, to work for the common good.

Resilience Vision

The community wants to safeguard marine and agricultural resources in three ways: making bylaws that restrict fishing to the local communities, reviving traditional practices with modern modifications where appropriate, such as dividing the land for conservation practices as they used to do, and aiming for excess production of fresh food from local gardens. The conservation of freshwater and the education of children are also priorities.

Resilience Picture

The fruit is the product of achievements of the community, which are needed for survival: food security, livelihood, prosperity, good health, good education and sustainable wellbeing. The leaves are the different community groups and all their members represented by the leaflets. The trunk is the connections that the community depend upon. The roots are the many elements of the five ecosystems that a community depends on.



Resilience Vision

Looking into the future for the generations of tomorrow, sustainable wellbeing will be dependent on maintaining and reviving as much traditional skills and knowledge as possible, through strategic training policies and other strengthening programs.

Local Indigenous Resilience Knowledge and Stories

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

To climb trees to harvest green coconuts to drink, the men used coconut climbing gear known as 'kafaga and teke'. The kafaga is a ring of strings that you wrap around your feet to tighten your grip around the trunk and use to hop up the trunk. The teke is a strong wooden platform of iron wood, to stand on when you reach the top of the tree.

Ancestors planned very well in advance because they knew the signs for droughts and storms. Months before these climate events or disasters happened, households stocked up with firewood, dried fish, breadfruit chips, pulaka chips, brown coconuts, germinated coconuts, arrowroot flour and toddy. They took the roofs off houses until storms had passed.

During cyclones and very strong westerlies, homes were exposed and vulnerable. The locals had a traditional shelter screen that shielded the homes from the impacts of the strong winds. The shelter was built of local timber cut from the bush and raised in front of the home in the direction of the wind. Then coconut fronds were cut and tied to the frame, with little gaps between the coconut fronds to break the wind force.

Catching water was done by using coconut palm trunks and pandanus trunks. Coconut leaves were woven around the trunks to make a spout. When it rained, containers were put beneath the coconut leaf spouts to collect water. According to the elders, the water was drinkable. They also used the water for bathing and cleaning clothes.

A control system was imposed by the chief, where land can be closed or prohibited to be harvested, then later opened for harvest for a period of time, allowing the land to naturally replenish and conserve biodiversity.

In those days, every morning during outdoor cleaning people would collect the fallen breadfruit leaves outside and separate them from other rubbish, tie them into neat uniform bundles and stack them at the foot of the breadfruit trees to accumulate. These bundles were used as compost for pulaka cultivation.

Salting and drying fish and baking then drying tuna were common preservation methods for coming bad weather. Salted strips of pork fat and meat were a popular preserved product. They were stored in woven baskets and hung in the ceiling of the house.

Most families would preserve the excess breadfruits by slicing them into thin pieces and drying them. They were then stored in baskets for use during difficult times, especially droughts and cyclones, when many breadfruit trees could be destroyed. Uprooted breadfruit or wilted breadfruits during bad weather were often replaced with new breadfruit plants to maintain this food security source.

Coconut 'pearl apples' (the germinated coconuts) were preserved by curing them in dug out pits. The seedling leaf was chopped off and they were stored in pits or in wooden boxes. The nuts developed an apple-like texture that was very popular, and they were used in hard times but also during community events.

PART 1

Ecosystems and Climate – Tuvalu Overview

Tuvalu is a low-lying atoll country in the western Pacific Ocean consisting of nine islands - three reef islands and six atolls - with a total land area of only 26km2. The islands have an average height of around one metre above sea level, with the highest elevation no higher than 4m, and its widest point is just 200m across. These islands are geologically young, with generally poor-quality soil, and are spread across a vast expanse of ocean, with Tuvalu's Exclusive Economic Zone covering approximately 900,00km2.

TEMPERATURES AND RAINFALL:

Temperatures range from 25-32 throughout the year. Monthly variation is minimal, though May and April tend to be hotter. Wet season runs from November until April. Rainfall in Tuvalu is affected by its position in the West Pacific Warm Pool, the South Pacific Convergence Zone (SPCZ) and the El Nino Southern Oscillation (ENSO). Mean annual rainfall in the south is around 3400mm, 2900mm in the north. Tropical cyclones are a hazard.

OCEANS:

Sea levels around Tuvalu have risen by approximately 5mm per year since 1993. The risk of coastal flooding is considered high. There are 40ha of mangroves, an important ecosystem which has decreased in recent years and is under threat, while reefs span around 3175km2.

HABITAT DIVERSITY:

There is little forested land, with only around 1000ha remaining, though this is 'highly disturbed' and dominated by non-native species like the coconut palm. There are 65 native plant species. There are six types of marine ecosystems: oceanic, outer reef, lagoonal, back reef, lagoon floor, patch reefs. Invasive Alien Species (IAS) are a significant threat in Tuvalu.

FRESHWATER:

With no rivers, streams, lakes or wetlands, there is no source of freshwater other than rain and groundwater. However, Tuvalu's groundwater is generally not suitable for human consumption due to pollution from saltwater intrusion, septic tanks and other waste.

Regional and national climate change impact and forecasts

Temperatures in Tuvalu are rising slightly more slowly than the global average. Since 1950, minimum air temperatures have risen by 0.24C per decade and maximums by 0.21C per decade. While sea surface temperatures have increased by 0.13C per decade since 1970.

Tuvalu's marine resources are the foundation of local livelihoods and food security. The maximum catch potential in Tuvalu is expected to decline significantly in coming decades due to temperature rise, ocean acidification and human exploitation.

The land available for agriculture is likely to decrease with sea level rise, with salinity intrusion already affecting traditional pulaka crops and decreasing yields of other crops and fruit trees.

Sea level rise will increase the potential damage of wave-driven flooding, which is expected to make some atolls uninhabitable by mid-century. Tuvalu is also prone to meteorological drought and is in an area - the Western tropical Pacific - considered a global hotspot for marine heatwaves.

Depending on the specific scenario:

Annual temperature will increase between 0.6C and 1.9C

Annual rainfall could vary between a 20% decrease and a 20% increase

There will be many more heatwaves and heavy rainfall events

A sea level rise of 44-83cm is likely by 2100

Tuvalu National Climate Change Adaptation and Disaster Governance

The Disaster Management Act (2008) enshrines in law the arrangements for disaster management and mandates. The Act mandates the National Disaster Committee to provide overall coordination and strategic direction for the ongoing strengthening of Tuvalu's DRM arrangements. The Tuvalu NDMO plays a key role in supporting work of the NDC and maintains a detailed work program.

The National Disaster Management Arrangements (Parts 1-3) set the government approach to disaster preparedness and response and describes the NDMO as the key agency responsible for coordinating disaster management before, during and after a disaster. The National Disaster Committee is the multi-agency advisory and coordination body for disaster mitigation, preparedness response and recovery. Through the NDMO the National Disaster Preparation Working Group (NDPWG) is responsible for development of policy and training and awareness programs aligned with key DRM issues as determined by the NDC. Island Disaster Committees (IDCs) play a key role in coordinating and managing disaster risk on each of 9 islands. The Government Advisory Committee is the forum for discussion.

The most relevant sections of the Act for communities are Sections 16-19, relating to the Island Disaster Committees, which are the most local level of committee and act as the main bridge between the NDC and communities.

The National Disaster Management Tuvalu Strategic Roadmap for Emergency Management has been developed to guide a whole of country approach to strengthening disaster management in Tuvalu.

The Disaster Management Act of Tuvalu requires disaster plans and disaster committees. Two of the four communities have plans and committees.

Two communities do not have disaster plans, but one has a disaster committee. Strategic planning for communities emphasises the need for the setup of Island Disaster Committees to be supervised by the Kaupules.

The National Strategy for Sustainable Development 2021-2030 contains recommendations for disaster resilience, including strengthened frameworks for disaster management and land rehabilitation, in the face of rising sea levels, and the resilience plans informed by this profile will align with the National Strategy goals.

Tuvalu 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
Funafuti	Funafuti Atoll	6320	Some
Nukufetau	Central islands	597	16
Papaelise	Funafuti Atoll	50	4
Vaitupu	Vaitupu Island	1061	124

The CRI Programme is so far operating in four communities in Tuvalu.

Sea level rise is an existential threat to Tuvaluans. Communities are noticing the effects of climate change through the disappearance of small and low islets, due to sea level rise. There are regular inundations, especially during storms or high tides. They are also noticing coral bleaching.

There is increasing inequality amongst Tuvaluans. Because of overharvesting and overfishing, tree and fish species are disappearing. Population pressures mean trees are being cut down for development.

Pulaka pits are a traditional Tuvaluan food growing practice, but only a small percentage of the pits has been maintained recently. This is due to factors such as water availability, labour mobility and the loss of knowledge of traditional methods.

Three of the communities are in outer island settings. One community is in Funafuti, where it is more urban. In Funafuti, while there are jobs from both the private and public sectors, there are some unemployed people. Most Funafuti men are employed in the local fishing industry. In the lagoon adjacent to their two villages, most of the fishing boats are owned by Funafuti fishermen. The wives of these fishermen sell their catches at the roadside. Making and selling handicrafts is important for many women on Funafuti, including the Indigenous Funafuti women.

In Vaitupu, community members are employed at the school. Otherwise, in communities, members are involved in home gardening, pig farming, fishing and collection of fruits. Community members traditionally depend mostly on the land and sea for their food. Men go out to sea to fish and grow pulaka in their pulaka pits for their food staples. People grow banana, breadfruit and pandanus trees for their food. However, expensive imported foods are increasing, with people increasingly relying on them for food, with traditional food only supplementing the imported food, rather than being the main source.

Tuvalu's marine resources are the foundation of local livelihoods and food security. Fish consumption is around 70kg per person each year in urban areas. However, there is little monitoring or regulation over fish catch methods or size and current practices are considered unsustainable. The maximum catch potential in Tuvalu is expected to decline significantly in coming decades due to temperature rise, ocean acidification and human exploitation. Additionally, most of the 118 threatened species in Tuvalu are corals, a particularly vulnerable and important ecosystem for the country for both livelihoods and climate impact mitigation.

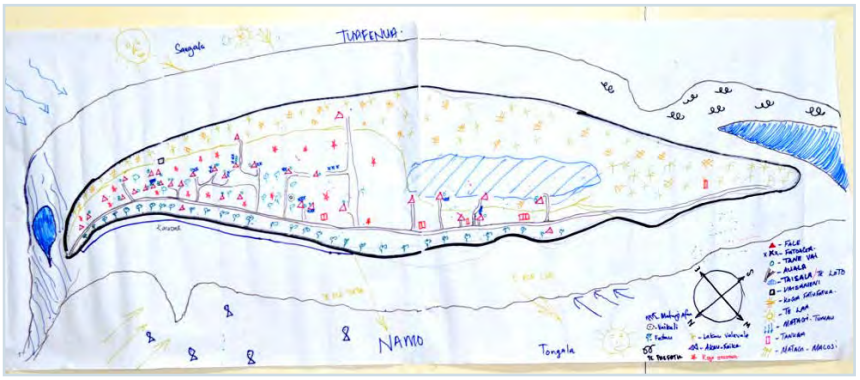
One of the key sites is the Funafuti Marine Conservation Area. The conservation area was established in around 1997 and is located along the western rim of the reef, encompassing six islets. This conservation area is protected by the Funafuti Marine Conservation Area Act. This conservation area has become one of the main breeding sites for many species of fish, some that were very near extinction, but since 1997 are in abundance. The Kaupule of Funafuti is responsible for monitoring the conservation area.

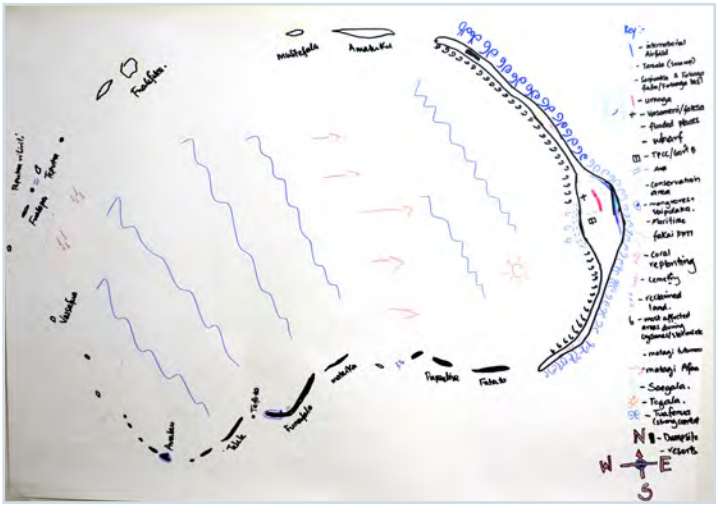
Tuvalu also faces challenges to its agricultural systems. Prone to droughts, which may worsen in the future, it is highly vulnerable to rainfall fluctuations. The land available for agriculture is likely to decrease with sea level rise, with salinity intrusion already affecting traditional pulaka crops and decreasing yields of other crops and fruit trees.

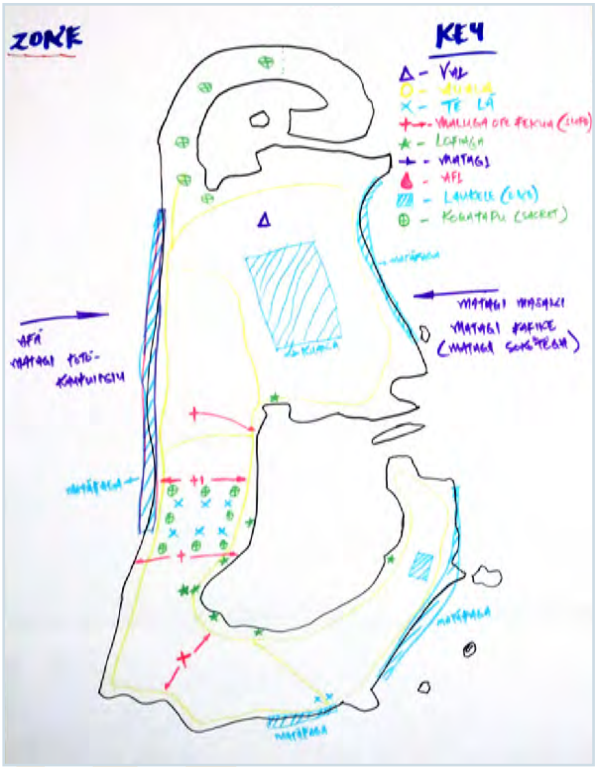
Local Ecosystem Information

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.







Communities mapped the following sectors, making comments about the extent of community knowledge and how well the sectors were functioning:

SECTOR	COMMUNITY KNOWLEDGE
WATER AVAILABILITY 	There are no streams. Supply is an issue during drought times.Many households have water tanks. Groundwater is becoming increasingly brackish, affecting pulaka pits and wells. Older water supply infrastructure is in need of repair.
HUMAN ACCESS 	Funafuti has good, tar roads. Other roads are dirt, which can become flooded or damaged. There is a deep passage on the NW side of the lagoon for ocean-going vessels.
SUN EXPOSURE 	Longer days occur in October to March. Temperatures are generally high. Communities have noticed increasing temperatures.
FLOODING 	While rainfall does not create extensive flooding, there are major threats from rising seas, especially during high and spring tides.
WIND 	Trade winds blow from the east and north. Westerly winds are damaging, and cyclones come from the west. Some communities have noticed trade winds becoming stronger, with rougher seas.
SOIL 	Good soil is generally found in pulaka pit areas, which have been extensively composted. However, many pulaka pits are being abandoned due to either brackish groundwater or replacement by imported foods. In one community the presence of a bird sanctuary and large trees contributes to better soils. Otherwise, soils are generally sandy.
SACRED OR TABU PLACES 	Cemeteries are the main sacred areas. Some areas require permission from the chief to enter.

Local Ecosystem Zones and Elements

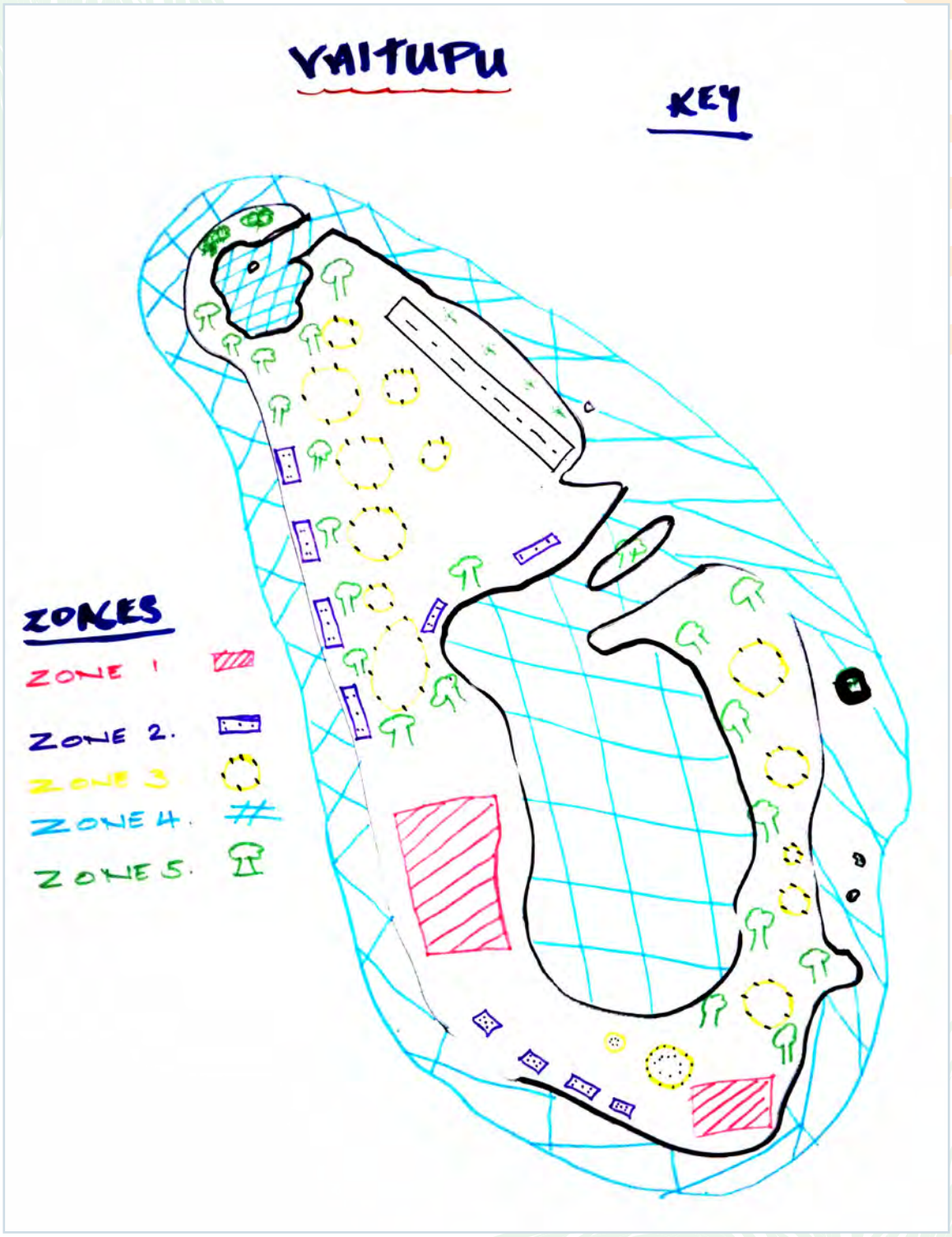
Communities mapped various ecosystem zones, to establish varying uses of land surrounding the community, the strengths and challenges for key elements within the zones, and the transfer of resources from one zone to another. Communities reflected on how activities in one zone can impinge on what happens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

- **Zone 1** usually consists of houses and home gardening areas. This might include fruit trees such as breadfruits and coconuts. Community buildings are also in this zone.
- **Zone 2** includes areas for piggeries and poultry runs. Gardens containing pandanus and banana may be found in this zone, which is visited daily.
- **Zone 3** is the lagoon, reefs, and coral ecosystems. The large marine ecosystem in the lagoon and the reef flats around the atoll on the oceanside provide a protein and livelihood source.
- **Zone 4** is the coconut woodland: this is the remaining vegetation cover of the island that is dominated by coconut palms. There are some pockets of large broadleaf trees and others, such as the wild bird nest fern. This is also the area where people collect firewood, building and craft materials, and where they harvest wild figs and wild crabs.

Community knowledge of fishing connects zones – for example, the flowering of special plants like the fetau tree indicates the beginning of fishing seasons for fish species.

There are conservation areas managed by the kaupule. A traditional practice of management is closing half of an island for a year to allow for regeneration. There are also similar traditional management techniques for the marine environment.

In agriculture, a lot of composting material is collected from the coconut woodland zone and transported to village areas to improve home gardens.


VAITUPU
KEY
ZONES
ZONE 1
ZONE 2.
ZONE 3
ZONE 4.
ZONE 5.

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
WATER SOURCES 	**Growing food** **Natural environment** **Livelihoods** **Health** **Kinship**	• Underground water reserves for long droughts • Households have plastic water tanks • Community water tanks add to water reserves • Wastewater control is priority in households	• Water underground is threatened by sea level rise and brackish • Household water reserves vulnerable to drought • Households living near western coastline will be threatened by cyclones and strong westerlies • Community water cisterns vulnerable to droughts • Not all households have water tanks
LAND 	**Growing food** **Health**	• Supports community infrastructure • Regular composting • Natural ecosystem protects land	• Waste, e.g, oil, plastic, batteries • Storm • Deforestation/ cutting down trees • Land use policy
MARINE CONSERVA-TION AREA 	**Growing food** **Health** **Livelihood** **Natural environment**	• Conservation area bylaws • Conservation area leads to regeneration and biodiversity. • Implementation of eco-tourism arm will create an alternative source of income	• Drought impact • Overfishing • Cyclone impacts • Fish poaching

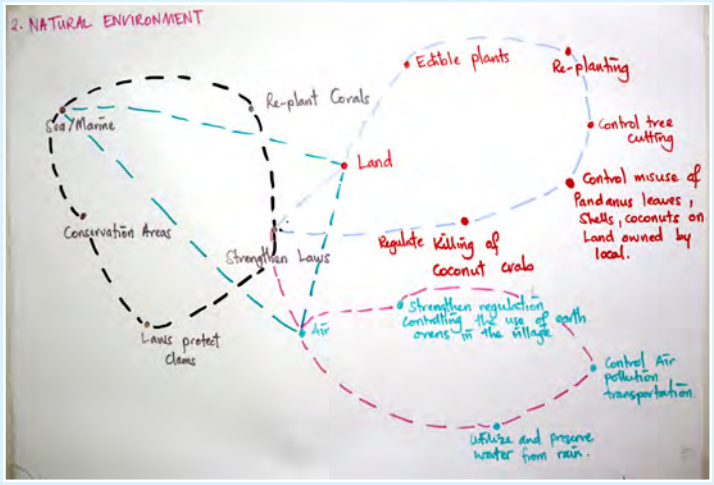
Ecosystem element	Important in which system web?	How this element is strong	How this element is vulnerable or threatened
FOOD GARDEN 	Health Livelihood Growing Food Kinship	• Nutrition in families • Income opportunities • Families look after as provides income	• Droughts impact gardens • Flooding causing saltwater contamination • Pests and diseases
COMPOST 	Growing food Natural environment Livelihoods Health Kinship	• Abundant in coconut woodland • Farmers have learned compost making traditionally and also from the department of agriculture.	• Sea level rise • Cyclones • Pests and diseases
MANGROVES 	Growing food Natural environment Livelihoods Health Kinship	• Crab harvesting area • Breeding area of the milkfish	• Increased climate temperatures • Mangrove areas not extensive on the island
PULAKA PITS 	Growing food Natural environment Livelihoods Health Kinship	• Large pits used for a long time • Knowledge is secure and strong and cultivation methods are kept as family secrets • Culturally strong as food for celebrations	• Saltwater intrusion • Drought • Loss of interest from young generation

Systems: Exploring connections between elements

Communities were asked to discuss and map connections within and across ecosystems, using ecosystem elements that they had listed. The following web drawings are examples from the communities and explore the connections that contribute to local resilience.

NATURAL ENVIRONMENT

This system analysis is focused on conservation areas and how to protect from misuse. Elements identified in this system include:

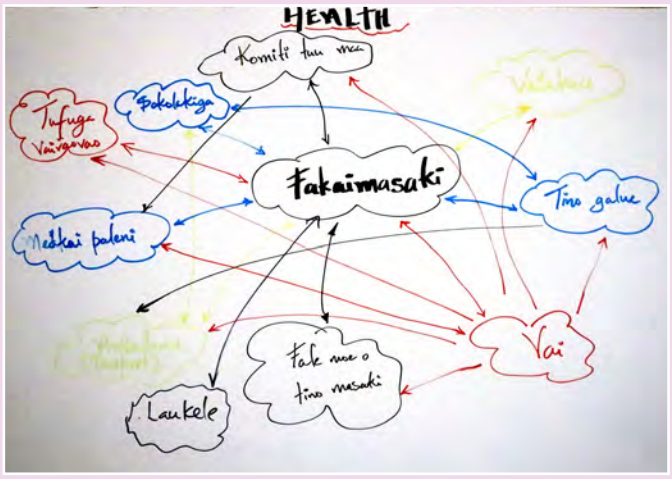


- Sea
- Conservation area
- Law to protect clans
- Replanted corals
- Land
- Control of air pollution
- Air
- Control of tree cutting
- Control theft of pandanus leaves, shells, coconuts
- Strengthen regulations

GROWING FOOD

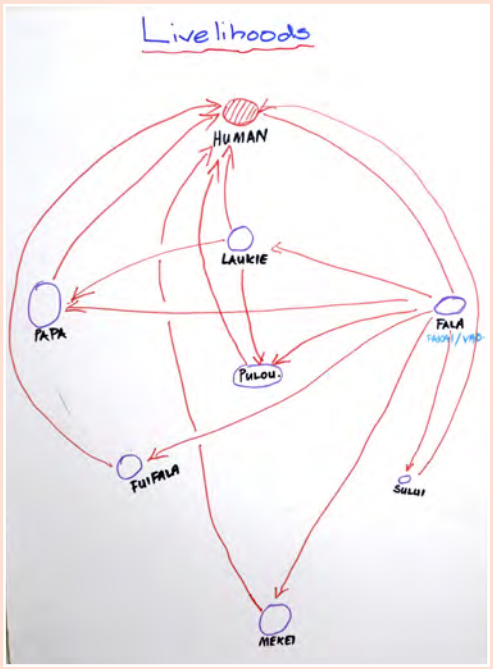
- Giant swamp taro
- Compost
- Pulaka pit soil
- Sun
- Transport
- Water
- Local skill or knowledge
- Donor support
- Tools
- Market
- Household food
- Lagi ate fenua
- Local obligations
- Customs and traditions

HEALTH



- Public & Environmental Health Inspection Committee
- Communication
- Local traditional doctor
- Balanced diet
- Lands
- Hospital wards
- Water
- Staff
- Medicine

LIVELIHOODS



- Human
- Lands
- Local mats (made from pandanus leaves)
- Local hats (made from pandanus leaves)
- Pandanus fruits

Timeline of important events

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

In Tuvalu, significant events included the following:

1946 – First settlement of Kioa Island.

1972 – Hurricane Bebe, Funafuti worst affected.

1978 – Tuvalu independence.

1980 – Many fish were washed ashore.

1987 – Dengue Fever outbreak.

1990 – Cholera outbreak.

1990 – TC Ofa brought gale force winds.

1993 – Powerful storm surge.

1993-4 – Cyclones Nina and Kina happened one after the other in the same month.

1996 – New boat harbour, Vaitupu

1999 – Drought

2007 – Drought

2011 – Drought

2012 – The island experienced an outbreak of dengue fever.

2014 – Many fish washed ashore.

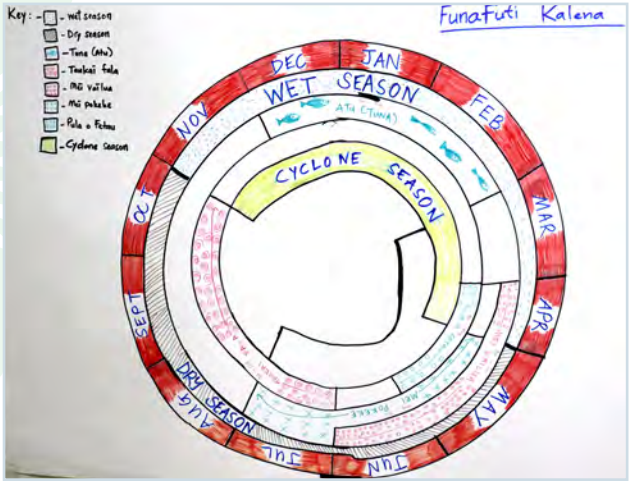
2015 – Land reclamation scheme.

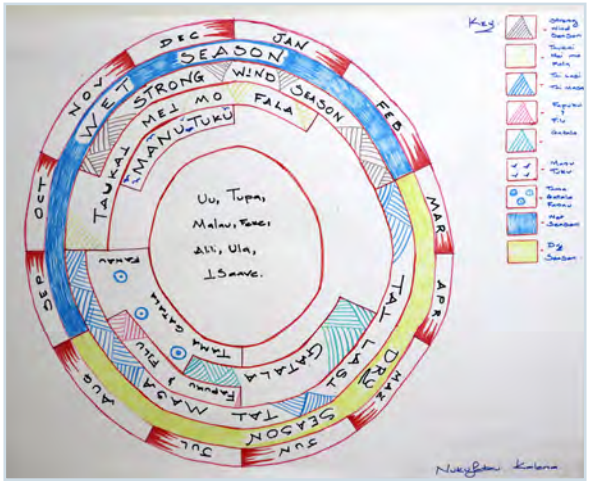
2015 – Tropical Cyclone Pam, including storm surges impacting the western coastlines of the islets, causing coastal land flooding. Nukufetau suffered an estimated 90% loss of crops.

2020 – In March the country declared a State of Emergency because of the Covid 19 pandemic. SOE was extended and lifted finally in December 2022.

2020 – A pest outbreak that impacted the islands' coconut palms. They are now slowly recovering.

Food Seasonal Calendar





Comments on seasonal calendar

- The yellow fin tuna and skip jack tuna or bonito are the most popular commercialized fish species, available December to February. Other fish species, such as red snapper, cod and flying fish are available all year.
- From October to January is the harvest season for breadfruit trees and pandanus, which are very popular. Some families sell pandanus fruits to make some alternative income.
- Between May and July is a great time to catch the smaller species of the cod fish known as 'gatala'.
- November to December is the breeding season of most sea bird species.
- When the Fetau tree is flowering 3 times a year and coincides with flowering of the pandanus, it indicates that octopus will be plentiful or that it is a good time to catch them.

Changes to seasonal calendar

- Popular fish such as red snapper are diminishing.
- Tuna used to be available close to land; now they are caught 20 miles from land.
- In the past, breadfruit was easily harvested and often shared for free with community and family. Now it is more commercial.
- Lately there have been more rains in the dry season.
- The 'Mafala' breadfruit variety is now fruiting a month later than usual.
- The pandanus flowering season has changed and therefore also the harvesting time.
- Some breadfruit trees bear fruits all year around, while others are seasonal.

SEASON	TIME/MONTH
Climate and Weather	
Dry season	April to September
Wet season	October to March
Fish	
Crab	March
Crayfish	April to May
Kaupaa phenomena (fish in lagoon die)	Always neap tide, worst in March
Fish - Alomea	March
Fish - Malau	May
Fish - Tagau	June
Fish - Kiokio	Jun - July
Birds fly	June-August
Harvesting	
Taro	Jan - December
Local fig harvest	December
Pandanus harvest	June - October
Breadfruit	August to October
Noni (Nonu)	September
Celebrations	
Asau District community day	October
Easter	April
Women's Day	13 August
Tumaseu District Community Day	November
Vaitupu Day	November
Christmas Day	December
New Year's Day	January

PART 2

Livelihood Information

Community members derive food and income from gardens, forest and ocean. Space is limited due to the atoll setting.

The Funafuti community is in an urban setting, in the densest population centre in the country. Land for gardens and plantations is limited, and there are few instances of local forest. Wage work, which may include labouring and fishing, skilled services such as carpentry, and formal employment are significant income sources.

In other communities, community members have pigs and chickens, and gather timber and handicraft materials, firewood and fruit and nuts from the forest.

Fishing is a traditional income and food source, and many community members are employed in fishing. People get their fish from the lagoon, the boat harbour, the fringing reefs of the island and from the ocean. In some communities, members feel this element is still physically secure due to the traditional marine conservation techniques, but generally there has been a decline in fish stocks. Most people are very knowledgeable about their fish and conservation systems.

Community members raise livestock, grow crops chickens, ducks and pigs. Crops include talo (taro), pulaka, cassava (tapioca), pawpaw and pumpkin. Fresh produce sold at markets includes seafood and resources from local forest: the wild figs, the bird nest ferns for their highly nutritious vegetable leaf tips, the coconut germinating coconuts, wild pandanus to preserve into a rich starch food, the Polynesian arrow roots that provide locally homemade flour, the creeping wild beans from the vigna marina plant.

Bananas and breadfruit are grown in gardens or plantations. Pulaka (taro) pits used to be a significant source of local foods, but population pressures, urbanisation, climate pressures and shifting food sources have significantly reduced the amount of use of pulaka pits.

Groundwater contamination, drought and hotter temperatures are affecting crop yields. Soil fertility is also an issue mentioned by some in the communities. Cyclones and sea level rise are primary threats.

Handicrafts are significant culturally and economically, and there is interest from community members in expanding this knowledge.

Some income is derived from formal employment and from labouring. Community members travel to Funafuti or overseas to New Zealand or Australia for seasonal work. Some gain employment in international shipping. Formal employment or wage work are sources of income for a majority of households. Formal employment includes public servants and teachers. There is a large high school on Vaitupu Island providing employment for community members.

LIVELIHOOD

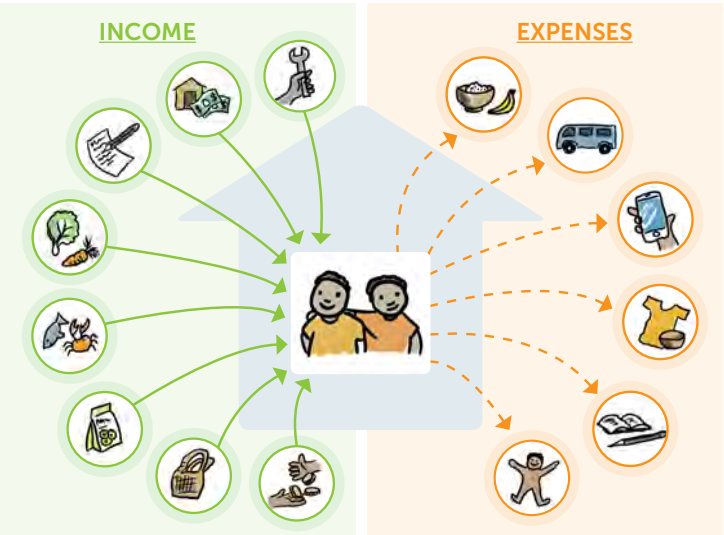
Wage work and similar employment, handicrafts, gardens, fishing, shops, wharf, copra, ocean

LIFE

Water supply, lagoon, trees, houses, sea wall, poultry, rainwater

WELLBEING

Religion, community, culture, handicrafts, land, lagoon, meeting hall, health centre, evacuation centre, education



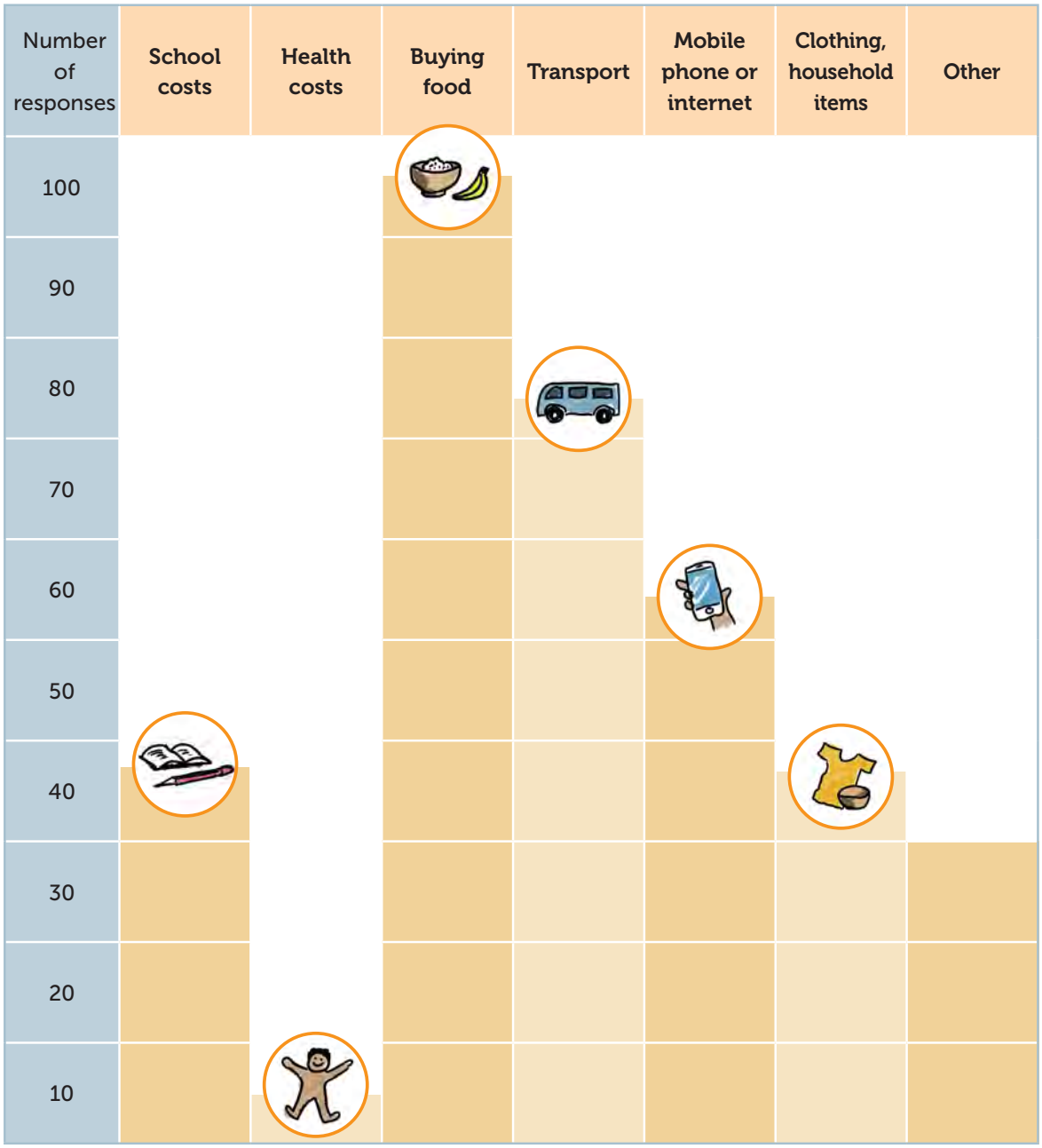
How does your household get income?

Households with more family members do not tend to have more income source. Formal employment, wage work and skilled services account for most income. Wage work can include fishing when the fishers are employed by commercial fishing companies. Selling agricultural produce is not a significant income source. Selling foods and other goods are included in the 'other' category.

What does your household spend money on?

Households across Tuvalu spend most money on buying food, irrespective of whether they are on outer islands or in urban settings. Transport and mobile phone costs are also significant costs. Health costs are minimal, which may reflect level of access to health services.

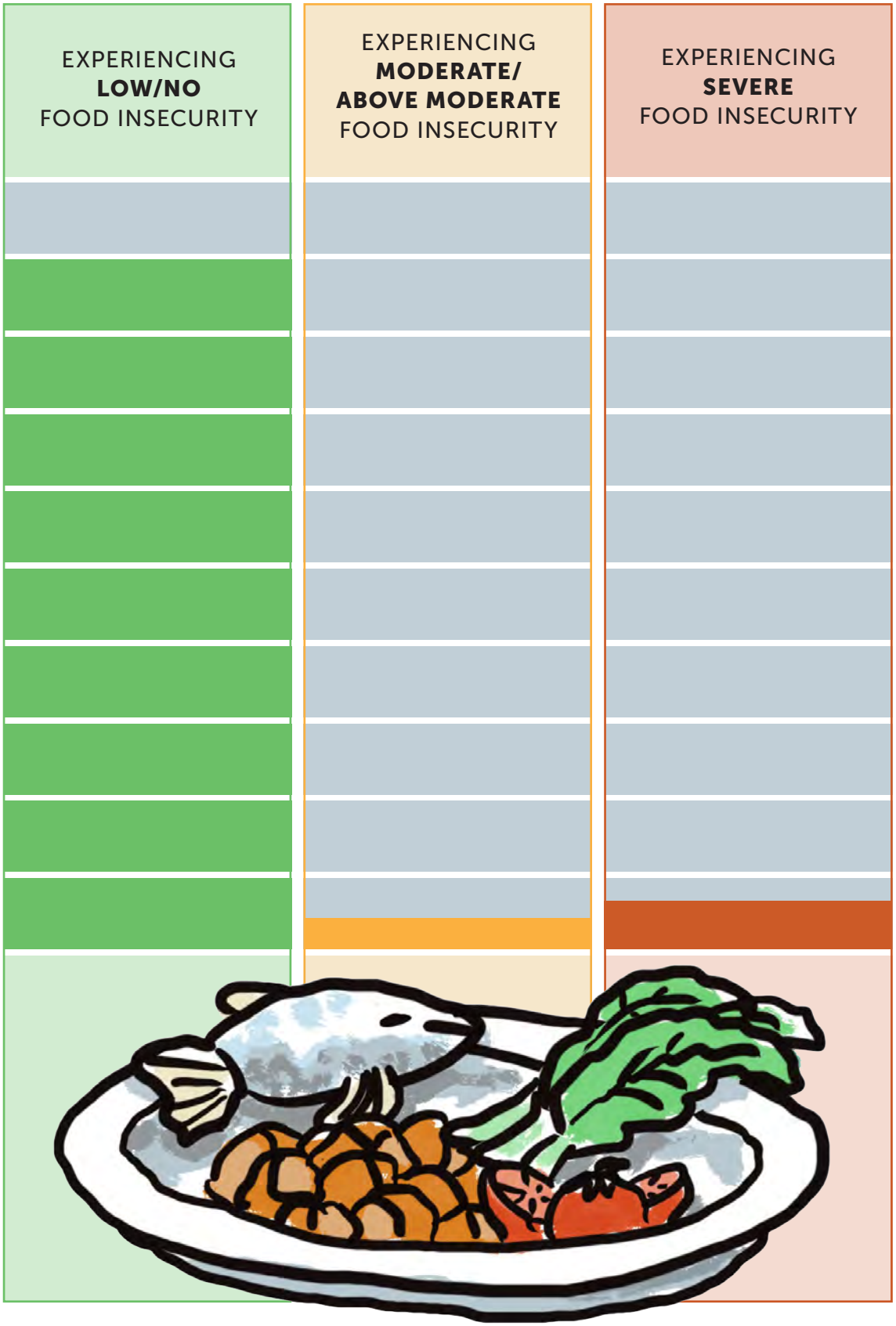
'Other' usually indicates community and church obligations and utilities such as electricity.



Twelve percent of households meet over 81% of their food needs from gardens, farm and sea. 32% of households meet 61-80% of their food needs from gardens, farm and sea. 55% of households meet 60% or less of their food needs from gardens, farm and sea.

Food Insecurity Experience

The Tuvalu communities surveyed reported very low food insecurity overall. Of the 96 respondent households, 89 reported no or low food insecurity, with just two in the moderate range and five experiencing severe insecurity.



The four partner communities were all consistent in their level of food insecurity, which was very low throughout each. Papaelise and Vaitupu were particularly notable, with no households in either community experiencing moderate or severe food insecurity. Overall, 69 households were found to be experiencing none of the indicators of food insecurity at all. Only two of the indicators were being experienced by more than 10 households – those asking about feeling worried about not having enough food to eat, and being unable to eat healthy and nutritious food, because of a lack of money or other resources.

Though the data distribution has a linear decline, suggesting reliability, these results are somewhat unusual for Tuvalu, which has noted challenges in its food systems, including limited land for locally grown food and reliance on imported foods. A more nuanced and detailed approach to strengthening food systems may be necessary for Tuvalu communities.

Community Resilience Indicators

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

Knowledge

- Traditional handicrafts
- Fishing
- Care of pulaka pits
- Skills for formal employment
- Knowledge of weather patterns
- Disaster preparation
- Culture and kinship including kaupule
- Food preservation techniques

Physical Security

- Adequate water supply
- Housing and community infrastructure above sea level
- Water supply protected from seawater contamination
- Fishing stocks protected/marine conservation area
- Housing safe from cyclones
- Adequate housing for population
- Boat or other transportation for income
- Protected coconut woodland
- Adequate waste disposal facilities for community
- Access to health services
- Good soils
- Access to seeds and fertilizers

Connections

- Family
- Community participation, particularly decision-making
- Community groups
- Government for DRR
- Interactions with communities on other islets
- Health services
- Church
- Kaupule

Community Risk Summary [2]

Overall resilience indicators:

1. **Secure water supply and sanitation**
2. **Safe location of house, and cyclone-proof construction**
3. **Security from inundation**
4. **Healthy food sources**
5. **Community participation**
6. **Transport**
7. **Consistent livelihood source**
8. **Healthy ocean and lagoon**

Across CRI Tuvalu communities, the trend for resilience is mixed. Raised income levels, water projects, income from relatives overseas and post-cyclone relief are all contributing to resilience.

Papaelise is a relatively new community, so long-term trends were unavailable. In one community, there has not been a shift in the percentage of households that class themselves as resilient, but that percentage is low, due to factors including loss of labour due to migration, inadequate infrastructure, lack of adequate water storage and decline in traditional agriculture.

As has been well-publicised, the effects of climate change, including sea level rise and increased damage due to storms, are major threats to resilience, particularly considering Tuvalu's low-lying status and small surface area.

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

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

Vulnerability

- Lack of adequate water storage, including house tanks
- Broken infrastructure
- Many young people with little traditional knowledge
- Population density increasing
- Relying on buying food
- Rely on pulaka pits
- Decline in fish stocks
- Lack of sanitation facilities in some households
- Waste not properly dealt with
- Lack of consistent income

Exposure

- Occasional droughts
- Marina exposed to storm surges
- Little protection from strong winds
- Low-lying areas widespread and threatened by sea level rise
- Pulaka pits threatened by sea level rise
- Lagoon polluted by waste
- Wild pigs damage gardens
- Small area for agriculture

Climate Change

- Increase in frequency and/or intensity of cyclones
- Coastal inundation and saltwater intrusion
- Sea level rise
- Changed rainfall patterns
- Extended and more frequent dry periods/droughts
- Increased sea temperatures
- Loss of coral

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

Community Priority Values & Assets

Communities in Tuvalu typically value the gardens that provide them with food and income, including pulaka pits, consistent water supply and adequate water storage, secure housing and their marine areas, including the lagoon. Mangroves and coconut forest, which provides material for handicrafts and income, are also 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 tank	• Contaminated or salty water • Not enough water cisterns • Not enough drinking water	• Water tanks near seasides • Cracks in water tanks	• Strong winds • Drought	3
Handicraft	• Disturbed ecosystem restricts availability • Land clearance • Usage of lands without approval	• Exposed to both seasides • Trees can fall down during strong winds	• Storms	3
Pulaka pits	• Pulaka pit cultivating is declining • Pulaka dying from hot temperatures and saltwater intrusion	• Located in lowlands, exposed to sea level rise • Lack shade trees	• Strong winds • Drought • Flooding	3
Land replanting	• Land erosion • Not enough plants and trees • Trees not growing well • Not enough water	• Exposed to both sea sides, so to storms, saltwater	• Strong winds • Drought	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)
Food garden	• Lack of water • Lack of compost & good soil • Lack of seeds	• Near coast, erosion, not enough land	• Long droughts • Storm surges on coastal areas	3
Coconut woodland	• Thick groves invite pest outbreaks	• Near or on coast, storm surges and cyclones	• Cyclone, storm surges • Sea level rise • New pests	3
Coastline ecosystem	• Erosion from sea level rise and storm surges destroys vegetation that moderates winds	• Exposed to strong westerlies and cyclones	• Climate change increasing storm surges and strength of cyclones	3
Marine resources	• No proper place to shelter from strong winds and big waves • Lacking financial aid	• No proper place to anchor • Lagoon waters are polluted by plastic waste	• Strong winds	3

Disaster Risk Reduction participation

CRI activities will align with Tuvaluan national plans. The plans include disaster preparation and response.

The Disaster Management Act of Tuvalu requires disaster plans and disaster committees. Two of the four communities have plans and committees.

Two communities do not have disaster plans, but one has a disaster committee. Strategic planning for communities emphasises the need for the setup of Island Disaster Committees to be supervised by the Kaupules.

Community Management Groups

The local government structure consists of three bodies: the Falekaupule, the Kaupule, which is the executive arm of the Falekaupule, and the Falekaupule Assembly, which is the consultative forum where issues are tabled for discussion and includes anyone 18 years and above.

The Falekaupule is the most formal community gathering for decisions. Churches are also important decision-making bodies. Ekalesia Kelisiano Tuvalu Church (EKT) is the main Christian denomination of Tuvalu. There are other groups such as women's and youth church groups, and district community groups. Chiefs and chief's families are responsible for management also.

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
WATER	• Kaupule • PWD • Individuals • Gutter maintenance • Use water wisely	**Strength:** Most houses have water tanks **Challenges:** Water rations during long dry periods, not enough water storage
HANDICRAFTS	• Women's council • Individuals	**Strength:** No proper place or building for women to sell their handicrafts **Challenge:** No proper place or building for women to sell their handicrafts
PULAKA PITS	• Landowners generally tend pits, but they also let them out to friends and relatives	**Strength:** Pulaka is somewhat salt tolerant and stores well **Challenges:** • Seawater intrusion, neglect of pits. Especially in Funafuti, pits have been abandoned. • Composting is labour intensive. • Loss of traditional knowledge
LAND	• Landowners • Government of Tuvalu	**Challenge:** Population is too high for current land allocation

ELEMENT	HOW MANAGED?	STRENGTHS AND CHALLENGES
FOOD GARDENS	• Landowner, families	**Challenges:** • Abandoned pulaka pits • Sustainability of pits • Lack of land, lack of good soil, lack of water
COCONUT WOODLAND	• Landowners, coconut rehabilitation projects, elders with traditional knowledge	**Strength:** Coconut woodland refuge for wildlife **Challenge:** Prone to cyclone damage
CONSERVATION AREA (MPA)	• Kaupule • Fisheries (GOT) • Rules & regulations • Monitoring fish poaching	**Strength:** It is there when there are big occasions held and communities will fish from there **Challenge:** Misuse of MPA

Next Steps

Climate resilience can be defined as:

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.[3]

We think about how three different things are combined when working with climate resilience[4]:

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

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

4 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, Tonga, Tuvalu, Solomon Islands and Papua New Guinea.

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

live & learn
ENVIRONMENTAL EDUCATION

NEW ZEALAND
FOREIGN AFFAIRS & TRADE
Manatū Aorere