

## Ecosystem based adaptation for improved livelihood in Tuvalu

### Part I: Project Information

**GEF ID**

10926

**Project Type**

FSP

**Type of Trust Fund**

LDCF

**CBIT/NGI**

CBIT No

NGI No

**Project Title**

Ecosystem based adaptation for improved livelihood in Tuvalu

**Countries**

Tuvalu

**Agency(ies)**

UNEP

**Other Executing Partner(s)**

Ministry of Finance

**Executing Partner Type**

Government

**GEF Focal Area**

Climate Change

**Taxonomy**

Influencing models, Strengthen institutional capacity and decision-making, Convene multi-stakeholder alliances, Local Communities, Stakeholders, Civil Society, Community Based Organization, Non-Governmental Organization, Type of Engagement, Participation, Consultation, Partnership, Information Dissemination, Communications, Behavior change, Awareness Raising, Beneficiaries, Gender Mainstreaming, Gender Equality, Sex-disaggregated indicators, Gender-sensitive indicators, Gender results areas, Knowledge Generation and Exchange, Access and control over natural resources, Participation and leadership, Access to benefits and services, Capacity Development, Capacity, Knowledge and Research, Knowledge Generation, Workshop, Training

**Sector**

Mixed & Others

**Rio Markers****Climate Change Mitigation**

Climate Change Mitigation 0

**Climate Change Adaptation**

Climate Change Adaptation 2

**Duration**

60 In Months

**Agency Fee(\$)**

419,540.00

**Submission Date**

2/22/2022

A. Indicative Focal/Non-Focal Area Elements

Programming Directions	Trust Fund	GEF Amount(\$)	Co-Fin Amount(\$)
CCA-1	LDCF	3,091,347.00	2,979,099.00
CCA-2	LDCF	1,324,863.00	2,506,546.00
	<b>Total Project Cost (\$)</b>	<b>4,416,210.00</b>	<b>5,485,645.00</b>

## B. Indicative Project description summary

### Project Objective

To reduce vulnerability to climate change through adaptive agricultural practices and ecosystem management in Tuvalu.

Project Component	Financing Type	Project Outcomes	Project Outputs	Trust Fund	GEF Amount(\$)	Co-Fin Amount(\$)
Component 1: Identifying and implementing integrated land management and ecosystem restoration strategies for increased resilience.	Investment	1.1. Restoration of <b>10 ha</b> of degraded Pulaka pits and increased resilience of <b>13 ha</b> of agricultural systems on <b>8</b> islands against the impacts of climate change and salt-water intrusion through innovative land management and agricultural practices.	<p>1.1.1 Rehabilitation of <b>3</b> historically degraded pulaka pit areas carried out.</p> <p>1.1.2. Proven climate-resilient technologies and practices – such as raised concrete beds and impermeable geomembranes to minimize saltwater intrusion under current climate change – implemented in <b>~32</b> pulaka pit areas.</p> <p>1.1.3 Alternative irrigation strategies – such as drip irrigation from roof catchments and tanks/micro-dams – installed to improve water supply to <b>~32</b> Pulaka pit areas.</p> <p>1.1.4 Diversified cropping strategies introduced to <b>~32</b> Pulaka pit areas to promote the use of climate-resilient crops that are able to withstand atoll conditions and simultaneously enhance soil quality. These strategies will include raising plants around Pulaka pits to generate organic material for remediation.</p>	LDC F	2,181,608.00	1,973,063.00

1.1.5 **8** community training groups  
– including representatives from  
women’s groups – established  
around pilot sites to generate  
knowledge of appropriate  
methodologies and upscale best  
practices of adaptation strategies  
among stakeholders, particularly for  
farmers and communities engaged  
with the Pulaka pit agriculture.

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<p>Component 1: Identifying and implementing integrated land management and ecosystem restoration strategies for increased resilience.</p>	<p>Investment</p>	<p>1.2 Groundwater infiltration and flood-risk reduction services improved on <b>8</b> islands through SLM practices that include the restoration and conservation of degraded atoll ecosystems.</p>	<p>1.2.1. <b>180 ha</b> of coastal ecosystems restored to enhance the provision of associated ecosystem services, including flood reduction and storm surge attenuation – to withstand increasing climate change impacts.</p> <p>1.2.2. Groundwater recharge zones in and around <b>~32</b> pulaka pit areas protected using EbA buffer zones to improve soil quality and freshwater infiltration potential.</p> <p>1.2.3. Diversified livelihood strategies introduced for <b>~800</b> people in local communities reliant on natural resource-based livelihoods based on sustainable fisheries management to conserve coastal ecosystems and their services.</p>	<p>LDC F</p>	<p>922,988.00</p>	<p>686,330.00</p>
<p>Component 2: Creating an enabling environment for implementing EbA through improving national policy and planning frameworks, strengthening</p>	<p>Technical Assistance</p>	<p>2.1. Institutional uptake of EbA enhanced through policy revisions and capacity building among core government staff.</p>		<p>LDC F</p>	<p>545,402.00</p>	<p>1,282,568.00</p>

institutional capacity, raising awareness and addressing barriers to CCA.

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2.1.1. Revisions made to 3 national policies and 1 sub-national sector plan relevant to EbA, water and agriculture to align with the GoT's broader sustainability indicators, streamline funding for adaptation priorities and facilitate coordination between government agencies. These revisions will enable the upscaling of EbA and CCA-related knowledge generation and capacity building of male and female stakeholders through the project.

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2.1.2. Training conducted for 100 government officials, with a focus on technical officers, coastal adaptation management professionals, representatives from women's groups and community representatives on the integration of EbA, climate-resilient agriculture and SLM principles into policies and planning at both national and community levels.

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<p>Component 2: Creating an enabling environment for implementing EbA through improving national policy and planning frameworks, strengthening institutional capacity, raising awareness and addressing barriers to CCA.</p>	<p>Technical Assistance</p>	<p>2.2. Develop and implement strategic action plans for or streamlining EbA national policy and planning frameworks.</p>	<p>2.2.1. Guidance Note for compliance monitoring and enforcement of EbA policy recommendations prepared under Output 2.1.1.</p> <p>2.2.2. Land-use zoning plan developed to enable EbA, climate-resilient agriculture and SLM under existing land tenure systems. Subactivities will include updating land ownership databases within the Department of Lands to clarify land ownership boundaries. These boundaries will facilitate stakeholder engagement and reporting arrangements in the context of Tuvalu's current land tenure system</p>	<p>LDC F</p>	<p>335,632.00</p>	<p>769,541.00</p>
<p>Component 2: Creating an enabling environment for implementing EbA through improving national policy and planning frameworks, strengthening institutional capacity, raising awareness and addressing barriers to CCA.</p>	<p>Technical Assistance</p>	<p>2.3. Uptake of EbA and climate-resilient agriculture practices enhanced through multi-level stakeholder decision-making programmes, knowledge management and awareness-raising regarding CCA.</p>		<p>LDC F</p>	<p>209,770.00</p>	<p>513,027.00</p>



2.3.1. Gender-responsive best-practice guidelines developed and disseminated to raise awareness and facilitate replication and upscaling of EbA, climate-resilient agricultural and land management practices.

2.3.2. A gender-responsive knowledge management and communication strategy developed for integrating EbA best practices and lessons learned into planning and policy.

2.3.3. Continuous training and gender-responsive knowledge generation programmes for public sector officials developed using the results of the direct capacity building of technical officers in Output 2.1.2.

	<b>Sub Total (\$)</b>	<b>4,195,400.00</b>	<b>5,224,529.00</b>
<b>Project Management Cost (PMC)</b>			
	LDCF	220,810.00	261,116.00
	<b>Sub Total(\$)</b>	<b>220,810.00</b>	<b>261,116.00</b>
	<b>Total Project Cost(\$)</b>	<b>4,416,210.00</b>	<b>5,485,645.00</b>

Please provide justification

Without urgent interventions to adapt Tuvalu's agriculture to climate change – by promoting climate-resilient agricultural management and soil remediation practices – and increase freshwater recharge, the production of pulaka in the country will continue to decline, directly impacting Tuvaluans' food security and cultural heritage. The preferred solution to overcome the impacts of climate change-induced sea level rise (SLR), coastal storms and rainfall variability on Tuvalu's food production systems requires an integrated management approach. Under the proposed project, this solution will involve implementing appropriate land management and ecosystem restoration strategies that maintain freshwater lenses by maximising rainwater capture and retention while reducing the rate of saltwater intrusion, ultimately enhancing the resilience of agricultural production in vulnerable areas. Moreover, by enhancing the resilience of rural livelihoods, the project will contribute to critical adaptation areas for Tuvalu by reducing rural to urban migration and the associated decreased resilience of the country's capital city. The innovative EbA project interventions will positively impact ~4,200 direct beneficiaries and ~7500 indirect beneficiaries in the project's target sites, namely: i) Nanumea; ii) Nanumaga; iii) Niutao; iv) Vaitupu; v) Nukufetau; vi) Nukulaelae; and vii) Funafuti, by conserving and protecting freshwater resources against climate change-induced saltwater intrusion, which, in turn, will secure climate-resilient community livelihoods.

**C. Indicative sources of Co-financing for the Project by name and by type**

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount(\$)
Recipient Country Government	Government of Tuvalu	In-kind	Recurrent expenditures	944,000.00
Donor Agency	Climate and Oceans Support Program in the Pacific (COSPPAC, E13046, 2019–2022)	Grant	Investment mobilized	760,500.00
GEF Agency	UNEP-GCF	Grant	Investment mobilized	3,781,145.00
			<b>Total Project Cost(\$)</b>	<b>5,485,645.00</b>

**Describe how any "Investment Mobilized" was identified**

The identified co-finance will be provided by two projects, namely 'Climate and Oceans Support Program in the Pacific' (COSPPAC 2, funded by the Government of Australia) and 'Enhancing climate information and knowledge services for resilience in 5 island countries of the Pacific Ocean' (funded by the GCF). This project will leverage from the climate information services and knowledge products developed by these two projects to enable and strengthen the uptake of climate-resilient practices, as well as build the knowledge and awareness of climate change adaptation. The co-financing has been broken down as US\$ 760,500 and US\$ 3,7 million from the COSPPAC 2 and 'Enhancing climate information and knowledge services for resilience in 5 island countries of the Pacific Ocean' projects, respectively. Additional details are provided under the section: 'Coordination with other projects and programmes of relevance' in Table 7.

D. Indicative Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount(\$)	Fee(\$)	Total(\$)
UNEP	LDCF	Tuvalu	Climate Change	NA	4,416,210	419,540	4,835,750.00
<b>Total GEF Resources(\$)</b>					<b>4,416,210.00</b>	<b>419,540.00</b>	<b>4,835,750.00</b>

**E. Project Preparation Grant (PPG)**

PPG Required **true**

PPG Amount (\$)

150,000

PPG Agency Fee (\$)

14,250

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount(\$)	Fee(\$)	Total(\$)	
UNEP	LDCF	Tuvalu	Climate Change	NA	150,000	14,250	<b>164,250.00</b>	
					<b>Total Project Costs(\$)</b>	<b>150,000.00</b>	<b>14,250.00</b>	<b>164,250.00</b>

## Meta Information - LDCF

LDCF **true**

SCCF-B (Window B) on technology transfer

**false**

SCCF-A (Window-A) on climate Change adaptation

**false**

Is this project LDCF SCCF challenge program?

**false**

This Project involves at least one small island developing State(SIDS).

**true**

This Project involves at least one fragile and conflict affected state.

**false**

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This Project will provide direct adaptation benefits to the private sector.

**false**

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This Project is explicitly related to the formulation and/or implementation of national adaptation plans (NAPs).

**false**

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This Project has an urban focus.

**false**

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This Project covers the following sector(s)[the total should be 100%]:\*

Agriculture	50.00%
Natural resources management	0.00%
Climate information Services	0.00%
Costal zone management	50.00%
Water resources Management	0.00%
Disaster risk Management	0.00%
Other infrastructure	0.00%
Health	0.00%
Other (Please specify:)	0.00%
Total	100%

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This Project targets the following Climate change Exacerbated/introduced challenges:\*

Sea level rise	Change in mean temperature	Increased Climatic Variability	Natural hazards
<b>true</b>	<b>true</b>		<b>true</b>

Land degradation	Costal and/or Coral reef degradation	GroundWater quality/quantity
true	true	true

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## Core Indicators - LDCF

CORE INDICATOR 1	Total	Male	Female	% for Women
Total number of direct beneficiaries	4,200	2,100	2,100	50.00%
<b>CORE INDICATOR 2</b>				
Area of land managed for climate resilience (ha)	230.00			
<b>CORE INDICATOR 3</b>				
Total no. of policies/plans that will mainstream climate resilience <sup>4</sup>				
<b>CORE INDICATOR 4</b>				
Total number of people trained	4,300	2,150	2,150	50.00%

## Part II. Project Justification

### 1a. Project Description

1. Tuvalu is a small island developing state (SIDS) located in the central Pacific Ocean, comprising nine atolls<sup>[1]</sup> across a total land area of 26 km<sup>2</sup> (Figure 1 below). Six islands – namely Nanumea, Nui, Nukufetau, Funafuti, Nukulaelae and Vaitupu – are low-lying<sup>[2]</sup> atolls consisting of *motu* (islets) fringing the edges of lagoons, that predominantly comprise young, poorly developed, infertile, sandy or gravel coralline soils. The remaining three islands – Nanumaga, Niutao and Niulakita – are raised limestone reef islands composed of poorly formed soil. These qualities result from the predominantly carbonate reef-borne material of the soils that lack structure and texture, ultimately leading to their considerably low water-holding capacity<sup>[1]</sup>.
2. In addition to having poor quality soil, Tuvalu has no surface freshwater resources such as rivers or lakes. Freshwater in the country is only available in the form of groundwater lenses that float hydrostatically on top of higher density saltwater, separated by a layer of brackish water located in a transition zone<sup>[1],[2]</sup> (Figure 2). Communities primarily use shallow wells to access water from these lenses. Although groundwater lenses are recharged by rainfall, maintaining the hydrostatic equilibrium, the transition zone shifts and freshwater availability decreases without sufficient recharge. In addition to recharging the freshwater lens, rainwater is also harvested directly by communities for household use.
3. Despite Tuvalu's small size, the islands are characterised by several vegetation types. These include: i) inland broadleaf<sup>[1]</sup> forest and woodland; ii) coastal littoral forest and scrub; iii) mangroves and wetlands; iv) coconut woodland and agroforest; v) excavated taro pits; and vi) ruderal vegetation<sup>[2]</sup>. Ecosystems of swamp taro – known locally as pulaka pits – prefer wet soil conditions, such as natural depressions where the plant can easily access the groundwater lens.
4. Tuvalu's tropical climate is characterised by a wet season from November to April and a dry season from May to October. Rainfall averages 200mm per month in Funafuti and 160mm per month in Nanumea. Tuvalu's wet season is affected by the movement and strength of the South Pacific Convergence zone. It is also affected year to year by the Intertropical Convergence Southern Oscillation. Rainfall is spatially varied, with mean annual rainfall in the southern islands of ~3,400 mm and a considerably lower ~2,900 mm in the northern islands. Temperatures are generally uniform, ranging from 25°C to 30°C throughout the year<sup>[3]</sup>. Increases in temperatures at 0.11C per decade in the dry season have been observed. Although Tuvalu often experiences droughts as a result of its location near the Pacific equatorial dry zone, dry periods are more severe in the northern than southern islands – notably between August and October annually. Droughts during the dry season can last for extended periods (up to three months), particularly in the northernmost islands<sup>[4]</sup>. Tuvalu's dry years are associated with a positive Southern Oscillation Index – the La Niña or cold phase of the El Niño Southern Oscillation<sup>[5]</sup> (ENSO) – and are causing increased drought events that contribute to the depletion of the country's freshwater resources. In addition to droughts. There are no clear trends in wet season rainfall, average rainfall, or extreme daily rainfall since 1927, but there is substantial variation from year to year.
5. Tuvalu is particularly vulnerable to extreme winds, storm surges and swells generated by tropical cyclones that occur annually between November to April. The most recent severe tropical cyclone – Tropical Cyclone Pam – devastated Tuvalu's islands in March 2015, damaging houses, infrastructure, food gardens, graves and coastlines. The cyclone also caused several islets in Tuvalu's capital Funafuti to disappear while displacing nearly half of the country's population (~3,300 people)<sup>[6]</sup>.



6. In the 42 year period between 1969 and 2010 35 tropical cyclones affected Tuvalu and most commonly experienced in El Nino years when ocean temperatures are warmer. The resulting flooding causes agricultural losses, as well as damage to buildings and roads. Sea level rise has risen by 5mm per year since 1993. This is larger than the 2.8 – 3.6mm average global increases. This rise may be partly explained by annual and decadal natural variations.

7. At Funafuti, the maximum average height of wind waves is in July and August at 2.15 m and minimum at 1.55m and in extreme events, wave height rises to 2.7m. July and August have the highest minimum wave height of 1.5m. The lowest wave height is in November with average minimum and maximum of 1.3m and 1.7m respectively. At Nanumea, the maximum average height of wind waves is in January and February at 2m and minimum at 1.4m and in extreme events, wave height rises to 2.4m. July and August have the highest minimum wave height of 1.4m. The lowest wave height is in November with average minimum and maximum of 1.2m and 1.7m respectively[7].

8. Data is also showing acidification of Tuvalu's ocean waters.

### *Governance*

9. Tuvalu is a democratic country governed under a Westminster system<sup>[1]</sup> comprising 15 elected members. Only three women have been elected to the government since Tuvalu's independence in 1978, including Dr Puakena Boreham, who was elected to represent Nui in the 2015 general election[2]. As of 2021, ~6% of seats in parliament are held by women[3], highlighting a considerably skewed gender representation at the parliamentary level. At the individual island level, a contemporary form of traditional governance is employed through the *Falekaupule* and *Kaupule* systems<sup>[4]</sup>. Similarly, Tuvalu's land tenure system is customary, with land being passed down equally through patrilineal and matrilineal lines. However, only men can inherit land in Tuvalu, with land being passed to a daughter only on the condition that there are no sons or if the daughter is the only child or the only surviving child[5].

### *Socioeconomic context*

10. Tuvalu's population was recorded at ~11,700 people<sup>[6]</sup> in 2020, growing at an annual rate of ~1.7% and comprising ~50.2% females and 49.8% males[7]. The country's population is densest in Funafuti – accounting for more than half of the country's total population – as result of high migration rates from the country's outer islands to the capital, driven by job opportunities and improved access to healthcare and education<sup>[8]</sup>. Most of the population are subsistence farmers that participate in livestock production, including pigs, free-range chickens and ducks at the household level. Where men engage in cash cropping[9], Tuvaluan women are traditionally responsible for the family's food security and production, often growing crops in homestead gardens, rearing small livestock, producing handicrafts. Women further contribute towards the family's livelihood by engaging in other value-added activities, such as copra making, fish drying, weaving, coconut oil production, preparation of traditional medicines, planting materials and seeds.

11. Given its remoteness from local and global markets, Tuvalu's economic base is limited, with trade primarily occurring with Fiji, Australia, New Zealand and Japan. In addition, the country is a dual economy comprising a small cash and subsistence economy centred around traditional fishing and small-scale agricultural sectors. As a result, the country largely relies on foreign aid, revenue from issuing fishing licenses to foreign vessels, remittances, postage stamp sales and 'dot TV' domain licenses<sup>[10]</sup>.

12. Outside of subsistence agriculture, employment opportunities in Tuvalu are dominated by the public sector. Women are predominantly employed in the service industry, participating in finance, insurance, public administration, education and social work activities, while men are employed in the manufacturing, construction and defence industries[11]. Private sector employment opportunities are limited, with Tuvaluan seafarers primarily working on foreign vessels overseas, particularly in Europe. Given that most jobs in the country are under employment by the government, which provides steady wages or salaries – approximately two-thirds of these jobs comprise formal employment – there is no apparent income disparity among the people of Tuvalu. The Tuvalu Trust

Fund (TTF) was established in 1987 by the United Kingdom, Australia and New Zealand to support to the country's economy by helping supplement national deficits, underpin economic development and help the nation achieve greater financial autonomy. The TTF has grown from ~US\$41 million in 1999 to ~US\$107 million in 2015 and now serves as the most important capital resource to finance recurrent government expenditure during fiscal downturns.

13. One of the most predominant forms of subsistence crop agriculture in the country involves the traditional practice of growing pulaka<sup>[12]</sup> – known in English as giant swamp taro – in large pits of composted soil below the level of the water table where plants can directly access the freshwater lens<sup>[13]</sup>. These natural depressions and excavated pits are the most suitable land to circumvent the agronomic limitations presented by Tuvalu's atoll soils (discussed in detail under the Proposed Alternative Scenario Section below) and are often used to grow other crops alongside pulaka. Moreover, pulaka pits are an important aspect of Tuvalu's local cultural heritage as they are dug and maintained by individual families over generations<sup>[14]</sup>.

#### *Pulaka cultivation in Tuvalu*

14. Pulaka (*Cyrtosperma merkusii*) is an important carbohydrate for the inhabitants of Tuvalu, making up the bulk of the islanders' traditional diet. As an atoll country, Tuvalu does not have the same soil composition and food crop varieties as volcanic countries like Fiji and Tonga. The soils on Tuvalu are predominantly derived from carbonate reef-borne material, making them highly porous and poorly developed, with little structure and texture. In addition, atoll soils are naturally deficient in the nutrients required for successful crop growth<sup>[15]</sup>. To circumvent these agronomic limitations, initial settlers burrowed pits below the groundwater level and fertilised them using dark soil and organic matter. This created conditions suitable to sustain pulaka – one of few crops able to withstand brackish water<sup>[16]</sup> and grow well in constantly wet soil conditions. Cultivating pulaka is a 'cultural art' in Tuvalu, with the transmission of this knowledge traditionally passed down from father to son<sup>[17]</sup>. In addition, the traditional method of cultivating pulaka is considered to be among the most sustainable forms of organic farming techniques in the world<sup>[18]</sup>.

15. Pulaka cultivation exists on each of the main islands of Tuvalu, as well as other small islets surrounding lagoons. A 2012 Population Census illustrated that ~80% of rural households in Tuvalu grew pulaka, although the number is thought to have declined considerably in the past decade<sup>[19]</sup>. The crop has few pest problems as a result of the country's isolation and is resistant to strong wind, enabling it to survive cyclones with minimal wind damage<sup>[20]</sup>. Other cultivated local foods include coconuts, banana, pawpaw, cabbage, cucumber, pumpkin, chicken and pigs; most crop production is primarily for subsistence. Tuvaluans traditionally consider local food to be high quality and the most culturally appropriate for consumption<sup>[21]</sup>. The precolonial Tuvaluan diet was based primarily on nearshore marine foods and coconut and was supplemented by local root crops, such as pulaka and taro. However, as a result of challenges to food security and sustained contact with European and American traders since the 19<sup>th</sup> century, agriculture and local food production have declined while dependence on nutrient-poor imported foods has increased considerably. It is estimated that Tuvalu imports ~3,100 tonnes of food, equivalent to ~US\$ 4.2 million annually<sup>[22]</sup>. The increasing imports of starch products, such as rice and flour, have been replacing the role of pulaka as a daily food crop. An extreme case of this shift can be observed on the densely populated island of Funafuti, where 50–80% of pulaka pits have been abandoned because of changing dietary preferences, declining interest in pulaka cultivation and environmental stressors such as periodic droughts and saltwater intrusion.

16. The increased dependence on imported foods has negatively impacted the local population of Tuvalu in several ways. For example, the dietary shift has resulted in the expansion of noncommunicable diseases, such as diabetes, obesity, hypertension and cerebrovascular diseases – which have become common among urban populations with increasingly non-traditional diets<sup>[23]</sup>. Moreover, the average consumption of 100 grams per capita per day of fruits and vegetables in Tuvalu is considerably lower than the 400 grams recommended by the World Health Organisation. Additionally, the dependence on imported food impacts Tuvalu's economy through high import costs as a result of Tuvalu's isolation – approximately US\$ 2,000 and US\$ 5,800 for a dried container from Fiji and New Zealand, respectively<sup>[24]</sup>. Moreover, climate change is projected to have a larger impact on imported grain products, such as rice and wheat flour, than

traditional staples, which could lead to food insecurity in Tuvalu if the country continues to depend on imports. These elevated prices could, however, increase the competitiveness of pulaka, enabling an advantage for domestic food production where the necessary support is provided. This increased demand would be further supported by Tuvaluan's preference for local over imported foods[25].

17. Most imported foods available at stores are processed, nutrient-poor and of low quality, meaning that food-purchasing decisions are often based on availability and affordability rather than quality. Increasing dependence on these foods has resulted in 59.9% of adult (aged 18 years and over) women and 51.5% of adult men living with obesity, which is higher than the regional average of 31.7% and 30.5% for women and men, respectively. By contrast, there are considerable health and nutritional benefits to consuming traditional local foods, which can be grown and cultivated in home gardens at low cost.

#### *Projected climate change in Tuvalu*

18. General trends of projected temperature and precipitation changes for Tuvalu over the 21<sup>st</sup> century indicate a warmer and wetter climate. The main climate hazards resulting from these changes – many of which are currently affecting communities and ecosystems in Tuvalu – are: i) extreme temperatures; ii) tropical cyclones; and iii) a rise in sea levels. These trends are projected to increase in intensity in the future (as indicated in Figure 3 below).

19. Cyclones are expected to be less frequent but more intense due to climate change. An increase in maximum wind speed by cyclones by between 2% and 11% and an increase in rainfall intensity of about 20% within the 100km of the cyclone centre. 7-18cm increase in sea level rise by 2030 and 26-57cm by 2070 under a high emissions scenario. Ocean acidity will increase. Together with storm damage, will likely degrade coral reefs[26].

20. Tuvalu's average annual temperatures are projected to increase by ~0.9°C and ~1.3°C under RCP4.5 and ~1.4°C and 2.9°C under RCP8.5 by 2050 and 2090, respectively[1]. These projections suggest an increase in hot days and warm nights and an overall decline in cooler weather. Temperature increases are projected to occur evenly throughout the year, with slight monthly variations. Similarly, the average annual rainfall is projected to increase across Tuvalu, with more extreme wet seasons and an increase in the intensity of extreme events, such as tropical cyclones[2]. Precipitation patterns are also expected to become increasingly challenging to predict because of the inability of climate models to simulate the changes for future ENSO patterns[3].

#### *The impacts of climate change on agriculture in Tuvalu*

21. As a SIDS, Tuvalu is one of the most vulnerable countries to climate change. In particular, Tuvalu's average elevation of one metre above mean sea level (AMSL) – with the highest point in the country at only five metres AMSL – increases the country's exposure to the impacts of SLR, specifically saltwater intrusion into freshwater lenses, soil and cultivation areas. Additionally, prolonged dry periods and increased frequency and intensity of extreme rainfall events have contributed to poor soil quality, increasing surface water runoff. This challenge is compounded by Tuvalu's small land area, which limits the availability of land for rainwater to infiltrate and replenish the freshwater lens. Additional impacts of climate change affecting the country include coastal erosion, loss of land, increased floods and storm surge inundation<sup>[4]</sup>, all of which promote saltwater intrusion into the country's limited freshwater resources.

22. Tuvaluans are strongly dependent on rainfall as a result of the saltwater intrusion discussed above. Although rainwater harvesting is usually adequate in supplying the country's household needs, a period of two to three weeks of no rainfall can result in severe water shortages – sometimes halving water levels in water tanks – which can adversely affect livelihoods and agricultural activities[5]. During these periods, communities and farmers depend on freshwater lenses to supplement their water supply. However, SLR is accelerating the hydrostatic rise of saltwater into these reservoirs, reducing the total volume of freshwater

available for drinking and food production. Exacerbating these challenges, the water from freshwater lenses in Tuvalu has become increasingly unsafe for drinking purposes because of: i) contamination resulting from poor wastewater management; and ii) increased levels of groundwater salinity resulting from the abovementioned climate change impacts.

23. Climate change is also adversely impacting agricultural production in Tuvalu. In particular, saltwater intrusion is negatively affecting pulaka cultivation – a critical and culturally important starch crop in Tuvalu previously used as a daily food crop – that relies on freshwater for its growth. Given that pulaka is intolerant of saline soil conditions, groundwater salinisation is expected to result in the total loss of pulaka productivity, with 60% of pulaka pit plantations already severely impacted by this climate change-induced effect<sup>[6]</sup>. Accordingly, the cultivation of pulaka in Tuvalu is predicted to become severely limited, exacerbating food insecurity. In response, pulaka cultivation has increasingly been replaced by imported starch food products – such as white flour and rice – across Tuvalu's islands to secure access to food. Niutao, Nui and Funafuti are among Tuvalu's most vulnerable islands to food insecurity according to the most recent assessment (Table 1).

24. The abovementioned impacts are further compounded by the occurrence of tropical cyclones – a recurring extreme climate event in Tuvalu<sup>[1]</sup> – accompanied by subsequent storm surges. These extreme climate events exacerbate downward saltwater intrusion into freshwater lenses from above ground, further decreasing these critical water sources' suitability for human consumption and agriculture. Tropical cyclones have also directly caused the degradation of pulaka pits by washing them away<sup>[2]</sup>. For example, prior to Tropical Cyclone Pam, three pulaka pits were located south of Nanumaga (Figure 4). However, the pit in close proximity to the ocean was degraded and now forms part of the beach as a result of storm surge associated with the cyclone (Figure 5)<sup>[3]</sup>.

**Table 1.** Vulnerability of Tuvalu's food security sector according to score and rank in the country's Integrated Vulnerability Assessment (IVA) Report<sup>[1]</sup>. A lower IVA score equates to higher vulnerability.

Food Security		
Island	IVA	Ranking
Niutao	1.8	1
Nui	1.9	2
Funafuti	1.9	2
Nanumea	2.1	3
Vaitupu	2.1	3
Nukufetau	2.7	4

[1] Government of Tuvalu. 2020. Tuvalu Integrated Vulnerability Assessment Report. Available at: <https://napglobalnetwork.org/wp-content/uploads/2021/01/napgn-en-2020-Tuvalu-IVA-report-Funafuti-community.pdf>.

25. With no natural sources of surface water, Tuvalu relies on rainwater as its primary source of freshwater. However, climate variability and the effects of climate change will exacerbate water resource availability, resulting in frequent water shortages. Water scarcity is a common problem in Funafuti – Tuvalu's capital – not only during the dry season (Jun–Sept) but occasionally during the wet season (Oct–Mar). In addition, the rapid population growth creates competing demands on already-constrained water resources. Sea level rise (SLR) is likely to increase saltwater intrusion into groundwater and soils and increase the risks of damage to water-supply infrastructure from natural hazards, such as tropical cyclones. Generally, water resources are not centralised as rainwater is collected and controlled by private households, which restricts its use. For example, groundwater is only used to feed pigs, wash pig pens and flush toilets in Funafuti, although its use extends to washing clothes and bathing during periods of drought.

#### *Root causes*

26. The quality of Tuvalu's land and soil is adversely impacted by its high vulnerability to extreme weather events as a result of its low-lying topography. These extreme events include storm surges from tropical cyclones, sea sprays and saltwater intrusion, all of which are exacerbated by several baseline factors. Tuvaluans have historically practised biodiversity conservation, but these traditional conservation practices are diminishing as a result of the gradual population growth and the transition away from subsistence to a semi-commercial economy. Consequently, inappropriate and unsustainable land management practices have become widespread, including: i) clearing vegetation using fires; ii) beach sand mining; iii) poor soil conservation management; and iv) monocropping.<sup>[1]</sup> These practices, in combination with the poor soil quality, have accelerated the deterioration of Tuvalu's already-vulnerable land and soil<sup>[1]</sup>. Moreover, the country's soils are inherently unsuited to intensive agriculture – with many general soil remediation techniques and best practices from other regions challenging to implement in this context – making restoration difficult.

27. As mentioned above, Tuvalu's constrained economy contributes to its developmental challenges<sup>[2]</sup>. These constraints are largely influenced by the country's remoteness from national and international markets, leading to the overexploitation of local land-based and marine resources. The remote nature of Tuvalu is compounded by the distances between the capital atoll of Funafuti and its outer islands. For example, the northernmost island of Nanumea is ~464 km away from Funafuti. Tuvalu does not have an internal air service between atolls, meaning that inter-island transport and travel is solely dependent on government ferries. This outer island remoteness, combined with Tuvalu's small land and population size, constrains opportunities for viable economic activities. For example, fisheries products from outer islands are seldom exported because of the considerable distance to markets. Simultaneously, the limited inflow of outside information and resources hinders access to alternative livelihoods for outer island communities. Together, these factors contribute to Tuvalu's loss of livelihoods and, accordingly, persistent poverty in the country.

28. As a result of the abovementioned socioeconomic factors, Tuvalu is experiencing extensive internal migration of its population from the outer islands into the capital atoll, Funafuti. Men make up the majority of individuals migrating to the capital atoll, while women often remain on the outer islands to tend to household tasks<sup>[3]</sup>. Internal migration is attributable to changes in the lifestyle of Tuvaluans, influenced by shifting employment opportunities, the increasing dependence on imported foods and a decrease in traditional pulaka production in the outer islands because of degradation. These trends have created additional pressure on Tuvalu's water resources, with population needs and household water demand in Funafuti surpassing the available water storage capacity at the household and infrastructural level, which increases the burden on women who will now have the additional task of ensuring there is enough water to tend to household activities. Consequently, there is a need to enhance the food security and resilience of communities on the outer islands to reduce the need for migration towards the more urban islands.

#### *Barriers to be addressed*

*Barrier 1: Limited knowledge and technology implementation with regards to climate resilient agriculture and land-management practices at both national and local levels[4].*

29. There is limited awareness regarding climate change and adaptation related to agriculture and land management at all institutional levels in Tuvalu, from national-level policymakers, to the *Falekaupule*[5] and civil society. Consequently, insufficient tools, knowledge and methodologies at national, technical and grassroots levels limit climate change adaptation (CCA) actions being initiated on the ground. Specifically, this has resulted in minimal adaptation in the country's agricultural sector to the impacts of climate change which has contributed to the local degradation of pulaka production sites. In addition, officials have identified cultural barriers to the widespread acceptance of climate change adaptation measures, specifically around widely held interpretations of religious texts. Although some religious leaders have made efforts to challenge existing interpretations of these texts, approximately half of the interviewees in a study responded that climate change was not a concern based on their current biblical interpretations[6]. This presents challenges when communicating and promoting the adoption of climate change adaptation strategies in Tuvalu. Resultantly, building technical capacity and knowledge to recognise climate change impacts – as well as appropriate tools and methodologies to identify necessary adaptation activities – on agriculture and land resources is required within relevant ministries (such as the Ministries of Finance, Public Works and Agriculture) and island councils to promote the uptake of these activities among all relevant groups and stakeholders at local and national scales.

*Barrier 2: Limited integration of EbA and SLM-related climate change adaptation priorities into Tuvalu's national planning, policy frameworks and budgeting systems[7].*

30. While previous projects in Tuvalu have promoted EbA-based SLM approaches at the community level, the strategic importance of EbA and SLM has not been adequately integrated into the country's national policies and regulations because a robust enabling environment for mainstreaming these activities has been unavailable, particularly for enhancing CCA in the country [8]. This has been compounded by the limited technical expertise necessary to mainstream these SLM approaches into national policies. Despite this barrier, SLM has been integrated into Tuvalu's national policies in the 2005 National Adaptation Plan (NAP) for land degradation and drought. However, while the NAP for land degradation emphasises the role of conservation and SLM for carbon sequestration and reducing carbon dioxide emissions, it omits the relationship between SLM and CCA. In addition to Tuvalu's insufficient environmental policies, its financial capacity is inadequate to determine the appropriate use and conservation of ecological resources, or to address their degradation. This is compounded by a mismatch in budget estimations and the information in many of the CCA plans, strategies and activities currently underway.

31. Although the Tuvalu Trust Fund (TTF) and the Kaupule Trust are good practice models for providing budget support and outer island support, they are not presently used for CCA activities[9] such as EbA-based SLM approaches. Moreover, the technical capacity and coordination mechanisms at both intra-governmental (between national agencies) and inter-governmental (between national, village and Outer Island government) are insufficient to achieve integrated decision-making on CCA. As a result, there is a need to incorporate climate change impacts into Tuvalu's national policies and programmes – particularly related to the most climate-sensitive sectors such as water, coastal zones and agriculture. Although Tuvalu's National Strategy for Sustainable Development (2021–2030)[10] includes environmental priorities and strategies on climate change impacts, these plans have not been implemented at a wide scale on the ground because of inadequate recruitment procedures, delays in staff recruitment and insufficient levels of professional and technical experience[11]. In addition, Tuvalu's NAP process – initiated in 2014 – remains incomplete, with the latest milestone occurring in 2018 when a database to store community-level vulnerability data was completed. Combined, the abovementioned factors have inhibited the widespread implementation of CCA activities in Tuvalu, and in response, CCA should be streamlined into on-the-ground interventions by establishing relevant national policies.

*Barrier 3: Limited technical and professional capacity for implementing climate change adaptation strategies at the national and local scale over the long-term [12].*

32. Despite the high level of coastal vulnerability in Tuvalu, the country does not have a support structure for strengthening the capacity of coastal adaptation management practitioners over the long term. For example, external development projects tend to focus on building short-term capacities by focussing solely on existing GoT officials, rather than building the long-term technical and professional capacity by educating non-governmental staff. Regional mobility is high among skilled professionals in the Pacific and – in the absence of targeted investments in long-term capacity building of the population – staff turnover in the GoT generally leaves a considerable gap in responding to urgent environmental concerns. To ensure that Tuvalu maintains a consistent level of technical capacity for climate change adaptation, it is imperative that the current capacity-building strategy is complemented by a support system, in particular, to build the long-term capacity in the specific sectors that are of national development priority, such as climate-resilient agricultural systems.

*Barrier 4: Limited opportunity for engaging landowners and tracking EbA interventions within Tuvalu's system of traditionally undefined land tenure*<sup>[13]</sup>.

33. Tuvalu's land tenure system is based on a common arrangement of sons or daughters<sup>[14]</sup> inheriting land, which is then subdivided between the landowners themselves, creating a growth pattern of continuously subdivided land parcels over time. Within this context, disputes over land boundaries and multiple ownership claims for the same land are prevalent because of inadequate land registration processes. In addition to constituting a barrier to land leasing and the exchange of land between Indigenous Tuvaluans – which limits economic growth and investments in commercial agriculture and infrastructure – this systemic challenge complicates stakeholder engagement and reporting arrangements, impeding the broad-scale implementation of EbA, climate-resilient agriculture and SLM within Tuvalu's current land tenure context.

#### *Baseline scenario*

34. The proposed project will collaborate with and build on several recent and ongoing projects implemented by partner stakeholders that address similar development challenges as this project. This collaboration will broaden the impact of project interventions, avoid duplication of efforts and enable sharing lessons learned throughout implementation. The details of these projects and their alignment with the proposed project – including the objectives, outcomes and budgets of the baseline projects – are provided below.

Implementing a 'Ridge to Reef' approach to protect biodiversity and ecosystem functions in Tuvalu (R2R Tuvalu)<sup>[15],[16]</sup> (2015–2021); US\$19,4 million<sup>[17]</sup>; GEF

35. The objective of the R2R Tuvalu project was to preserve ecosystem services, sustain livelihoods and improve resilience in Tuvalu using a 'ridge-to-reef' approach' as part of the Pacific R2R programme on 'Pacific Islands Ridge-to-Reef National Priorities – Integrated Water, Land, Forest and Coastal Management to Preserve Ecosystem Services, Store Carbon, Improve Climate Resilience and Sustain Livelihoods'. To achieve this, the project comprised four components, each providing extensive potential for the proposed project to build on. These components include: i) enhancing and strengthening conservation and protected areas – Component 1; ii) rehabilitating degraded coastal and inland forests and landscapes and supporting the delivery of integrated water resource management (IWRM) and integrated coastal management (ICM) at a national scale while piloting approaches on three islands – Component 2; iii) enhancing governance and institutional capacities at the national, island and community levels for enhanced inland and coastal natural resource management – Component 3; and iv) improving data and information systems that would enable improve evidence-based planning, decision-making and management of natural resources in Tuvalu – Component 4.

Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT, 2017–2022)<sup>[18],[19]</sup>; US\$18,5 million; GEF

36. FASNETT is aimed at facilitating the development and use of feasible renewable energy resources and application of energy-efficient technologies to enable the GoT to achieve its updated National Determined Contribution (NDC) target of reducing GHG emissions from the electricity generation sector by 100% by 2025<sup>[20]</sup>. This will be achieved by implementing the four project components: i) awareness raising on renewable energy and energy-efficient applications; ii)

energy policy improvement and institutional capacity building; iii)) applications of renewable energy and energy-efficient technologies and techniques; and iv) financing of renewable energy and energy-efficient initiatives. Although the proposed project will not benefit directly from FASNETT, the transition from fossil fuels to renewable energy resources will support the sustainability of the proposed interventions, as well as Tuvalu's environmental, social and economic context.

#### Progress made and lessons learned on previous adaptation projects

37. The Government of New Zealand (GoNZ) has an ongoing development cooperation with the GoT, aimed at, *inter alia*, growing Tuvalu's sovereign wealth, ensuring Tuvalu's infrastructure and services are climate resilient and well managed, and ensuring Tuvalu's population is more skilled and qualified to secure increased employment and economic opportunities. For the 2019–2021 period, the GoNZ's efforts have focussed on: i) improving access to safe and climate-resilient public utilities and services; ii) improving Tuvalu's fisheries management capacity; iii) increasing the robustness and effectiveness of Tuvalu's financial management systems; and iv) improving vocational pathways and qualification standards to lead to increased employment opportunities[21]. Initiatives that have been implemented by the GoNZ in Tuvalu include, *inter alia*, the remediation of borrow pits to improve the living standards of Tuvaluans and reduce the risk of water-borne diseases[22][23].

38. From 2014–2019, the GEF-funded project entitled 'Effective and responsive island-level governance to secure and diversify climate resilient marine-based coastal livelihoods and enhance climate hazard response capacity' – also referred to as NAPA-2 – aimed to increase the resilience of Tuvalu's outer island communities to future climate change-induced risks, such as declining marine resource productivity and increasing and/or intensifying climate hazards[24]. The Terminal Evaluation (TE) report of NAPA-2 identified several lessons learned during the implementation of the project, including that an appropriate assessment of the needs and priorities of targeted beneficiaries will facilitate the successful implementation of interventions. A needs assessment will provide an adequate response to national priorities and lead to realistic solutions well adapted to the local context, while also ensuring ownership of these interventions by the beneficiaries, consequently promoting the sustainability of the interventions and benefits. To ensure this ownership includes women, the NAPA 2 TE indicated that appropriate gender mainstreaming can be ensured by identifying gender-based expected results, indicators and targets throughout the project development.

39. The project entitled 'Increasing Resilience of Coastal Areas and Community Settlements to Climate Change in Tuvalu' – completed in 2013 – aimed to strengthen the GoT's institutional capacity to identify and address climate change-driven events that systematically increase the vulnerability of island communities[25]. The project contributed towards enhancing the capacity of local community members, including women, to adapt to dynamic climate-related impacts and risks, in addition to protecting their livelihoods. This included, *inter alia*, installing and repairing water tanks, supporting home gardens by providing capacity building and farming inputs, as well as coastal protection measures[26].

40. Tuvalu's NAPA-1 project 'Increasing Resilience of Coastal Areas and Community Settlements to Climate Change in Tuvalu', was the first national project to address priorities identified in Tuvalu's National Adaptation Programme of Action (NAPA). The project contributed toward: i) enhancing capacity of public administration to plan and respond to climate change risks, notably by developing national policies supportive of climate change (Outcome 1); and ii) strengthening the capacities of local communities to adapt to climate change through practical community-based adaptation measures, specifically for agriculture and water security (Outcome 2). An additional grant was provided by AusAID to build on existing project mechanisms and enable efficient replication and upscaling of practical adaptation measures at the community level (NAPA-1+). The TE report of NAPA-1 and NAPA-1+ indicates that



establishing linkages to existing national development priorities and other initiatives with adequate country ownership could have substantially enhanced the sustainability of the project. Moreover, the NAPAs identified that the assistance from women's groups combined with targeted trainings contributed to ensuring that women benefit proportionately from interventions aimed at enhancing communities' adaptive capacity.

41. Finally, the 'Building Capacity and Mainstreaming Sustainable Land Management (SLM) in Tuvalu' was a GEF-funded project implemented from 2008–2012. The objective of the project was to: i) enhance and develop the individual, institutional, and systemic capacity for Sustainable Land Management (SLM); ii) mainstream SLM considerations into national development strategies and policies; iii) improve the quality of project design and implementation in the development arena; and iv) develop a National Action Plan for SLM, as well as a medium-term investment plan, while ensuring that all relevant stakeholder views are reflected and integrated into the process. The recommendations generated in the project's TE report emphasised incorporating principles of Strategic Environmental Assessment (SEA) and Integrated Coastal Zone Management (ICZM), together with SLM principles, into land-use planning and decision-making in Tuvalu to ensure sustainable land use and avoid continued land degradation.

#### *Proposed alternative scenario*

42. Without urgent interventions to adapt Tuvalu's agricultural sector to climate change — by promoting climate-resilient agricultural management and soil remediation practices[27] — and increase freshwater recharge, the production of pulaka in the country will continue to decline, directly impacting Tuvaluans' food security and cultural heritage. The preferred solution to overcome the impacts of climate change-induced sea level rise (SLR), coastal storms and rainfall variability on Tuvalu's food production systems requires an integrated management approach. Under the proposed project, this solution will involve implementing appropriate land management and ecosystem restoration strategies that maintain freshwater lenses by maximising rainwater capture and retention while reducing the rate of saltwater intrusion, ultimately enhancing the resilience of agricultural production in vulnerable areas. Moreover, by enhancing the resilience of rural livelihoods, the project will contribute to critical adaptation areas for Tuvalu by reducing rural to urban migration and the associated decreased resilience of the country's capital city. The innovative EbA project interventions will positively impact ~4,200 direct beneficiaries and ~7500 indirect beneficiaries in the project's target sites, namely: i) Nanumea; ii) Nanumaga; iii) Niutao; iv) Vaitupu; v) Nukufetau; vi) Nukulaelae; and vii) Funafuti, by conserving and protecting freshwater resources against climate change-induced saltwater intrusion, which, in turn, will secure climate-resilient community livelihoods. The number of direct beneficiaries, hectares of land under sustainable management and number of stakeholders receiving capacity development under the project is presented in Table 2.

43. Several criteria determined the selection of pulaka as a primary crop for adaptation under the proposed project. First, baseline tolerance to saline conditions is required, as these conditions are projected to continue to impact freshwater resources and agricultural soils as a result of SLR. Second, with the increasing frequency and intensity of cyclones under climate change, crop resistance to wind is required. Third, the crop must be adaptable to the increasing temperatures and drought conditions in Tuvalu. Finally, the crop must grow well in the atoll soils, which — as discussed under Section 1a — are highly porous, poorly developed and naturally deficient in the nutrients required for successful plant growth.

44. Examples of the limited crops capable of growing in inhospitable atoll environments include coconuts, breadfruit, pulaka, taro, kumala[28] and cassava. Of these, coconuts, along with seafood, have traditionally been Tuvalu's most important food source. Coconuts thrive in a tropical climate and — as a result of having evolved in cyclone-prone environments — can withstand extreme winds. In addition, coconuts can tolerate short periods of saltwater inundation, intensive rainfall and drought. However, the increasing proportion of senile coconut palms in Tuvalu — older than 80 years — is a considerable challenge in the country, particularly as trees become less flexible with age, which increases their susceptibility to being uprooted or breaking when subjected to cyclones. An estimated 65%-70% of coconut trees in Tuvalu are senile and no longer bear fruit[29]. In addition, nut production is considerably delayed during periods of prolonged drought, which are projected to increase under climate change.

45. The traditional diet of marine foods and coconuts in Tuvalu is supplemented by local root crops, such as pulaka, which are mostly in the outer islands[30]. An essential part of Tuvalu's cultural and culinary tradition, ~80% of Tuvaluan households grow this nutrient-dense crop. Although pulaka is intolerant to the sandy, porous atoll soils, damp pulaka pits – dug and maintained by individual families over generations[31] – provide appropriate conditions for its successful cultivation. The crop has few pest problems and is resistant to strong winds, even when fully grown. Pulaka grows well in wet conditions and does not tolerate drought well. However, the tuber can be preserved in the ground to last for up to three years, enabling a degree of food security during periods of low agricultural productivity.

46. Other than coconut and pulaka, the remaining crops grown on Tuvalu are either completely intolerant or have a low adaptive capacity to one or more of the increasing climate impacts discussed above[32]. For example, while kumala is relatively drought-tolerant, the crop is highly susceptible to storm surges. Breadfruit is tolerant to poor soils but cannot sustain salt spray. Taro, which is grown on the edge of pulaka pits, is intolerant to saltwater and strong winds, and, while cassava can withstand drought, it is susceptible to waterlogging and high winds.

47. These benefits to cultivating pulaka are further supported by the inherent cultural value of the crop and the associated traditional knowledge regarding its cultivation, as well as the extensive network of already established pulaka pits around the country. In addition, pulaka offers immediate livelihood resilience as the corm typically takes a year to grow, in contrast to coconut palms which can take between three and eight years before bearing fruit. The sustainable production and storage of pulaka will contribute to diversifying local food production in Tuvalu, increasing the availability of nutritious food sources in the country and enhancing overall food security. Moreover, improving the resilience of pulaka pits will support the groves of coconut trees and several layers of crops inter-planted between them. Focusing on pulaka, specifically, will complement coconut-targeted projects in the area – such as the project entitled, 'Coconut-based integrated farming to enhance food security and build resilience to climate change in Tuvalu'[33] – while streamlining efforts to maximise the production and climate-resilience of pulaka.

48. Under Component 1, the preferred solution involves restoring 10 ha of degraded pulaka pits – by, *inter alia*, relocating existing and degraded pulaka pits – while adopting innovative ecosystem-based adaptation (EbA) approaches to land management and agricultural practices in 13 ha of pulaka pits and 180 ha of coastal ecosystems surrounding them. Some examples of on-the-ground EbA interventions to consider for the project include: i) establishing a protected area and associated management plan for the 180 ha of coastal ecosystems surrounding the pulaka pits; and ii) replanting and restoring coastal vegetation, such as mangroves, to limit saltwater intrusion and flooding resulting from storm surges. These interventions will help slow down the speed of rainwater surface flow to promote infiltration by providing ecological buffers and support the agricultural development under the project. A detailed assessment of EbA interventions will be conducted during the PPG phase of the project.

49. The project will upscale the successes of the abovementioned pilot initiatives in Tuvalu (such as the NAPA-I and NAPA-I+ Projects[34]) by taking into account the recommendations and lessons learned from these initiatives' terminal evaluations to effectively mitigate risks to project implementation. For example, these pilot initiatives have successfully implemented raised beds and soil remediation in pulaka pits in Nanumaga, Nui, Niutao, Nanumea and Nukulaelae. Such initiatives will be replicated by the project in the islands of Funafuti, Vaitupu, Nukufetau, while the reach of the existing pilot interventions on the original islands of Nanumaga, Nui, Niutao, Nanumea, and Nukulaelae will be expanded. In total, 449 raised pulaka pit beds will be constructed through the project – 275 in the three new islands and 174 in the original five islands, respectively. Based on the land-use zoning plan proposed under Component 2, existing pulaka pits will also be considered for relocation to higher-leveled ground to reduce their exposure to flooding during coastal storms and cyclones. Specifically, where space allows, the pits will be relocated to areas above the projected minimum average wave height of 1.5 m. These physical interventions will be supported by the introduction of salt-tolerant varieties in the pulaka pits. Although attempts through the NAPA to introduce salt-tolerant varieties were deemed unsustainable, the threat of future climate impacts on wave height and water salinity necessitates the need to further salt-tolerant alternative. The

project will, therefore, further explore options for the introduction of salt-tolerant varieties of pulaka as part of the long term adaptation strategy. Under Component 2, an enabling environment will be created by project-facilitated policy modifications – co-developed with relevant authorities and community leaders in target islands – that align with the GoT’s broader sustainability indicators to streamline development and funding for adaptation priorities.

### **Component 1: Identifying and implementing integrated land management and ecosystem restoration strategies for increased resilience.**

50. Component 1 of the proposed project will include on-the-ground investments to support the preferred solution as outlined above. This component is aimed at ensuring the resilience of agricultural systems in pulaka pits on eight islands to withstand climate change impacts, specifically increasing saltwater intrusion, by utilising innovative land management and agricultural practices (Outcome 1.1). Complementary on-the-ground interventions will include locally appropriate land restoration strategies for previously functional pulaka pits that were degraded by the impacts of Cyclone Pam (Output 1.1.1), which will be supported by the development of a land-use zoning plan under Output 2.2.2. Considering that the minimum average wave height experienced in Tuvalu is 1.5 m, the proposed project will also include the relocation of pulaka pits which lie below this height further inland to higher-leveled ground to reduce the potential risk of flooding with sea water. Additionally, proven climate-resilient technologies and practices – such as raised concrete beds and impermeable geomembranes to minimise the intensifying saltwater intrusion – will be implemented in and around existing pulaka pit areas (Output 1.1.2). These EbA interventions will slow down the surface flow of rainfall and floodwater, resulting in improved infiltration and the protection of agricultural production from climate change-induced extreme rainfall events and its impacts. Although attempts through the NAPA to introduce salt tolerant varieties were deemed unsustainable, the threat of future climate impacts on wave height and water salinity necessitates the need to further salt-tolerant alternative. The project will, therefore, support the physical interventions to the pulaka pits themselves by further exploring options for the introduction of salt-tolerant varieties of pulaka as part of the long term adaptation strategy.

51. To improve water supply to pulaka pit areas, alternative irrigation strategies – such as drip irrigation from roof catchments and tanks/micro-dams – will be installed (Output 1.1.3). The drip irrigation will be supplementary to – and not serve as a replacement for – existing irrigation methods such as groundwater and rainfed irrigation. This will ensure there is an adequate supply for water for the pulaka pits during dry periods that will extend in the future as a result of increased rainfall variability. For example, the average rainfall in Nuie is ~3,100 mm, occurring between December and March each year. As a result, the National Building Code has projected that this amount will allow 80 days of water storage during the dry period<sup>[35]</sup>. The next phase of the project will determine the exact number of rainwater harvesting tanks available and calculate how much rainwater can be stored. Under the proposed project, rural houses with rainwater harvesting roof structures will be provided – where they are not readily available – ensuring that these structures are resilient to climate change impacts such as storms. Simultaneously, diversified cropping strategies will be introduced to pulaka pit areas (Output 1.1.4) to promote climate-resilient crops<sup>[36]</sup> that are able to withstand atoll conditions, specifically under current climate change, and enhance soil quality. These strategies will include raising plants around pulaka pits to generate organic material for remediation. With Tuvalu being highly-dependent on food importation to ensure food security, the global impacts of Covid-19 – such as the restrictions on movement and trade – highlighted the country’s vulnerability to external health and economic shocks. Therefore, there is an urgent need to support and promote climate-resilient food production and enable food self-sufficiency in the country<sup>[37]</sup>. Resultantly, the cumulative impact of the project’s interventions under this component – particularly promoting climate-resilient practices and crop species under Outputs 1.1.2 and 1.1.4 – will contribute to Tuvalu’s green recovery efforts by strengthening food security and reducing Tuvalu’s reliance on imported goods and food supplies. Improving food security in the country will increase the population’s resilience to extreme climate events, as well as external economic and health shocks.

52. The project will simultaneously implement climate change adaptation-oriented sustainable land management (SLM) interventions – such as the restoration and conservation of degraded atoll ecosystems – to strengthen groundwater infiltration and flood-risk reduction services under Outcome 1.2. Accordingly, coastal ecosystems will be restored (Output 1.2.1) to enhance the provision of associated ecosystem services, including flood reduction and

storm surge attenuation which will increase the resilience to extreme climate events. These restoration activities will be carried out according to proven best practices recommended from current and previous initiatives such as the abovementioned TCAP and 'Increasing Resilience of Coastal Areas and Community Settlements to Climate Change in Tuvalu' projects. Additionally, groundwater recharge zones in and around pulaka pit areas will be protected using EbA buffer zones to improve soil quality and freshwater infiltration potential (Output 1.2.2) in response to increasing saltwater intrusion. Finally, diversified livelihoods strategies will be introduced for ~800 beneficiaries of local communities reliant on natural resource-based livelihoods to reduce pressure on and thereby conserve coastal ecosystems and their services (Output 1.2.3). This will involve establishing locally sustainable fisheries for rural communities in the country. A fisheries conservation and management approach that has been adopted in several Pacific island countries is the locally managed marine area (LMMA) approach. This approach relies on traditional authority to establish and manage marine conservation and fishing sites. Through traditional authority, no-take or "Tabu" sites are established over multiple years while other areas remain either open or under certain restrictions. The spillover from the "Tabu" sites therefore provides benefit as food source for local communities. Tuvalu is well placed to do this since – through the Falekaupule Act – traditional island councils are recognized and have delegated governance authority for their island communities. The project will facilitate establishment of LMMAs on each island along with capacity building for management and monitoring of the sites so they are able to gauge the effectiveness of the approach. As a basis for this activity, there is an already established Pacific LMMA network that the project could engage with to assist through South-south sharing of experiences, lessons learnt and best practices. Additional livelihoods that can stem from these activities include secondary processing, value-adding and selling smoked/dried fish at local markets. These extra livelihood activities will grant rural communities a buffer to climate change impacts on subsistence crop cultivation.

53. Component 1 will address Barrier 1 by increasing awareness and local knowledge of CCA in Tuvalu's agricultural sector. Accordingly, the resilience of pulaka production in the country will be increased by providing rural stakeholders with the knowledge, tools and technologies for adapting their livelihood activities to climate change.

**Component 2: Creating an enabling environment for implementing EbA through improving national policy and planning frameworks, strengthening institutional capacity, raising awareness and addressing barriers to CCA.**

54. Under Component 2, the proposed project aims to mainstream EbA principles and practices into national and local GoT planning and management to address the barriers (Section 1a) to implementing CCA in Tuvalu. To create the enabling environment for this EbA mainstreaming, the project will recommend revisions to relevant policies and strengthen the necessary institutional capacity (Outcome 2.1) to ensure long-term resilience in Tuvalu.

55. EbA-related national policies and procedures will be revised to align with the GoT's broader sustainability indicators and to streamline funding for adaptation priorities. These revisions will enable the upscaling of EbA, generation of CCA-related knowledge and CCA-related capacity building through the project (Output 2.1.1). Policy adjustments will be done in collaboration with national and local community leadership to ensure they align with the GoT's sustainability indicators. In addition, government officials – in particular technical officers, community representatives and coastal adaptation management professionals – will be trained on the integration of EbA, climate-resilient agriculture and SLM principles into policies and planning at both national and community levels (Output 2.1.2).

56. Under project Outcome 2.2, strategic action plans for streamlining EbA into national policy and planning frameworks will be developed and implemented. To date, there have been few attempts to streamline EbA and climate change-related SLM approaches in national policies owing to limited technical expertise and the absence of a coordinating body for SLM. Following the closeout of NAPA-I: 'Increasing resilience of coastal areas and community settlements to climate change in Tuvalu', it was recommended to improve linkages between existing national development priorities and other initiatives under the project. In accordance, this outcome will create the enabling environment to ensure the streamlining of EbA and SLM approaches into national policies, specifically the: i) Te Kete (Tuvalu National Sustainable Strategy); ii) Vakafenua (Climate Change Policy); and iii) the Climate Change Resilience Act 2019, managed through the

Ministry of Finance. Additionally, the project will review a section plan by the Public Works Department that was developed for pulaka pit protection as part of a previous project, in order to identify potential integration of the proposed project’s objectives at the sub-national level. The strategic action plans for streamlining EbA into national policy will include: i) a Guidance Note for compliance monitoring and enforcement of EbA policy recommendations (Output 2.1.1); and ii) a land-use zoning plan developed to enable EbA, climate-resilient agriculture and SLM under existing land tenure systems (Output 2.2.2). The land-use zoning plan will include an updated land ownership database within the Department of Lands to indicate land ownership boundaries to facilitate stakeholder engagement and reporting arrangements in the context of Tuvalu’s current land tenure system. The plan will also be used to inform and explore the availability of land for the relocation of degraded pulaka pits, as well as for the establishment of new ones under Output 1.1.1.

57. The uptake of EbA and climate-resilient agricultural practices will be enhanced through multi-level stakeholder decision-making programmes, knowledge management and awareness raising towards CCA (Outcome 2.3). Building on this output, gender-responsive best practice guidelines will be developed and disseminated to facilitate replication and upscaling of EbA and climate-resilient agricultural and land management practices across Tuvalu and other SIDS (Output 2.3.1). A complementary knowledge management and communication strategy for integrating EbA best practices and lessons learned into planning and policy (Output 2.3.2) will also be developed to ensure the sustainability of project interventions beyond the project lifespan. This strategy will be shaped by the knowledge and capacity needs identified by previous initiatives, specifically the NAPA-I and NAPA-I+ projects. Finally, continuous training and knowledge generation programmes for public sector officials will be developed (Output 2.3.3) based on the results of the direct capacity building of technical officers in Output 2.1.2. In particular, these training programmes will encompass a ‘training of trainers’ methodology to ensure the replication and upscaling of interventions across other island states. To complement the national-level capacity building activities in Component 2, community training groups will be established around pilot sites under Output 1.1.5 to upscale awareness and best practices of adaptation strategies among local-level stakeholders – particularly farmers and communities engaged in pulaka pit agriculture. This will provide community representatives with the appropriate tools, knowledge and methodologies for local adaptation. The project will seek to synergise its training objectives with existing networks, including the island councils, gender-based groups, youth groups, and religious groups.

58. Component 2 will address Barrier 2 by reinforcing an enabling environment for the mainstreaming of EbA and SLM within Tuvalu’s national policies – given that this mainstreaming has been limited to date – particularly with regards to implementing CCA in the country. Coordination between national agencies on CCA will be strengthened through inclusive and collaborative stakeholder engagement at all levels of governance. Additionally, Barrier 3 will be addressed by targeted technical capacity building of core staff at government and community levels, while long-term capacity for CCA management in Tuvalu will be facilitated by continuous training and knowledge generation beyond the project’s lifespan. This process will partly involve the establishment of training groups at the community level, which will contribute to addressing Barrier 1. Finally, Barrier 4 will be addressed through the clarification of agricultural land ownership boundaries – based on the outcomes of targeted stakeholder engagements – which will enable more streamlined investment into and management of climate-resilient agriculture and SLM in Tuvalu’s rural context.

**Table 2.** Numbers of direct beneficiaries, hectares of land under sustainable management and number of stakeholders receiving capacity development under the project.

Output	Direct beneficiaries	Area of land under sustainable management	Stakeholders receiving capacity development
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1.1.1. Rehabilitation of <b>3</b> historically degraded pulaka pit areas carried out.	~4,200 people (50% men; 50% women) <sup>[1]</sup>	10 ha	
1.1.2. Proven climate-resilient technologies and practices – such as raised concrete beds and impermeable geomembranes to minimise saltwater intrusion – implemented in <b>~32</b> pulaka pit areas.	~4,200 people (50% men; 50% women)	13 ha	
1.1.3. Alternative irrigation strategies – such as drip irrigation from roof catchments and tanks/micro-dams – installed to improve water supply to <b>~32</b> pulaka pit areas.	~4,200 people (50% men; 50% women)		
1.1.4. Diversified cropping strategies introduced to <b>~32</b> pulaka pit areas to promote the use of climate-resilient crops that are able to withstand atoll conditions under current climate change and simultaneously enhance soil quality. These strategies will include raising plants around pulaka pits to generate organic material for remediation.	~4,200 people (50% men; 50% women)	13 ha	
1.1.5. <b>8</b> community training groups established around pilot sites to upscale awareness and best practices of adaptation strategies among stakeholders, particularly for farmers and communities engaged with the pulaka pit agriculture.	~4,200 people (50% men; 50% women)		~4,200 (50% men; 50% women)

1.2.1. <b>180 ha</b> of coastal ecosystems restored to enhance the provision of associated ecosystem services, including flood reduction and storm surge attenuation.		180 ha	
1.2.2. Groundwater recharge zones in and around ~32 pulaka pit areas protected using EbA buffer zones to improve soil quality and freshwater infiltration potential.		180 ha	
1.2.3. Diversified livelihoods strategies introduced for <b>800</b> people in local communities reliant on natural resource-based livelihoods to reduce pressure on and thereby conserve coastal ecosystems and their services.	~800 people (50% men; 50% women)		
2.1.2. Training conducted for 100 government officials, with a focus on technical officers and community representatives, on the integration of EbA, climate-resilient agriculture and SLM principles into policies and planning at both national and community levels.			100 (50% men; 50% women)

[1] The sex-disaggregated targets are based on the ratio of men to women as provided by Tuvalu's 2017 Census data, which is housed under the national Central Statistics Division.

59. The proposed project is aligned with three LDCF Focal Areas, namely: i) CCA-1 – Reduce vulnerability and increased resilience through innovation and technology transfer for climate change adaptation; and ii) CCA-2 – Mainstream climate change adaptation and resilience for systemic impact. Details of how the project aligns with these focal areas are provided below.

Focal Area CCA-1: Reduce vulnerability and increased resilience through innovation and technology transfer for climate change adaptation

60. Under Component 1, the project will directly reduce the climate vulnerability of Tuvalu’s rural population by focussing on improving the resilience of pulaka pits to the impacts of climate change and in particular the increasing salt-water intrusion. Specifically, resilience will be increased by implementing innovative and proven climate-resilient technologies and practices, that are aimed at i) salt-water seepage prevention; ii) moisture retention; iii) alternative irrigation strategies; and iv) diversified cropping practices. The resilience of these agricultural systems will be complemented by increased ecosystem services provision in surrounding areas as a result of targeted ecosystem restoration.

Focal Area CCA-2: Mainstream climate change adaptation and resilience for systemic impact

61. Under Component 2, the project will facilitate climate change adaptation at the systemic level in Tuvalu by mainstreaming EbA and climate-focussed SLM into national development planning and policies related to water resources, agriculture and land management. These mainstreaming activities will strengthen climate change adaptation at the national level by streamlining funding for adaptation priorities and facilitate coordination between government agencies. Additionally, the capacity of government staff and local communities will be strengthened to identify climate risks and engage in adaptation measures through focussed training programmes on integrating EbA, climate-resilient agriculture and SLM principles into policies and planning. These capacity-building activities – in tandem with awareness-raising and improved knowledge management measures – will facilitate the upscaling of conservation, restoration and sustainable land and water resource management, ultimately strengthening enabling conditions for effective climate change adaptation within Tuvalu.

*Incremental/additional cost reasoning and expected contributions from the baseline*

62. Several recent and ongoing initiatives within Tuvalu have been designed to address baseline developmental challenges, climate hazards and barriers. These initiatives, however, do not adequately account for the additional impact presented by future climate change conditions, limiting their long-term effectiveness. Despite this limitation, these initiatives represent a baseline to which the proposed project will provide additional finance to address climate change and promote adaptation. Table 3 below provides a summary of the baseline scenario the proposed project will build on, as well as the project outcomes that will provide climate change additionality.

**Table 3.** Additional cost reasoning for the three components of the proposed project.

<b>Component and additional cost</b>	<b>Baseline</b>	<b>Alternative scenario</b>
<b>Component 1:</b> Identifying and implementing integrated land management and ecosystem restoration strategies for increased resilience	The salinisation of the Tuvalu’s freshwater lenses from increasing sea level rise (SLR) has considerably impacted freshwater supply, livelihoods, as well as agricultural productivity – specifically pulaka production which is understood to be intolerant of saline groundwater conditions. To protect pulaka production from saltwater intrusion, ongoing efforts have successfully been piloted to raise the beds of pulaka pits. However, agricultural productivity is further com	Under this component, GEF resources will increase the resilience of agricultural systems in pulaka pits on eight islands against the impacts of climate change and the resultant increasing saltwater intrusion through innovative land management – including the relocation of previously degraded pulaka pits – and agricultural practices such as soil remediation and diversified cropping strategies. This will promote the use of climate-resilient crops that can withstand atoll conditions



	<p>promised by the structure of atoll soils found in Tuvalu, which are already highly prone to nutrient deficiency, rapid drainage, low moisture retention capacity and minimal cation-exchange capacity. Consequently, these soils are generally unsuited to intensive agriculture, with many general soil remediation techniques and best practices from other regions difficult to implement in this context.</p>	<p>and simultaneously enhance soil quality. Additionally, groundwater infiltration and flood-risk reduction services will be improved on the eight islands by climate change adaptation-focussed sustainable land management (SLM) practices, restoration and conservation activities – such as mangrove planting and replanting of coastal vegetation – as well as diversified livelihood strategies for vulnerable farmers and community members in the form of sustainable fisheries as managed through the LMMA methodology.</p>
<p><b>Component 2:</b> Creating an enabling environment for implementing EbA through improving national policy and planning frameworks, strengthening institutional capacity, raising awareness and addressing barriers to CCA</p>	<p>Currently, the strategic importance of ecosystem-based adaptation (EbA) and SLM has not been integrated into the country's national policies and regulations because of the limited robust enabling environment for mainstreaming these activities. In addition, technical expertise is insufficient, a coordinating body for SLM is absent and there is a mismatch between budget estimations and information in existing CCA plans, strategies and activities. This has been exacerbated by insufficient appropriate tools, knowledge and methodologies both at the national, technical and grassroots levels which consequently limit climate change adaptation (CCA) actions being initiated at the local level. However, the Australian government has funded a multi-country programme entitled 'Climate and Ocean Support Program in the Pacific (COSPPac)' which aims to develop useful products and services to governments and communities,</p>	<p>GEF resources will be targeted to facilitate the institutional uptake of EbA interventions which are enhanced through policy revisions and capacity-building initiatives among core government officers and communities. Capacity building activities under the project will be strengthened through a 'training of trainers' approach. Moreover, the uptake of EbA and climate-resilient agricultural practices will be promoted and enhanced through multi-level stakeholder decision-making programmes and CCA-related knowledge management and awareness raising. Resources will also be directed towards developing and implementing strategic action plans for streamlining EbA into national policy and planning frameworks which has not been undertaken in previous adaptation projects in Tuvalu to date, as well as through review of relevant sub-national plans. The mainstreaming of EbA in national policy is expected to enhance the enabling environment to facilitate</p>

	building resilience to the impact of climate change, climate variability and disasters.	upscaling of the proposed project interventions.
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*Adaptation benefits*

Climate change impacts such as prolonged dry seasons and extreme rainfall events in combination with limited irrigation infrastructure have decreased the productivity of Tuvalu’s small-scale rainfed agriculture. Simultaneously, climate change-induced sea level rise (SLR) has resulted in the salinisation of freshwater sources in Tuvalu – and is projected to be exacerbated under future climate conditions – which affects the access and quality of water required for household and agricultural use. In particular, saltwater intrusion into pulaka pits has adversely impacted the agricultural sector by reducing the production of pulaka, which is a saline-tolerant crop, and will continue to do so under future climate change scenarios. SLR, combined with sand mining, accelerates the process of saltwater intrusion by grading agricultural land and reducing ecological buffers around agricultural areas. This process also contributes to coastal erosion which further reduces the country’s limited freshwater availability and exacerbates the overall reduction of agricultural productivity in Tuvalu. Given the cultural importance of pulaka, the salinisation of freshwater resources not only threatens Tuvalu’s food security but its cultural heritage as well. Finally, the climate change-induced degradation of traditional pulaka production systems in the outer islands are driving rural populations to migrate to Funafuti, decreasing the climate resilience of the capital city.

Long-term adaptation to climate change is underpinned by functional ecosystems that deliver valuable ecosystem services to moderate the impacts of climate change and support diversified climate-resilient livelihoods and enterprises. Restoring and conserving ecosystems strengthen these services to improve coastal protection and natural resource availability for local communities. Accordingly, the project aims to address the abovementioned challenges by restoring ecosystem functionality through integrated land management and the sustainable use of biodiversity, which will work synergistically with agricultural-focussed interventions to reduce the vulnerability of Tuvalu’s food production systems. Moreover, this approach will reduce ecological degradation while maintaining local knowledge and culture/traditions. The proposed project will deliver adaptation benefits aligned with two LDCF focal areas (Section 1a.), positively impacting ~4,200 direct beneficiaries (3,400 people directly involved in agriculture, and ~800 people in rural areas receiving livelihood support) and ~7,500 indirect beneficiaries in the project’s target sites. Because of Tuvalu’s small size, direct beneficiaries comprise ~37% of the country’s population (the proportion of rural households engaged in pulaka production), while indirect beneficiaries comprise the remainder of the population[1]. Benefits will reach the rural population through a suite of EbA interventions to support the agricultural adaptation focus of the project, as well as locally appropriate livelihood diversification options (such as fisheries) and strengthened training programmes and knowledge sharing. Both direct and indirect beneficiaries will benefit from the increased resilience of rural livelihoods as households engaged in crop production are closely linked in Tuvalu’s rural areas by traditional bartering arrangements. A co-benefit of the project will also be the reduced rural to urban migration of the population because outer island communities will become more favourable, reducing adaptation pressure in Funafuti. Moreover, indirect beneficiaries will be expanded through upscaling conservation, restoration and sustainable land and water resource management and knowledge as a result of continuous training and awareness raising at both community and national levels under Component 2.

Based on the best practices and lessons learned on sustainable land use and management from similar past and ongoing projects – such as the ‘Building Capacity and Mainstreaming Sustainable Land Management (SLM) in Tuvalu’ project – the proposed project will use an integrated management approach that implements appropriate land management and ecosystem restoration strategies. These strategies will use ecosystem-based adaptation (EbA) interventions to secure ecosystem services and community resilience in the target areas. Project activities will specifically enhance water security in vulnerable communities by: i) ensuring water availability during dry months; and ii) increasing the water retention and flood attenuation properties of local ecosystems. Moreover, installing climate-resilient

irrigation systems will enable communities to harvest water from rainfall events, securing water provision despite saltwater intrusion into water lenses. Contributing to these activities, groundwater protection and restoration through EbA interventions will promote water conservation and groundwater recharge, resulting in flood reduction, increased groundwater recharge and improved surface water quality – particularly during extreme climate events. Combined, these interventions will promote diversified and sustainable livelihoods (agro- and non-agro-based) and reduce soil erosion and consequent saltwater intrusion in the outer island areas of Tuvalu, securing freshwater resources for domestic and agricultural use with the co-benefit of reduced rural-urban migration.

66. Complementing the project's ecosystem restoration interventions, strengthened policies and capacities will support the necessary enabling environment for long-term CCA in Tuvalu. Information sharing will improve access to locally appropriate scientific information and raise awareness of climate change impacts and adaptation among communities, farmers and public sector officials, ensuring the sustainability of interventions in Tuvalu beyond the proposed project's lifespan. Moreover, as co-benefits of the project, coastal communities, the private sector and local governments, as well as ecosystems in other islands will benefit from the increased institutional capacity of the GoT to implement similar adaptation interventions.

#### *Innovation, sustainability and potential for scaling up*

##### **Innovation**

67. The proposed project will undertake an ecosystem-based adaptation (EbA) approach to improve land management and agricultural practices in and around Tuvalu's pulaka pits. Although interventions to raise pulaka pits for protection against saltwater intrusion have previously been implemented in Tuvalu, the proposed project will particularly utilise an integrated approach to raising these pits to simultaneously improve ecosystem health and build their climate resilience. This solution will involve implementing innovative, locally appropriate and climate change adaptation-oriented sustainable land management (SLM) and ecosystem restoration strategies that maintain freshwater lenses by maximising the water capture and retention while reducing the rate of saltwater infiltration. This will ultimately enhance the resilience of agricultural production in the eight vulnerable islands (Outcomes 1.1 and 1.2).

68. To achieve these solutions, on-the-ground interventions will include locally appropriate land restoration strategies (Output 1.1.1) and proven climate-resilient technologies and practices – such as raised concrete beds and impermeable geomembranes to minimise saltwater intrusion from ground water – implemented in and around pulaka pit areas (Output 1.1.2). These EbA interventions are based on best practices and lessons learned from past and ongoing projects in Tuvalu that have successfully piloted raising beds and remediating soil. The project will make use of environmentally neutral geotextile to ensure the ecological sustainability of this intervention<sup>[2],[3]</sup>. In the case of this project, impermeable sheeting will be used. The interventions will be accompanied by adopting appropriate diversified cropping strategies under Output 1.1.4 – such as raising plants around pulaka pits – to promote the use of climate-resilient crops that can withstand atoll conditions and simultaneously enhance soil quality. The selected cropping methods will contribute to slowing down surface flow of rainfall and floodwater, which is projected to intensify under future climate change impacts, resulting in improved infiltration and the protection of agricultural production from extreme rainfall events and its impacts. Additional project interventions to slow water flow include: i) concrete raised beds; ii) raised baskets of soil; iii) shading; iv) agroforestry; and v) mulching. The project will also utilise innovative irrigation strategies – such as installing drip irrigation from roof catchments and tanks/micro-dams (Output 1.1.3) – to improve access to clean water for household and agricultural use.

##### **Sustainability**

69. The institutional, economic and social sustainability of the proposed interventions (detailed below) and their impacts beyond the project lifespan will be ensured by the project's integrated approach. Specifically, under Component 2 of the project, an enabling environment will be created by project-facilitated policy modifications – co-developed with relevant authorities and community leaders in target islands – that align with the Government of Tuvalu's (GoT)

broader sustainability indicators, as well as the necessary capacity building to ensure long-term climate change adaptation (CCA) in Tuvalu. In this way, the project's sustainability will be promoted by continued stakeholder engagement throughout the project lifespan.

#### *Institutional sustainability*

70. To promote the sustainability of institutional capacity in Tuvalu to adapt to climate change, 30 government officials – primarily technical officers and community representatives – will be trained on integrating EbA, climate-resilient agriculture and sustainable land management (SLM) principles into national- and community-level policies and planning. This intervention will be accompanied by a Guidance Note for monitoring compliance with and enforcing the EbA policy recommendations prepared under Output 2.1.1. As a result of these policy revisions and institutional capacity building, EbA principles and practices will be mainstreamed into Tuvalu's development planning and management. Moreover, continuous training and knowledge generation programmes for public sector officials will be developed (Output 2.3.3) based on the results of the direct capacity building of technical officers in Output 2.1.2.

#### *Economic sustainability*

71. The economic sustainability of project interventions will be achieved by introducing diversified livelihoods strategies (under Output 1.2.3) to local communities dependent on natural resource-based livelihoods. This will be strengthened by the EbA, climate-resilient agricultural and SLM practices implemented under Outcome 1.2 to reduce pressure on and conserve coastal ecosystems and their services. The proposed project will also develop a land-use zoning plan to promote these sustainability practices under existing Tuvaluan land tenure systems.

#### *Social sustainability*

72. The project will enable the social sustainability of the proposed interventions by supporting inclusivity, specifically by implementing EbA, climate-resilient agricultural and SLM practices that are gender-responsive. These practices will include locally appropriate soil fertility remediation strategies implemented in and around pulaka pit areas. In addition, the social sustainability of project interventions will rely on establishing community training groups around pilot sites (Output 1.1.5) to upscale awareness and best practices of adaptation strategies among stakeholders in Tuvalu, particularly for farmers and communities engaged in pulaka pit agriculture. These training groups will provide community representatives with the appropriate tools, knowledge and methodologies for sustained local adaptation. A complementary knowledge management and communication strategy for integrating EbA best practices and lessons learned into planning and policy (Output 2.3.2) will also be developed to ensure the sustainability of project interventions beyond the project lifespan, in addition to enabling the replication and upscaling of the project in other SIDS (detailed under Scalability below). Finally, a comprehensive stakeholder engagement strategy will be developed during the PPG phase to ensure extensive consultation with targeted community members to raise awareness on proposed land-zoning plans and enable the identification of potential social conflicts as a result of the land-zoning process.

#### **Scalability**

73. At a local level, community training groups will be established around pilot sites to upscale awareness and best practices of adaptation strategies among all relevant stakeholders in Tuvalu, particularly farmers and communities engaged in pulaka pit agriculture (Output 1.1.5). This will provide community representatives with the appropriate tools, knowledge and methodologies for continued local adaptation. Building on this output, gender-responsive best practice guidelines will be developed and disseminated to facilitate replication and upscaling of EbA across Tuvalu and the Pacific region as a whole, along with climate-resilient agricultural and land management practices (Output 2.3.1). These interventions will be complemented by the abovementioned knowledge management and communication strategy promoting the integration of EbA best practices and lessons learned into planning and policy (Output 2.3.2), ensuring the sustainability of project interventions beyond the project lifespan. Notably, policy revisions will enable the upscaling of EbA and CCA-related

knowledge generation and capacity building through the project (Output 2.1.1) to other SIDS with similar development and climate change challenges. Based on the capacity building of technical officers (Output 2.1.2), continuous training and knowledge generation programmes for public sector officials will be developed (Output 2.3.3) to further ensure the replication and upscaling of interventions across other island nations. The continuous training and knowledge generation under Component 2 will increase upscaling by disseminating lessons learned to both direct and indirect beneficiaries, with indirect beneficiaries receiving additional adaptation benefits through the reduction of intra-island migration in Tuvalu, ultimately enhancing the resilience of communities beyond those directly targeted by the project.

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- [1] Central Statistics Division of the Government of Tuvalu. 2017. Tuvalu Agriculture and Fisheries Report. Available at: [https://spccfpstore1.blob.core.windows.net/digitallibrary-docs/files/62/6222aa68d1c4d739a85cb156f1c7e265.pdf?sv=2015-12-11&sr=b&sig=aPv%2B9denEu3SL%2BSQU9THboVcmE%2Fi6u66UCiwuCH0k0%3D&se=2022-07-27T08%3A39%3A01Z&sp=r&rsc=public%2C%20max-age%3D864000%2C%20max-stale%3D86400&rsct=application%2Fpdf&rscd=inline%3B%20filename%3D%22Tuvalu\\_agriculture\\_and\\_fisheries\\_report.pdf%22](https://spccfpstore1.blob.core.windows.net/digitallibrary-docs/files/62/6222aa68d1c4d739a85cb156f1c7e265.pdf?sv=2015-12-11&sr=b&sig=aPv%2B9denEu3SL%2BSQU9THboVcmE%2Fi6u66UCiwuCH0k0%3D&se=2022-07-27T08%3A39%3A01Z&sp=r&rsc=public%2C%20max-age%3D864000%2C%20max-stale%3D86400&rsct=application%2Fpdf&rscd=inline%3B%20filename%3D%22Tuvalu_agriculture_and_fisheries_report.pdf%22)
- [2] <https://www.sciencedirect.com/topics/materials-science/geotextiles>
- [3] Modern agricultural geotextiles are made from polymers which are chemically and biologically neutral, remaining stable between pH levels 1–14 and up to 150°C while having a life expectancy of more than 200 years when buried. In consultations with GoT and regional experts, it was noted that no EbA measure would sufficiently impede salinisation of the pulaka pits as compared to impermeable geomembranes. This conclusion was reached after Tuvalu had trialled various techniques to address soil salinisation.
- [4] SOPAC. 2007. Tuvalu Technical Report Assessment of salinity of groundwater in swamp taro (*Cyrtosperma Chamissonis*) “pulaka” pits in Tuvalu. [https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite\\_download2.php?id=9675](https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite_download2.php?id=9675)
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- [1] Government of Tuvalu. 2016. Tuvalu National Biodiversity Strategy and Action Plan: Fifth National report to the Convention on Biological Diversity. Available at: <https://www.cbd.int/doc/world/tv/tv-nr-05-en.pdf>.
- [2] Government of Tuvalu. 2015. Second National Communication of Tuvalu. Available at: [https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452\\_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf](https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf).
- [3] Milan, A., Oakes, R., and Campbell, J. (2016). Tuvalu: Climate change and migration – Relationships between household vulnerability, human mobility and climate change. Report No.18. Bonn: United Nations University Institute for Environment and Human Security.
- [4] Department of Environment. 2007. Tuvalu’s National Adaptation Programme of Action. Available at: <https://unfccc.int/resource/docs/napa/tuv01.pdf>.
- [5] The Falekaupule on each of the Islands of Tuvalu is the traditional assembly of elders. According to the Falekaupule Act (1997), the powers and functions of the Falekaupule are shared with the Kaupule on each island, which is the executive arm of the Falekaupule, comprising elected members. The Kaupule has an elected president as well as an appointed treasurer and is managed by a committee appointed by the Kaupule.

- [6] This is based on the Christian belief as captured in the Bible that God made a covenant with Noah that another flood would not occur. Source: Rubow, C. and Bird, C., 2016. Eco-theological responses to climate change in Oceania. *Worldviews: Global Religions, Culture, and Ecology*, 20(2), pp.150-168.
- [7] Department of Environment. 2007. Tuvalu's National Adaptation Programme of Action. Available at: <https://unfccc.int/resource/docs/napa/tuv01.pdf>.
- [8] GEF. 2012. Capacity Building for Sustainable Land Management in Tuvalu: Terminal evaluation report. Available at: [https://publicpartnershipdata.azureedge.net/gef/PMISGEFDocuments/MandE/TE/FY2016/UNDP/G003504/3407\\_Final%20Terminal%20Evaluation%20SLM%20Tuvalu%20Report%2011%20July%202012.pdf](https://publicpartnershipdata.azureedge.net/gef/PMISGEFDocuments/MandE/TE/FY2016/UNDP/G003504/3407_Final%20Terminal%20Evaluation%20SLM%20Tuvalu%20Report%2011%20July%202012.pdf)
- [9] Global Climate Change Alliance: Pacific Small Island States. 2013. Review of mainstreaming of climate change into national plans and policies: Tuvalu. Available at: [https://www.cakex.org/sites/default/files/documents/mainstreaming\\_profile\\_final-tuvalu.pdf](https://www.cakex.org/sites/default/files/documents/mainstreaming_profile_final-tuvalu.pdf).
- [10] <https://www.adb.org/sites/default/files/linked-documents/cobp-tuv-2017-2019-ld-02.pdf>
- [11] UNDP. 2016. Terminal Evaluation of the Tuvalu National Adaptation Programme of Action (NAPA) NAPA-I and NAPA-I+ Projects. Available at: <https://www.adaptation-undp.org/projects/ldcf-tuvalu>.
- [12] Tuvalu Coastal Adaptation Project, 2020.
- [13] Government of Tuvalu. 2015. Second National Communication of Tuvalu. Available at: [https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452\\_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf](https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf).
- [14] Daughters are only able to inherit if there are no sons, the daughter is the only child or the only surviving child – as mentioned in the country overview section.
- [15] UNDP. Projects: TV Ridge to Reef. Available at: <https://open.undp.org/projects/00086015>
- [16] [https://info.undp.org/docs/pdc/Documents/TUV/5220\\_Final%20Prodoc\\_Tuvalu%20R2R\\_.pdf](https://info.undp.org/docs/pdc/Documents/TUV/5220_Final%20Prodoc_Tuvalu%20R2R_.pdf)
- [17] US\$3,762,844 (GEF resources)
- [18] <https://open.undp.org/projects/00097730>
- [19] <https://info.undp.org/docs/pdc/Documents/TUV/PIMS%205613%20TUV%20FASNETT%20Project%20Document%20Final.pdf>
- [20] <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Tuvalu%20First/TUVALU%20INDC.pdf>
- [21] Government of New Zealand: Ministry of Foreign Affairs and Trade. Tuvalu: Development cooperation. Available at: <https://www.mfat.govt.nz/assets/Aid-Prog-docs/IATI-PDFs/PACPF/Tuvalu.pdf>
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[25] UNDP. Increasing Resilience of Coastal Areas and Community Settlements to Climate Change in Tuvalu. Available at: <https://www.adaptation-undp.org/projects/lDCF-tuvalu>

[26] UNDP. Increasing Resilience of Coastal Areas and Community Settlements to Climate Change in Tuvalu. Available at: [https://www.adaptation-undp.org/sites/default/files/downloads/tuvalu\\_napa\\_final.pdf](https://www.adaptation-undp.org/sites/default/files/downloads/tuvalu_napa_final.pdf)

[27] These practices will include: i) concrete raised beds; ii) raised baskets of soil; iii) shading; iv) intercropping; v) mulching; and vi) composting.

[28] Sweet potato.

[29] Coconut-based integrated farming to enhance food security and build resilience to climate change in Tuvalu. Available at: <http://ccprojects.gsd.spc.int/wp-content/uploads/2016/06/TU6-Project-Concept-Note-final.pdf>

[30] Food security in the atoll countries of the South Pacific – with particular reference to Tuvalu: A Report prepared for IFAD to assist in the preparation of funding proposal to the Global Agriculture and Food Security Program. Available at: [https://www.gafspfund.org/sites/default/files/inline-files/Note%202.%20Multi-country\\_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf](https://www.gafspfund.org/sites/default/files/inline-files/Note%202.%20Multi-country_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf)

[31] Webb, A. 2007. Tuvalu Technical report: Assessment of salinity of groundwater in swamp taro (*Cyrtosperma Chamissonis*) "Pulaka" Pits in Tuvalu. Available at: [https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite\\_download2.php?id=9675](https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite_download2.php?id=9675).

[32] Food security in the atoll countries of the South Pacific – with particular reference to Tuvalu: A Report prepared for IFAD to assist in the preparation of funding proposal to the Global Agriculture and Food Security Program. Available at: [https://www.gafspfund.org/sites/default/files/inline-files/Note%202.%20Multi-country\\_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf](https://www.gafspfund.org/sites/default/files/inline-files/Note%202.%20Multi-country_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf)

[33] Coconut-based integrated farming to enhance food security and build resilience to climate change in Tuvalu. Available at: <http://ccprojects.gsd.spc.int/wp-content/uploads/2016/06/TU6-Project-Concept-Note-final.pdf>

[34] GEF. 2016. Terminal Evaluation of the Tuvalu National Adaptation Programme of Action (NAPA) NAPA-I and NAPA-I+ Projects. Available at: <https://erc.undp.org/evaluation/documents/download/10280>

[35] Public Seal of Nuie. 2014. Nuie National Building Code.

[36] The main crop will be pulaka (*Cyrtosperma merkusii*), also known as swamp taro. Supplementary climate-adapted crops will include: i) sweet potatoes (*Ipomoea batatas*); ii) taro (*Colocasia esculanta*); iii) banana (*Musa paradisiaca*); iv) sugarcane (*Saccharum officinarum*); as well as v) broad leaf vegetables.

[37] International Labour Organization (ILO). Powering past the pandemic: Bolstering Tuvalu's socioeconomic resilience in a Covid-19 world. Available at: <https://publications.iom.int/books/powering-past-pandemic-bolstering-tuvalus-socioeconomic-resilience-covid-19-world>

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[1] Intense tropical cyclones are more frequent during El Niño years with ~12 cyclones per decade occurring during this period. Tropical cyclones are associated with strong winds, storm surges and swells which result in considerable flooding. The impacts of tropical cyclones increase the vulnerability of Tuvaluans as they result in considerable loss of and damage to housing, livelihoods and infrastructure. Future climate change predictions indicate reduced frequency, but increased intensity of tropical cyclones in the Tuvalu region.

[2] Taupo, T. 2017. At the very edge of a storm: The impact of a distant cyclone on Atoll Islands. *Economic of Disasters and Climate Change*.

[3] Information and images provided by the Government of Tuvalu.

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[1] World Bank Group. 2021. Climate Risk Country Profile: Tuvalu. Available at: [https://climateknowledgeportal.worldbank.org/sites/default/files/2021-06/15824-WB\\_Tuvalu%20Country%20Profile-WEB.pdf](https://climateknowledgeportal.worldbank.org/sites/default/files/2021-06/15824-WB_Tuvalu%20Country%20Profile-WEB.pdf).

[2] USAID. 2018. Climate Risk Profile Pacific Islands. Available at: [https://www.climatelinks.org/sites/default/files/asset/document/2018-26-Feb\\_CadmusCISF\\_Climate-Risk-Profile-Pacific-Islands.pdf](https://www.climatelinks.org/sites/default/files/asset/document/2018-26-Feb_CadmusCISF_Climate-Risk-Profile-Pacific-Islands.pdf).

[3] World Bank Group. 2021. Climate Risk Country Profile: Tuvalu. Available at: [https://climateknowledgeportal.worldbank.org/sites/default/files/2021-06/15824-WB\\_Tuvalu%20Country%20Profile-WEB.pdf](https://climateknowledgeportal.worldbank.org/sites/default/files/2021-06/15824-WB_Tuvalu%20Country%20Profile-WEB.pdf).

[4] Government of Tuvalu. 2015. Second National Communication of Tuvalu. Available at: [https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452\\_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf](https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf).

[5] Tuvalu PACC Country Brief. 2015. Available at: [https://www.adaptation-undp.org/sites/default/files/downloads/pacc\\_cb\\_tuv.pdf](https://www.adaptation-undp.org/sites/default/files/downloads/pacc_cb_tuv.pdf).

[6] GoT. 2007. Tuvalu NAPA. <https://unfccc.int/resource/docs/napa/tuv01.pdf>

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[1] A Westminster system comprises a sovereign, parliament, government, Prime Minister or Premier, ministry and independent judiciary: <https://sef.psc.nsw.gov.au/nsw-government-context/the-westminster-system>

[2] Cabinet position could await new Tuvalu MP. 2015. Available at: <https://www.rnz.co.nz/international/pacific-news/270875/cabinet-position-could-await-new-tuvalu-mp>.

Tuvalu Oceania: UN Women. 2021. Available at: <https://data.unwomen.org/country/tuvalu>

[4] According to the Falekaupule Act, the Falekaupule means "traditional assembly in each island ... composed in accordance with the Aganu of each island", with Aganu meaning traditional customs and culture. The Kaupule is the implementing and advisory branch of the Falekaupule.

[5] Australian Government. 2019. Pacific Women Shaping Pacific development: Tuvalu country summary. Available at: <https://www.dfat.gov.au/sites/default/files/pwspd-tuvalu-summary.pdf>.

[6] The World Bank. 2021. World Development Indicators. Available at: <https://datatopics.worldbank.org/world-development-indicators/>.

[7] Tuvalu population. 2022. Available at: <https://countrymeters.info/en/Tuvalu>

[8] Taupo, T et al. 2018. Household vulnerability on the frontline of climate change: the Pacific atoll nation of Tuvalu. Environmental Economic Policy Studies.

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- [10] A dot tv license is the Internet country code top-level domain (ccTLD) for Tuvalu. Except for reserved names like com.tv, net.tv, org.tv and others, any person may register second-level domains in TV. The domain name is popular, because it is an abbreviation of the word television, and therefore economically valuable.
- [11] Central Statistics Division of the Government of Tuvalu. 2021. Tuvalu agriculture and fisheries report. Available at: [https://www.spc.int/DigitalLibrary/Doc/SDD/Agriculture\\_Survey/Tuvalu\\_agriculture\\_and\\_fisheries\\_report.pdf](https://www.spc.int/DigitalLibrary/Doc/SDD/Agriculture_Survey/Tuvalu_agriculture_and_fisheries_report.pdf).
- [12] Pulaka, or giant swamp taro (*Cyrtosperma merkusii*), is a gigantic rubber plant, that can grow up to four meters high. It grows in pits that are dug deep into the coral down to the freshwater lens.
- [13] Government of Tuvalu. 2016. Tuvalu National Biodiversity Strategy and Action Plan: Fifth National report to the Convention on Biological Diversity. Available at: <https://www.cbd.int/doc/world/tv/tv-nr-05-en.pdf>.
- [14] Webb, A. 2007. Tuvalu Technical report: Assessment of salinity of groundwater in swamp taro (*Cyrtosperma Chamissonis*) "Pulaka" Pits in Tuvalu. Available at: [https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite\\_download2.php?id=9675](https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite_download2.php?id=9675).
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- [16] Thompson, Sue. 1982. *Cyrtosperma chamissonis* (araceae): Ecology, distribution and economic importance in the South Pacific. Available at: [https://www.persee.fr/doc/jatba\\_0183-5173\\_1982\\_num\\_29\\_2\\_3868#:~:text=Cyrtosperma%20chamissonis%20is%20cultivated%20primarily,foods%20such%20as%20coconut%20cream](https://www.persee.fr/doc/jatba_0183-5173_1982_num_29_2_3868#:~:text=Cyrtosperma%20chamissonis%20is%20cultivated%20primarily,foods%20such%20as%20coconut%20cream).
- [17] Pulaka: A staple food of the people of Tuvalu. Available at: <https://ichcourier.unesco-ichcap.org/>
- [18] Food security in the atoll countries of the South Pacific – with particular reference to Tuvalu. Available at: [https://www.gafspfund.org/sites/default/files/inline-files/Note%202.%20Multi-country\\_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf](https://www.gafspfund.org/sites/default/files/inline-files/Note%202.%20Multi-country_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf)
- [19] Ibid.
- [20] Ibid.
- [21] McCubbin, S.G., Pearce, T., Ford, J.D., Smit, B. Social-ecological change and implications for food security in Fanufuti, Tuvalu. 2017. Available at: <https://www.jstor.org/stable/pdf/26270106.pdf>
- [22] Food security in the atoll countries of the South Pacific – with particular reference to Tuvalu. Available at: [https://www.gafspfund.org/sites/default/files/inline-files/Note%202.%20Multi-country\\_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf](https://www.gafspfund.org/sites/default/files/inline-files/Note%202.%20Multi-country_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf)
- [23] Pacific Islanders have some of the highest rates of diabetes and obesity in the world, with the prevalence of both diseases having risen disproportionately fast in this region over the past three decades.
- [24] Food security in the atoll countries of the South Pacific – with particular reference to Tuvalu. Available at: [https://www.gafspfund.org/sites/default/files/inline-files/Note%202.%20Multi-country\\_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf](https://www.gafspfund.org/sites/default/files/inline-files/Note%202.%20Multi-country_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf)

[25] McCubbin, S.G., Pearce, T., Ford, J.D., Smit, B. Social-ecological change and implications for food security in Fanufuti, Tuvalu. 2017. Available at: <https://www.jstor.org/stable/pdf/26270106.pdf>

[26] Current and Future Climate Change of Tuvalu. 2015. Pacific -Australia Climate Change Science and climate change adaptation planning programme. Available at: [www.pacificclimatechangescience.org](http://www.pacificclimatechangescience.org)

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[1] Broadleaf provides several ecosystem services such as serving as food, sealing steam into earth ovens for cooking, and as organic manure.

[2] Ruderal vegetation, often comprising weeds, is vegetation that is able to grow in severely disturbed habitats such as human dwellings.

[3] Government of Tuvalu. 2015. Second National Communication of Tuvalu. Available at: [https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452\\_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf](https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf).

[4] Government of Tuvalu. 2016. Tuvalu National Biodiversity Strategy and Action Plan: Fifth National report to the Convention on Biological Diversity. Available at: <https://www.cbd.int/doc/world/tv/tv-nr-05-en.pdf>.

[5] The El Niño Southern Oscillation (ENSO) refers to the warming of the ocean surface, or above-average sea surface temperatures in the central and eastern tropical Pacific Ocean. Rainfall increases over the tropical Pacific Ocean. The low-level surface winds, which normally blow from east to west along the equator instead weaken or, in some cases, start blowing from the other direction i.e., from west to east.

[6] Government of Tuvalu. 2015. Second National Communication of Tuvalu. Available at: [https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452\\_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf](https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf).

[7] Current and Future Climate Change of Tuvalu. 2015. Pacific -Australia Climate Change Science and climate change adaptation planning programme. Available at: [www.pacificclimatechangescience.org](http://www.pacificclimatechangescience.org)

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[1] The transition zone refers to the area in the groundwater lens that separates freshwater and salt water from the seawater as depicted in Figure 2.

[2] Government of Tuvalu. 2016. Tuvalu National Biodiversity Strategy and Action Plan: Fifth National report to the Convention on Biological Diversity. Available at: <https://www.cbd.int/doc/world/tv/tv-nr-05-en.pdf>.

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[1] Atolls are ring-shaped reefs, islands, or a chain of islands formed of coral.

[2] Topographically, the Tuvalu islands seldom rise more than four meters above sea level.

[3] Government of Tuvalu. 2016. Tuvalu National Biodiversity Strategy and Action Plan: Fifth National report to the Convention on Biological Diversity. Available at: <https://www.cbd.int/doc/world/tv/tv-nr-05-en.pdf>. *Physical context, background, problems and root causes*

[Country overview](#)

## Background and physical context

1. Tuvalu is a small island developing state (SIDS) located in the central Pacific Ocean, comprising nine atolls<sup>[1]</sup> across a total land area of 26 km<sup>2</sup> (Figure 1 below). Six islands – namely Nanumea, Nui, Nukufetau, Funafuti, Nukulaelae and Vaitupu – are low-lying<sup>[2]</sup> atolls consisting of *motu* (islets) fringing the edges of lagoons, that predominantly comprise young, poorly developed, infertile, sandy or gravel coralline soils. The remaining three islands – Nanumaga, Niutao and Niulakita – are raised limestone reef islands composed of poorly formed soil. These qualities result from the predominantly carbonate reef-borne material of the soils that lack structure and texture, ultimately leading to their considerably low water-holding capacity<sup>[3]</sup>.

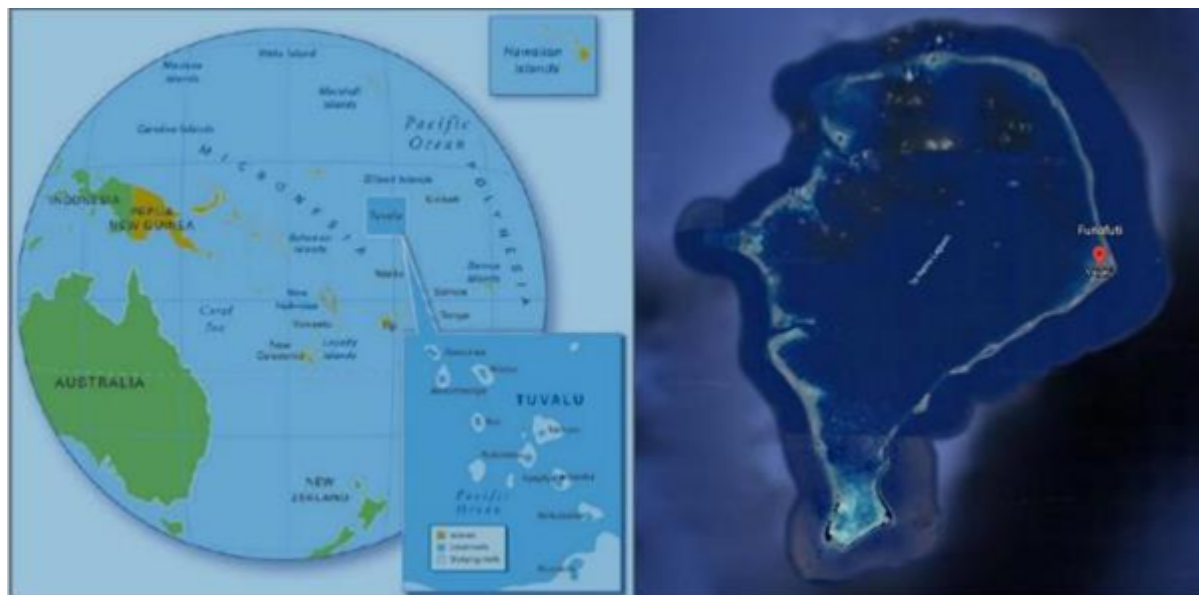


Figure 1. Map indicating Tuvalu's location in the Pacific Ocean<sup>[4]</sup>. Funafuti atoll, with a total land area of 2.4 km, is presented on the right<sup>[5]</sup>.

2. In addition to having poor quality soil, Tuvalu has no surface freshwater resources such as rivers or lakes. Freshwater in the country is only available in the form of groundwater lenses that float hydrostatically on top of higher density saltwater, separated by a layer of brackish water located in a transition zone<sup>[6],[7]</sup> (Figure 2). Communities primarily use shallow wells to access water from these lenses. Although groundwater lenses are recharged by rainfall, maintaining the hydrostatic equilibrium, the transition zone shifts and freshwater availability decreases without sufficient recharge. In addition to recharging the freshwater lens, rainwater is also harvested directly by communities for household use.

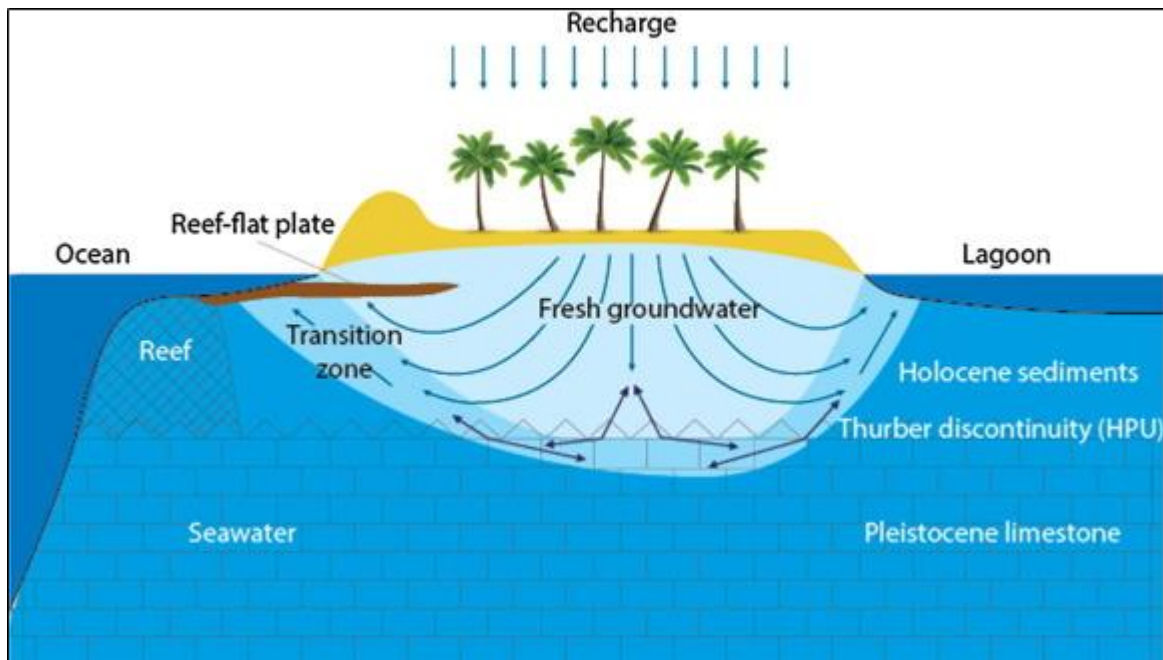


Figure 2. A depiction of freshwater lenses on atoll islands<sup>[8]</sup>.

3. Despite Tuvalu's small size, the islands are characterised by several vegetation types. These include: i) inland broadleaf<sup>[9]</sup> forest and woodland; ii) coastal littoral forest and scrub; iii) mangroves and wetlands; iv) coconut woodland and agroforest; v) excavated taro pits; and vi) ruderal vegetation<sup>[10]</sup>. Ecosystems of swamp taro – known locally as pulaka pits – prefer wet soil conditions, such as natural depressions where the plant can easily access the groundwater lens.

4. Tuvalu's tropical climate is characterised by a wet season from November to April and a dry season from May to October. Rainfall is spatially varied, with mean annual rainfall in the southern islands of ~3,400 mm and a considerably lower ~2,900 mm in the northern islands. Temperatures are generally uniform, ranging from 25°C to 30°C throughout the year<sup>[11]</sup>. Although Tuvalu often experiences droughts as a result of its location near the Pacific equatorial dry zone, dry periods are more severe in the northern than southern islands – notably between August and October annually. Droughts during the dry season can last for extended periods (up to three months), particularly in the northernmost islands<sup>[12]</sup>. Tuvalu's dry years are associated with a positive Southern Oscillation Index – the La Niña or cold phase of the El Niño Southern Oscillation<sup>[13]</sup> (ENSO) – and are causing increased drought events that contribute to the depletion of the country's freshwater resources. In addition to droughts, Tuvalu is particularly vulnerable to extreme winds, storm surges and swells generated by tropical cyclones that occur annually between November to April. The most recent severe tropical cyclone – Tropical Cyclone Pam – devastated Tuvalu's islands in March 2015, damaging houses, infrastructure, food gardens, graves and coastlines. The cyclone also caused several islets in Tuvalu's capital Funafuti to disappear while displacing nearly half of the country's population (~3,300 people)<sup>[14]</sup>.

## Governance

5. Tuvalu is a democratic country governed under a Westminster system<sup>[15]</sup> comprising 15 elected members. Only three women have been elected to the government since Tuvalu's independence in 1978, including Dr Puakena Boreham, who was elected to represent Nui in the 2015 general election<sup>[16]</sup>. As of 2021, ~6% of seats in parliament are held by women<sup>[17]</sup>, highlighting a considerably skewed gender representation at the parliamentary level. At the individual island level, a contemporary form of traditional governance is employed through the *Falekaupule* and *Kaupule* systems<sup>[18]</sup>. Similarly, Tuvalu's land tenure system is customary, with land being passed down equally through patrilineal and matrilineal lines. However, only men can inherit land in Tuvalu, with land being passed to a daughter only on the condition that there are no sons or if the daughter is the only child or the only surviving child<sup>[19]</sup>.

## Socioeconomic context

6. Tuvalu's population was recorded at ~11,700 people<sup>[20]</sup> in 2020, growing at an annual rate of ~1.7% and comprising ~50.2% females and 49.8% males<sup>[21]</sup>. The country's population is densest in Funafuti – accounting for more than half of the country's total population – as result of high migration rates from the country's outer islands to the capital, driven by job opportunities and improved access to healthcare and education<sup>[22]</sup>. Most of the population are subsistence farmers that participate in livestock production, including pigs, free-range chickens and ducks at the household level. Where men engage in cash cropping<sup>[23]</sup>, Tuvaluan women are traditionally responsible for the family's food security and production, often growing crops in homestead gardens, rearing small livestock, producing handicrafts. Women further contribute towards the family's livelihood by engaging in other value-added activities, such as copra making, fish drying, weaving, coconut oil production, preparation of traditional medicines, planting materials and seeds.

7. Given its remoteness from local and global markets, Tuvalu's economic base is limited, with trade primarily occurring with Fiji, Australia, New Zealand and Japan. In addition, the country is a dual economy comprising a small cash and subsistence economy centred around traditional fishing and small-scale agricultural sectors. As a result, the country largely relies on foreign aid, revenue from issuing fishing licenses to foreign vessels, remittances, postage stamp sales and 'dot TV' domain licenses<sup>[24]</sup>.

8. Outside of subsistence agriculture, employment opportunities in Tuvalu are dominated by the public sector. Women are predominantly employed in the service industry, participating in finance, insurance, public administration, education and social work activities, while men are employed in the manufacturing, construction and defence industries<sup>[25]</sup>. Private sector employment opportunities are limited, with Tuvaluan seafarers primarily working on foreign vessels overseas, particularly in Europe. Given that most jobs in the country are under employment by the government, which provides steady wages or salaries – approximately two-thirds of these jobs comprise formal employment – there is no apparent income disparity among the people of Tuvalu. The Tuvalu Trust Fund (TTF) was established in 1987 by the United Kingdom, Australia and New Zealand to support to the country's economy by helping supplement national deficits, underpin economic development and help the nation achieve greater financial autonomy. The TTF has grown from ~US\$41 million in 1999 to ~US\$107 million in 2015 and now serves as the most important capital resource to finance recurrent government expenditure during fiscal downturns.

9. One of the most predominant forms of subsistence crop agriculture in the country involves the traditional practice of growing pulaka<sup>[26]</sup> – known in English as giant swamp taro – in large pits of composted soil below the level of the water table where plants can directly access the freshwater lens<sup>[27]</sup>. These natural depressions and excavated pits are the most suitable land to circumvent the agronomic limitations presented by Tuvalu's atoll soils (discussed in detail under the Proposed Alternative Scenario Section below) and are often used to grow other crops alongside pulaka. Moreover, pulaka pits are an important aspect of Tuvalu's local cultural heritage as they are dug and maintained by individual families over generations<sup>[28]</sup>.

#### *Pulaka cultivation in Tuvalu*

10. Pulaka (*Cyrtosperma merkusii*) is an important carbohydrate for the inhabitants of Tuvalu, making up the bulk of the islanders' traditional diet. As an atoll country, Tuvalu does not have the same soil composition and food crop varieties as volcanic countries like Fiji and Tonga. The soils on Tuvalu are predominantly derived from carbonate reef-borne material, making them highly porous and poorly developed, with little structure and texture. In addition, atoll soils are naturally deficient in the nutrients required for successful crop growth<sup>[29]</sup>. To circumvent these agronomic limitations, initial settlers burrowed pits below the groundwater level and fertilised them using dark soil and organic matter. This created conditions suitable to sustain pulaka – one of few crops able to withstand brackish water<sup>[30]</sup> and grow well in constantly wet soil conditions. Cultivating pulaka is a 'cultural art' in Tuvalu, with the transmission of this knowledge traditionally passed down from father to son<sup>[31]</sup>. In addition, the traditional method of cultivating pulaka is considered to be among the most sustainable forms of organic farming techniques in the world<sup>[32]</sup>.

11. Pulaka cultivation exists on each of the main islands of Tuvalu, as well as other small islets surrounding lagoons. A 2012 Population Census illustrated that ~80% of rural households in Tuvalu grew pulaka, although the number is thought to have declined considerably in the past decade<sup>[33]</sup>. The crop has few pest problems as a result of the country's isolation and is resistant to strong wind, enabling it to survive cyclones with minimal wind damage<sup>[34]</sup>. Other cultivated local foods include coconuts, banana, pawpaw, cabbage, cucumber, pumpkin, chicken and pigs; most crop production is primarily for subsistence. Tuvaluans traditionally consider local food to be high quality and the most culturally appropriate for consumption<sup>[35]</sup>. The precolonial Tuvaluan diet was based primarily on nearshore marine foods and coconut and was supplemented by local root crops, such as pulaka and taro. However, as a result of challenges to food security and sustained contact with European and American traders since the 19<sup>th</sup> century, agriculture and local food production have declined while dependence on nutrient-poor imported foods has increased considerably. It is estimated that Tuvalu imports ~3,100 tonnes of food, equivalent to ~US\$ 4.2 million annually<sup>[36]</sup>. The increasing imports of starch products, such as rice and flour, have been replacing the role of pulaka as a daily food crop. An extreme case of this shift can be observed on the densely populated island of Funafuti, where 50–80% of pulaka pits have been abandoned because of changing dietary preferences, declining interest in pulaka cultivation and environmental stressors such as periodic droughts and saltwater intrusion.

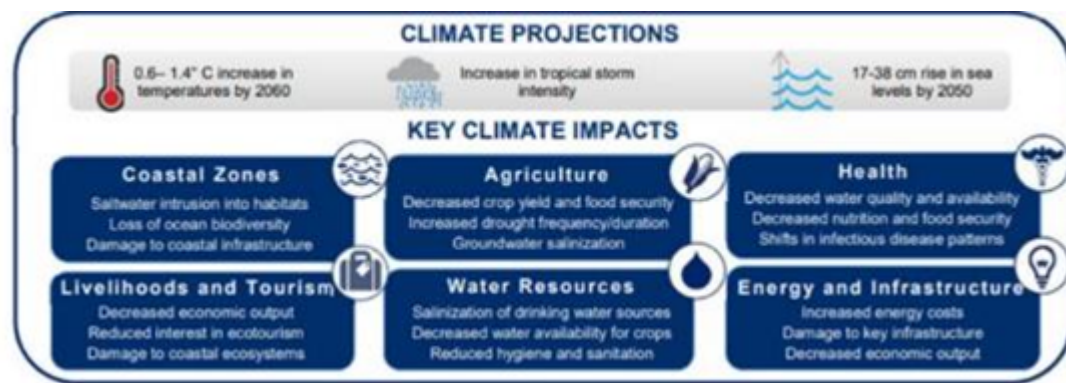
12. The increased dependence on imported foods has negatively impacted the local population of Tuvalu in several ways. For example, the dietary shift has resulted in the expansion of noncommunicable diseases, such as diabetes, obesity, hypertension and cerebrovascular diseases – which have become common among urban populations with increasingly non-traditional diets<sup>[37]</sup>. Moreover, the average consumption of 100 grams per capita per day of fruits and

vegetables in Tuvalu is considerably lower than the 400 grams recommended by the World Health Organisation. Additionally, the dependence on imported food impacts Tuvalu's economy through high import costs as a result of Tuvalu's isolation – approximately US\$ 2,000 and US\$ 5,800 for a dried container from Fiji and New Zealand, respectively[38]. Moreover, climate change is projected to have a larger impact on imported grain products, such as rice and wheat flour, than traditional staples, which could lead to food insecurity in Tuvalu if the country continues to depend on imports. These elevated prices could, however, increase the competitiveness of pulaka, enabling an advantage for domestic food production where the necessary support is provided. This increased demand would be further supported by Tuvaluan's preference for local over imported foods[39].

13. Most imported foods available at stores are processed, nutrient-poor and of low quality, meaning that food-purchasing decisions are often based on availability and affordability rather than quality. Increasing dependence on these foods has resulted in 59.9% of adult (aged 18 years and over) women and 51.5% of adult men living with obesity, which is higher than the regional average of 31.7% and 30.5% for women and men, respectively. By contrast, there are considerable health and nutritional benefits to consuming traditional local foods, which can be grown and cultivated in home gardens at low cost.

*Projected climate change in Tuvalu*

14. General trends of projected temperature and precipitation changes for Tuvalu over the 21<sup>st</sup> century indicate a warmer and wetter climate. The main climate hazards resulting from these changes – many of which are currently affecting communities and ecosystems in Tuvalu – are: i) extreme temperatures; ii) tropical cyclones; and iii) a rise in sea levels. These trends are projected to increase in intensity in the future (as indicated in Figure 3 below).



**Figure 3.** Predominant climate projections and their impacts for Tuvalu, namely an increase in temperature, tropical cyclone intensity and sea level rise

15. Tuvalu's average annual temperatures are projected to increase by ~0.9°C and ~1.3°C under RCP4.5 and ~1.4°C and 2.9°C under RCP8.5 by 2050 and 2090, respectively[41]. These projections suggest an increase in hot days and warm nights and an overall decline in cooler weather. Temperature increases are projected to occur evenly throughout the year, with slight monthly variations. Similarly, the average annual rainfall is projected to increase across Tuvalu, with more extreme wet seasons and an increase in the intensity of extreme events, such as tropical cyclones[42]. Precipitation patterns are also expected to become increasingly challenging to predict because of the inability of climate models to simulate the changes for future ENSO patterns[43]. Given the complex

link between tropical cyclones in Tuvalu with the abovementioned El Niño Southern Oscillation (ENSO), an understanding of the relationship between climate change and tropical cyclones remains inadequate. Despite this limitation, general projections point to reduced tropical cyclone frequency but increased cyclone intensity by 2050<sup>[44]</sup>.

### *The impacts of climate change on agriculture in Tuvalu*

16. As a SIDS, Tuvalu is one of the most vulnerable countries to climate change. In particular, Tuvalu's average elevation of one metre above mean sea level (AMSL) – with the highest point in the country at only five metres AMSL – increases the country's exposure to the impacts of SLR, specifically saltwater intrusion into freshwater lenses, soil and cultivation areas. Additionally, prolonged dry periods and increased frequency and intensity of extreme rainfall events have contributed to poor soil quality, increasing surface water runoff. This challenge is compounded by Tuvalu's small land area, which limits the availability of land for rainwater to infiltrate and replenish the freshwater lens. Additional impacts of climate change affecting the country include coastal erosion, loss of land, increased floods and storm surge inundation<sup>[45]</sup>, all of which promote saltwater intrusion into the country's limited freshwater resources.

17. Tuvaluans are strongly dependent on rainfall as a result of the saltwater intrusion discussed above. Although rainwater harvesting is usually adequate in supplying the country's household needs, a period of two to three weeks of no rainfall can result in severe water shortages – sometimes halving water levels in water tanks – which can adversely affect livelihoods and agricultural activities<sup>[46]</sup>. During these periods, communities and farmers depend on freshwater lenses to supplement their water supply. However, SLR is accelerating the hydrostatic rise of saltwater into these reservoirs, reducing the total volume of freshwater available for drinking and food production. Exacerbating these challenges, the water from freshwater lenses in Tuvalu has become increasingly unsafe for drinking purposes because of: i) contamination resulting from poor wastewater management; and ii) increased levels of groundwater salinity resulting from the abovementioned climate change impacts.

18. Climate change is also adversely impacting agricultural production in Tuvalu. In particular, saltwater intrusion is negatively affecting pulaka cultivation – a critical and culturally important starch crop in Tuvalu previously used as a daily food crop – that relies on freshwater for its growth. Given that pulaka is intolerant of saline soil conditions, groundwater salinisation is expected to result in the total loss of pulaka productivity, with 60% of pulaka pit plantations already severely impacted by this climate change-induced effect<sup>[47]</sup>. Accordingly, the cultivation of pulaka in Tuvalu is predicted to become severely limited, exacerbating food insecurity. In response, pulaka cultivation has increasingly been replaced by imported starch food products – such as white flour and rice – across Tuvalu's islands to secure access to food. Niutao, Nui and Funafuti are among Tuvalu's most vulnerable islands to food insecurity according to the most recent assessment (Table 1).

**Table 1.** Vulnerability of Tuvalu's food security sector according to score and rank in the country's Integrated Vulnerability Assessment (IVA) Report<sup>[48]</sup>. A lower IVA score equates to higher vulnerability.

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Food Security		
Island	IVA	Ranking
Niutao	1.8	1
Nui	1.9	2
Funafuti	1.9	2
Nanumea	2.1	3
Vaitupu	2.1	3
Nukufetau	2.7	4
Niulakita	2.8	5
Nukulaelae	2.9	6
Nanumaga	3.2	7

19. The abovementioned impacts are further compounded by the occurrence of tropical cyclones – a recurring extreme climate event in Tuvalu<sup>[49]</sup> – accompanied by subsequent storm surges. These extreme climate events exacerbate downward saltwater intrusion into freshwater lenses from above ground, further decreasing these critical water sources' suitability for human consumption and agriculture. Tropical cyclones have also directly caused the degradation of pulaka pits by washing them away<sup>[50]</sup>. For example, prior to Tropical Cyclone Pam, three pulaka pits were located south of Nanumaga (Figure 4). However, the pit in close proximity to the ocean was degraded and now forms part of the beach as a result of storm surge associated with the cyclone (Figure 5)<sup>1</sup>

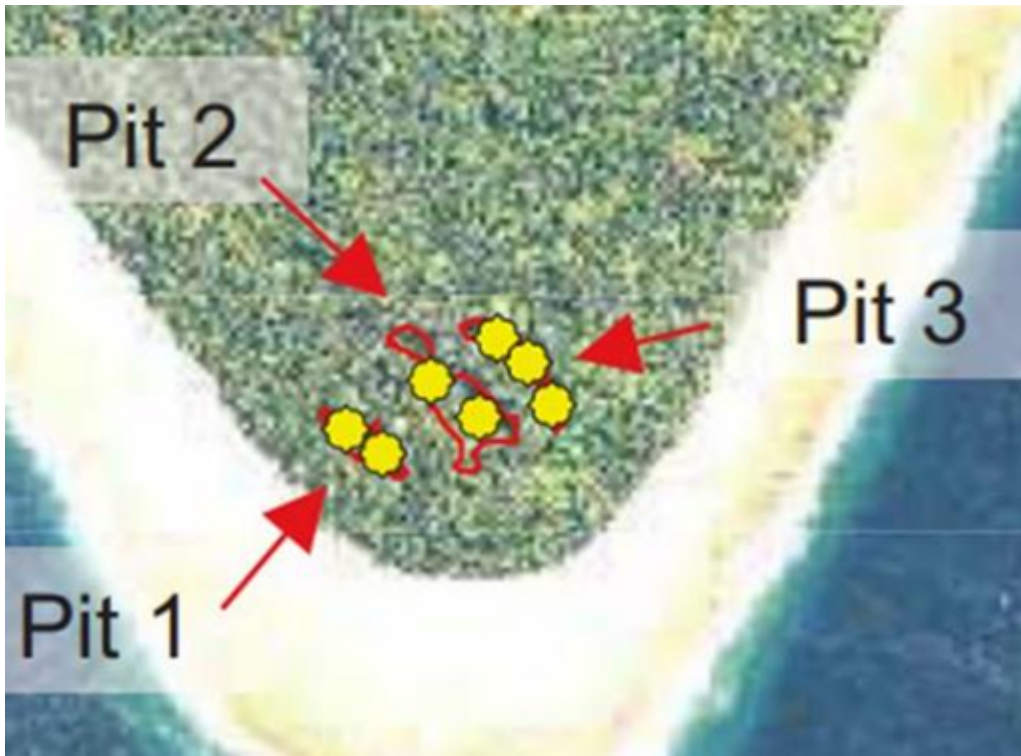


Figure 4. Image showing existing pulaka pits prior to Tropical Cyclone Pam.



**Figure 5.** Image showing existing pulaka pits after Tropical Cyclone Pam. The area marked in black depicts the pulaka pit washed away by the cyclone.

### *The impacts of climate change on the water sector in Tuvalu*

20. With no natural sources of surface water, Tuvalu relies on rainwater as its primary source of freshwater. However, climate variability and the effects of climate change will exacerbate water resource availability, resulting in frequent water shortages. Water scarcity is a common problem in Funafuti – Tuvalu’s capital – not only during the dry season (Jun–Sept) but occasionally during the wet season (Oct–Mar). In addition, the rapid population growth creates competing demands on already-constrained water resources. Sea level rise (SLR) is likely to increase saltwater intrusion into groundwater and soils and increase the risks of damage to water-supply infrastructure from natural hazards, such as tropical cyclones. Generally, water resources are not centralised as rainwater is collected and controlled by private households, which restricts its use. For example, groundwater is only used to feed pigs, wash pig pens and flush toilets in Funafuti, although its use extends to washing clothes and bathing during periods of drought.

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### *Root causes*

21. The quality of Tuvalu's land and soil is adversely impacted by its high vulnerability to extreme weather events as a result of its low-lying topography. These extreme events include storm surges from tropical cyclones, sea sprays and saltwater intrusion, all of which are exacerbated by several baseline factors. Tuvaluans have historically practised biodiversity conservation, but these traditional conservation practices are diminishing as a result of the gradual population growth and the transition away from subsistence to a semi-commercial economy. Consequently, inappropriate and unsustainable land management practices have become widespread, including: i) clearing vegetation using fires; ii) beach sand mining; iii) poor soil conservation management; and iv) monocropping. These practices, in combination with the poor soil quality, have accelerated the deterioration of Tuvalu's already-vulnerable land and soil<sup>[52]</sup>. Moreover, the country's soils are inherently unsuited to intensive agriculture – with many general soil remediation techniques and best practices from other regions challenging to implement in this context – making restoration difficult.

22. As mentioned above, Tuvalu's constrained economy contributes to its developmental challenges<sup>[53]</sup>. These constraints are largely influenced by the country's remoteness from national and international markets, leading to the overexploitation of local land-based and marine resources. The remote nature of Tuvalu is compounded by the distances between the capital atoll of Funafuti and its outer islands. For example, the northernmost island of Nanumea is ~464 km away from Funafuti. Tuvalu does not have an internal air service between atolls, meaning that inter-island transport and travel is solely dependent on government ferries. This outer island remoteness, combined with Tuvalu's small land and population size, constrains opportunities for viable economic activities. For example, fisheries products from outer islands are seldom exported because of the considerable distance to markets. Simultaneously, the limited inflow of outside information and resources hinders access to alternative livelihoods for outer island communities. Together, these factors contribute to Tuvalu's loss of livelihoods and, accordingly, persistent poverty in the country.

23. As a result of the abovementioned socioeconomic factors, Tuvalu is experiencing extensive internal migration of its population from the outer islands into the capital atoll, Funafuti. Men make up the majority of individuals migrating to the capital atoll, while women often remain on the outer islands to tend to household tasks<sup>[54]</sup>. Internal migration is attributable to changes in the lifestyle of Tuvaluans, influenced by shifting employment opportunities, the increasing dependence on imported foods and a decrease in traditional pulaka production in the outer islands because of degradation. These trends have created additional pressure on Tuvalu's water resources, with population needs and household water demand in Funafuti surpassing the available water storage capacity at the household and infrastructural level, which increases the burden on women who will now have the additional task of ensuring there is enough water to tend to household activities. Consequently, there is a need to enhance the food security and resilience of communities on the outer islands to reduce the need for migration towards the more urban islands.

#### *Barriers to be addressed*

*Barrier 1: Limited knowledge and technology implementation with regards to climate resilient agriculture and land-management practices at both national and local levels<sup>[55]</sup>.*

24. There is limited awareness regarding climate change and adaptation related to agriculture and land management at all institutional levels in Tuvalu, from national-level policymakers, to the *Falekaupule*[56] and civil society. Consequently, insufficient tools, knowledge and methodologies at national, technical and grassroots levels limit climate change adaptation (CCA) actions being initiated on the ground. Specifically, this has resulted in minimal adaptation in the country's agricultural sector to the impacts of climate change which has contributed to the local degradation of pulaka production sites. In addition, officials have identified cultural barriers to the widespread acceptance of climate change adaptation measures, specifically around widely held interpretations of religious texts. Although some religious leaders have made efforts to challenge existing interpretations of these texts, approximately half of the interviewees in a study responded that climate change was not a concern based on their current biblical interpretations[57]. This presents challenges when communicating and promoting the adoption of climate change adaptation strategies in Tuvalu. Resultantly, building technical capacity and knowledge to recognise climate change impacts – as well as appropriate tools and methodologies to identify necessary adaptation activities – on agriculture and land resources is required within relevant ministries (such as the Ministries of Finance, Public Works and Agriculture) and island councils to promote the uptake of these activities among all relevant groups and stakeholders at local and national scales.

*Barrier 2: Limited integration of EbA and SLM-related climate change adaptation priorities into Tuvalu's national planning, policy frameworks and budgeting systems*[58].

25. While previous projects in Tuvalu have promoted EbA-based SLM approaches at the community level, the strategic importance of EbA and SLM has not been adequately integrated into the country's national policies and regulations because a robust enabling environment for mainstreaming these activities has been unavailable, particularly for enhancing CCA in the country<sup>[59]</sup>. This has been compounded by the limited technical expertise necessary to mainstream these SLM approaches into national policies. Despite this barrier, SLM has been integrated into Tuvalu's national policies in the 2005 National Adaptation Plan (NAP) for land degradation and drought. However, while the NAP for land degradation emphasises the role of conservation and SLM for carbon sequestration and reducing carbon dioxide emissions, it omits the relationship between SLM and CCA. In addition to Tuvalu's insufficient environmental policies, its financial capacity is inadequate to determine the appropriate use and conservation of ecological resources, or to address their degradation. This is compounded by a mismatch in budget estimations and the information in many of the CCA plans, strategies and activities currently underway.

26. Although the Tuvalu Trust Fund (TTF) and the Kaupule Trust are good practice models for providing budget support and outer island support, they are not presently used for CCA activities[60] such as EbA-based SLM approaches. Moreover, the technical capacity and coordination mechanisms at both intra-governmental (between national agencies) and inter-governmental (between national, village and Outer Island government) are insufficient to achieve integrated decision-making on CCA. As a result, there is a need to incorporate climate change impacts into Tuvalu's national policies and programmes – particularly related to the most climate-sensitive sectors such as water, coastal zones and agriculture. Although Tuvalu's National Strategy for Sustainable Development (2021–2030)[61] includes environmental priorities and strategies on climate change impacts, these plans have not been implemented at a wide scale on the ground because of inadequate recruitment procedures, delays in staff recruitment and insufficient levels of professional and technical experience[62]. In addition, Tuvalu's NAP process – initiated in 2014 – remains incomplete, with the latest milestone occurring in 2018 when a database to store community-level vulnerability data was completed. Combined, the abovementioned factors have inhibited the widespread implementation of CCA activities in Tuvalu, and in response, CCA should be streamlined into on-the-ground interventions by establishing relevant national policies.

*Barrier 3: Limited technical and professional capacity for implementing climate change adaptation strategies at the national and local scale over the long-term [63].*

27. Despite the high level of coastal vulnerability in Tuvalu, the country does not have a support structure for strengthening the capacity of coastal adaptation management practitioners over the long term. For example, external development projects tend to focus on building short-term capacities by focussing solely on existing GoT officials, rather than building the long-term technical and professional capacity by educating non-governmental staff. Regional mobility is high among skilled professionals in the Pacific and – in the absence of targeted investments in long-term capacity building of the population – staff turnover in the GoT generally leaves a considerable gap in responding to urgent environmental concerns. To ensure that Tuvalu maintains a consistent level of technical capacity for climate change adaptation, it is imperative that the current capacity-building strategy is complemented by a support system, in particular, to build the long-term capacity in the specific sectors that are of national development priority, such as climate-resilient agricultural systems.

*Barrier 4: Limited opportunity for engaging landowners and tracking EbA interventions within Tuvalu's system of traditionally undefined land tenure [64].*

28. Tuvalu's land tenure system is based on a common arrangement of sons or daughters [65] inheriting land, which is then subdivided between the landowners themselves, creating a growth pattern of continuously subdivided land parcels over time. Within this context, disputes over land boundaries and multiple ownership claims for the same land are prevalent because of inadequate land registration processes. In addition to constituting a barrier to land leasing and the exchange of land between Indigenous Tuvaluans – which limits economic growth and investments in commercial agriculture and infrastructure – this systemic challenge complicates stakeholder engagement and reporting arrangements, impeding the broad-scale implementation of EbA, climate-resilient agriculture and SLM within Tuvalu's current land tenure context.

#### *Baseline scenario*

29. The proposed project will collaborate with and build on several recent and ongoing projects implemented by partner stakeholders that address similar development challenges as this project. This collaboration will broaden the impact of project interventions, avoid duplication of efforts and enable sharing lessons learned throughout implementation. The details of these projects and their alignment with the proposed project – including the objectives, outcomes and budgets of the baseline projects – are provided below.

Implementing a 'Ridge to Reef' approach to protect biodiversity and ecosystem functions in Tuvalu (R2R Tuvalu) [66],[67] (2015–2021); US\$19,4 million [68]; GEF

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30. The objective of the R2R Tuvalu project was to preserve ecosystem services, sustain livelihoods and improve resilience in Tuvalu using a 'ridge-to-reef' approach' as part of the Pacific R2R programme on 'Pacific Islands Ridge-to-Reef National Priorities – Integrated Water, Land, Forest and Coastal Management to Preserve Ecosystem Services, Store Carbon, Improve Climate Resilience and Sustain Livelihoods'. To achieve this, the project comprised four components, each providing extensive potential for the proposed project to build on. These components include: i) enhancing and strengthening conservation and protected areas – Component 1; ii) rehabilitating degraded coastal and inland forests and landscapes and supporting the delivery of integrated water resource management (IWRM) and integrated coastal management (ICM) at a national scale while piloting approaches on three islands – Component 2; iii) enhancing governance and institutional capacities at the national, island and community levels for enhanced inland and coastal natural resource management – Component 3; and iv) improving data and information systems that would enable improve evidence-based planning, decision-making and management of natural resources in Tuvalu – Component 4.

Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT, 2017–2022)<sup>[69][70]</sup>; US\$18,5 million; GEF

31. FASNETT is aimed at facilitating the development and use of feasible renewable energy resources and application of energy-efficient technologies to enable the GoT to achieve its updated National Determined Contribution (NDC) target of reducing GHG emissions from the electricity generation sector by 100% by 2025<sup>[71]</sup>. This will be achieved by implementing the four project components: i) awareness raising on renewable energy and energy-efficient applications; ii) energy policy improvement and institutional capacity building; iii) applications of renewable energy and energy-efficient technologies and techniques; and iv) financing of renewable energy and energy-efficient initiatives. Although the proposed project will not benefit directly from FASNETT, the transition from fossil fuels to renewable energy resources will support the sustainability of the proposed interventions, as well as Tuvalu's environmental, social and economic context.

Progress made and lessons learned on previous adaptation projects

32. The Government of New Zealand (GoNZ) has an ongoing development cooperation with the GoT, aimed at, *inter alia*, growing Tuvalu's sovereign wealth, ensuring Tuvalu's infrastructure and services are climate resilient and well managed, and ensuring Tuvalu's population is more skilled and qualified to secure increased employment and economic opportunities. For the 2019–2021 period, the GoNZ's efforts have focussed on: i) improving access to safe and climate-resilient public utilities and services; ii) improving Tuvalu's fisheries management capacity; iii) increasing the robustness and effectiveness of Tuvalu's financial management systems; and iv) improving vocational pathways and qualification standards to lead to increased employment opportunities<sup>[72]</sup>. Initiatives that have been implemented by the GoNZ in Tuvalu include, *inter alia*, the remediation of borrow pits to improve the living standards of Tuvaluans and reduce the risk of water-borne diseases<sup>[73][74]</sup>.

33. From 2014–2019, the GEF-funded project entitled 'Effective and responsive island-level governance to secure and diversify climate resilient marine-based coastal livelihoods and enhance climate hazard response capacity' – also referred to as NAPA-2 – aimed to increase the resilience of Tuvalu's outer island communities to future climate change-induced risks, such as declining marine resource productivity and increasing and/or intensifying climate hazards[75]. The Terminal Evaluation (TE) report of NAPA-2 identified several lessons learned during the implementation of the project, including that an appropriate assessment of the needs and priorities of targeted beneficiaries will facilitate the successful implementation of interventions. A needs assessment will provide an adequate response to national priorities and lead to realistic solutions well adapted to the local context, while also ensuring ownership of these interventions by the beneficiaries, consequently promoting the sustainability of the interventions and benefits. To ensure this ownership includes women, the NAPA 2 TE indicated that appropriate gender mainstreaming can be ensured by identifying gender-based expected results, indicators and targets throughout the project development.

34. The project entitled 'Increasing Resilience of Coastal Areas and Community Settlements to Climate Change in Tuvalu' – completed in 2013 – aimed to strengthen the GoT's institutional capacity to identify and address climate change-driven events that systematically increase the vulnerability of island communities[76]. The project contributed towards enhancing the capacity of local community members, including women, to adapt to dynamic climate-related impacts and risks, in addition to protecting their livelihoods. This included, *inter alia*, installing and repairing water tanks, supporting home gardens by providing capacity building and farming inputs, as well as coastal protection measures[77].

35. Tuvalu's NAPA-1 project 'Increasing Resilience of Coastal Areas and Community Settlements to Climate Change in Tuvalu', was the first national project to address priorities identified in Tuvalu's National Adaptation Programme of Action (NAPA). The project contributed toward: i) enhancing capacity of public administration to plan and respond to climate change risks, notably by developing national policies supportive of climate change (Outcome 1); and ii) strengthening the capacities of local communities to adapt to climate change through practical community-based adaptation measures, specifically for agriculture and water security (Outcome 2). An additional grant was provided by AusAID to build on existing project mechanisms and enable efficient replication and upscaling of practical adaptation measures at the community level (NAPA-1+). The TE report of NAPA-1 and NAPA-1+ indicates that establishing linkages to existing national development priorities and other initiatives with adequate country ownership could have substantially enhanced the sustainability of the project. Moreover, the NAPAs identified that the assistance from women's groups combined with targeted trainings contributed to ensuring that women benefit proportionately from interventions aimed at enhancing communities' adaptive capacity.

36. Finally, the 'Building Capacity and Mainstreaming Sustainable Land Management (SLM) in Tuvalu' was a GEF-funded project implemented from 2008–2012. The objective of the project was to: i) enhance and develop the individual, institutional, and systemic capacity for Sustainable Land Management (SLM); ii) mainstream SLM considerations into national development strategies and policies; iii) improve the quality of project design and implementation in the development arena; and iv) develop a National Action Plan for SLM, as well as a medium-term investment plan, while ensuring that all relevant stakeholder views are reflected and integrated into the process. The recommendations generated in the project's TE report emphasised incorporating principles of Strategic Environmental Assessment (SEA) and Integrated Coastal Zone Management (ICZM), together with SLM principles, into land-use planning and decision-making in Tuvalu to ensure sustainable land use and avoid continued land degradation.



### *Proposed alternative scenario*

37. Without urgent interventions to adapt Tuvalu's agricultural sector to climate change – by promoting climate-resilient agricultural management and soil remediation practices[78] – and increase freshwater recharge, the production of pulaka in the country will continue to decline, directly impacting Tuvaluans' food security and cultural heritage. The preferred solution to overcome the impacts of climate change-induced sea level rise (SLR), coastal storms and rainfall variability on Tuvalu's food production systems requires an integrated management approach. Under the proposed project, this solution will involve implementing appropriate land management and ecosystem restoration strategies that maintain freshwater lenses by maximising rainwater capture and retention while reducing the rate of saltwater intrusion, ultimately enhancing the resilience of agricultural production in vulnerable areas. Moreover, by enhancing the resilience of rural livelihoods, the project will contribute to critical adaptation areas for Tuvalu by reducing rural to urban migration and the associated decreased resilience of the country's capital city. The innovative EbA project interventions will positively impact ~4,200 direct beneficiaries and ~7500 indirect beneficiaries in the project's target sites, namely: i) Nanumea; ii) Nanumaga; iii) Niutao; iv) Vaitupu; v) Nukufetau; vi) Nukulaelae; and vii) Funafuti, by conserving and protecting freshwater resources against climate change-induced saltwater intrusion, which, in turn, will secure climate-resilient community livelihoods. The number of direct beneficiaries, hectares of land under sustainable management and number of stakeholders receiving capacity development under the project is presented in Table 2.

38. Several criteria determined the selection of pulaka as a primary crop for adaptation under the proposed project. First, baseline tolerance to saline conditions is required, as these conditions are projected to continue to impact freshwater resources and agricultural soils as a result of SLR. Second, with the increasing frequency and intensity of cyclones under climate change, crop resistance to wind is required. Third, the crop must be adaptable to the increasing temperatures and drought conditions in Tuvalu. Finally, the crop must grow well in the atoll soils, which – as discussed under Section 1a – are highly porous, poorly developed and naturally deficient in the nutrients required for successful plant growth.

39. Examples of the limited crops capable of growing in inhospitable atoll environments include coconuts, breadfruit, pulaka, taro, kumala[79] and cassava. Of these, coconuts, along with seafood, have traditionally been Tuvalu's most important food source. Coconuts thrive in a tropical climate and – as a result of having evolved in cyclone-prone environments – can withstand extreme winds. In addition, coconuts can tolerate short periods of saltwater inundation, intensive rainfall and drought. However, the increasing proportion of senile coconut palms in Tuvalu – older than 80 years – is a considerable challenge in the country, particularly as trees become less flexible with age, which increases their susceptibility to being uprooted or breaking when subjected to cyclones. An estimated 65%-70% of coconut trees in Tuvalu are senile and no longer bear fruit[80]. In addition, nut production is considerably delayed during periods of prolonged drought, which are projected to increase under climate change.

40. The traditional diet of marine foods and coconuts in Tuvalu is supplemented by local root crops, such as pulaka, which are mostly in the outer islands[81]. An essential part of Tuvalu's cultural and culinary tradition, ~80% of Tuvaluan households grow this nutrient-dense crop. Although pulaka is intolerant to the sandy, porous atoll soils, damp pulaka pits – dug and maintained by individual families over generations[82] – provide appropriate conditions for its successful

cultivation. The crop has few pest problems and is resistant to strong winds, even when fully grown. Pulaka grows well in wet conditions and does not tolerate drought well. However, the tuber can be preserved in the ground to last for up to three years, enabling a degree of food security during periods of low agricultural productivity.

41. Other than coconut and pulaka, the remaining crops grown on Tuvalu are either completely intolerant or have a low adaptive capacity to one or more of the increasing climate impacts discussed above[83]. For example, while kumala is relatively drought-tolerant, the crop is highly susceptible to storm surges. Breadfruit is tolerant to poor soils but cannot sustain salt spray. Taro, which is grown on the edge of pulaka pits, is intolerant to saltwater and strong winds, and, while cassava can withstand drought, it is susceptible to waterlogging and high winds.

42. These benefits to cultivating pulaka are further supported by the inherent cultural value of the crop and the associated traditional knowledge regarding its cultivation, as well as the extensive network of already established pulaka pits around the country. In addition, pulaka offers immediate livelihood resilience as the corm typically takes a year to grow, in contrast to coconut palms which can take between three and eight years before bearing fruit. The sustainable production and storage of pulaka will contribute to diversifying local food production in Tuvalu, increasing the availability of nutritious food sources in the country and enhancing overall food security. Moreover, improving the resilience of pulaka pits will support the groves of coconut trees and several layers of crops inter-planted between them. Focusing on pulaka, specifically, will complement coconut-targeted projects in the area – such as the project entitled, ‘Coconut-based integrated farming to enhance food security and build resilience to climate change in Tuvalu’[84] – while streamlining efforts to maximise the production and climate-resilience of pulaka.

43. Under Component 1, the preferred solution involves restoring 10 ha of degraded pulaka pits while adopting innovative ecosystem-based adaptation (EbA) approaches to land management and agricultural practices in 13 ha of pulaka pits and 180 ha of coastal ecosystems surrounding them. Some examples of on-the-ground EbA interventions to consider for the project include: i) establishing a protected area and associated management plan for the 180 ha of coastal ecosystems surrounding the pulaka pits; and ii) replanting and restoring coastal vegetation, such as mangroves, to limit saltwater intrusion and flooding resulting from storm surges. These interventions will support the agricultural development under the project, providing ecological buffers to crops and protecting them from the impacts of climate change. A detailed assessment of EbA interventions will be conducted during the PPG phase of the project.

44. The project will upscale the successes of the abovementioned pilot initiatives in Tuvalu (such as the NAPA-I and NAPA-I+ Projects[85]) by taking into account the recommendations and lessons learned from these initiatives' terminal evaluations to effectively mitigate risks to project implementation. For example, these pilot initiatives have successfully implemented raised beds and soil remediation in pulaka pits in Nanumaga, Nui, Niutao, Nanumea and Nukulaelae. Such initiatives will be replicated by the project in the islands of Funafuti, Vaitupu, Nukufetau, while the reach of the existing pilot interventions on the original islands of Nanumaga, Nui, Niutao, Nanumea, and Nukulaelae will be expanded. In total, 449 raised pulaka pit beds will be constructed through the project – 275 in the three new islands and 174 in the original five islands, respectively. These strategies will help slow down the speed of rainwater surface flow to promote infiltration and protect these production systems from SLR and storm surges resulting from extreme rainfall events, which are projected to increase

under future climate change. Under Component 2, an enabling environment will be created by project-facilitated policy modifications – co-developed with relevant authorities and community leaders in target islands – that align with the GoT’s broader sustainability indicators to streamline development and funding for adaptation priorities.

### **Component 1: Identifying and implementing integrated land management and ecosystem restoration strategies for increased resilience.**

45. Component 1 of the proposed project will include on-the-ground investments to support the preferred solution as outlined above. This component is aimed at ensuring the resilience of agricultural systems in pulaka pits on eight islands to withstand climate change impacts, specifically increasing saltwater intrusion, by utilising innovative land management and agricultural practices (Outcome 1.1). Complementary on-the-ground interventions will include locally appropriate land restoration strategies for previously functional pulaka pits that were degraded by the impacts of Cyclone Pam (Output 1.1.1), as well as proven climate-resilient technologies and practices – such as raised beds and impermeable geomembranes to minimise the intensifying saltwater intrusion – implemented in and around existing pulaka pit areas (Output 1.1.2). These EbA interventions will slow down the surface flow of rainfall and floodwater, resulting in improved infiltration and the protection of agricultural production from climate change-induced extreme rainfall events and its impacts.

46. To improve water supply to pulaka pit areas, alternative irrigation strategies – such as drip irrigation from roof catchments and tanks/micro-dams – will be installed (Output 1.1.3). The drip irrigation will be supplementary to – and not serve as a replacement for – existing irrigation methods such as groundwater and rainfed irrigation. This will ensure there is an adequate supply for water for the pulaka pits during dry periods that will extend in the future as a result of increased rainfall variability. For example, the average rainfall in Nuie is ~3,100 mm, occurring between December and March each year. As a result, the National Building Code has projected that this amount will allow 80 days of water storage during the dry period<sup>[86]</sup>. The next phase of the project will determine the exact number of rainwater harvesting tanks available and calculate how much rainwater can be stored. Under the proposed project, rural houses with rainwater harvesting roof structures will be provided – where they are not readily available – ensuring that these structures are resilient to climate change impacts such as storms. Simultaneously, diversified cropping strategies will be introduced to pulaka pit areas (Output 1.1.4) to promote climate-resilient crops<sup>[87]</sup> that are able to withstand atoll conditions, specifically under current climate change, and enhance soil quality. These strategies will include raising plants around pulaka pits to generate organic material for remediation. With Tuvalu being highly-dependent on food importation to ensure food security, the global impacts of Covid-19 – such as the restrictions on movement and trade – highlighted the country’s vulnerability to external health and economic shocks. Therefore, there is an urgent need to support and promote climate-resilient food production and enable food self-sufficiency in the country<sup>[88]</sup>. Resultantly, the cumulative impact of the project’s interventions under this component – particularly promoting climate-resilient practices and crop species under Outputs 1.1.2 and 1.1.4 – will contribute to Tuvalu’s green recovery efforts by strengthening food security and reducing Tuvalu’s reliance on imported goods and food supplies. Improving food security in the country will increase the population’s resilience to extreme climate events, as well as external economic and health shocks.

47. The project will simultaneously implement climate change adaptation-oriented sustainable land management (SLM) interventions – such as the restoration and conservation of degraded atoll ecosystems – to strengthen groundwater infiltration and flood-risk reduction services under Outcome 1.2. Accordingly, coastal ecosystems will be restored (Output 1.2.1) to enhance the provision of associated ecosystem services, including flood reduction and

storm surge attenuation which will increase the resilience to extreme climate events. These restoration activities will be carried out according to proven best practices recommended from current and previous initiatives such as the abovementioned TCAP and 'Increasing Resilience of Coastal Areas and Community Settlements to Climate Change in Tuvalu' projects. Additionally, groundwater recharge zones in and around pulaka pit areas will be protected using EbA buffer zones to improve soil quality and freshwater infiltration potential (Output 1.2.2) in response to increasing saltwater intrusion. Finally, diversified livelihoods strategies will be introduced for ~800 beneficiaries of local communities reliant on natural resource-based livelihoods to reduce pressure on and thereby conserve coastal ecosystems and their services (Output 1.2.3). This will involve establishing locally sustainable fisheries for rural communities in the country. A fisheries conservation and management approach that has been adopted in several Pacific island countries is the locally managed marine area (LMMA) approach. This approach relies on traditional authority to establish and manage marine conservation and fishing sites. Through traditional authority, no-take or "Tabu" sites are established over multiple years while other areas remain either open or under certain restrictions. The spillover from the "Tabu" sites therefore provides benefit as food source for local communities. Tuvalu is well placed to do this since – through the Falekaupule Act – traditional island councils are recognized and have delegated governance authority for their island communities. The project will facilitate establishment of LMMAs on each island along with capacity building for management and monitoring of the sites so they are able to gauge the effectiveness of the approach. As a basis for this activity, there is an already established Pacific LMMA network that the project could engage with to assist through South-south sharing of experiences, lessons learnt and best practices. Additional livelihoods that can stem from these activities include secondary processing, value-adding and selling smoked/dried fish at local markets. These extra livelihood activities will grant rural communities a buffer to climate change impacts on subsistence crop cultivation.

48. Component 1 will address Barrier 1 by increasing awareness and local knowledge of CCA in Tuvalu's agricultural sector. Accordingly, the resilience of pulaka production in the country will be increased by providing rural stakeholders with the knowledge, tools and technologies for adapting their livelihood activities to climate change.

**Component 2: Creating an enabling environment for implementing EbA through improving national policy and planning frameworks, strengthening institutional capacity, raising awareness and addressing barriers to CCA.**

49. Under Component 2, the proposed project aims to mainstream EbA principles and practices into national and local GoT planning and management to address the barriers (Section 1a) to implementing CCA in Tuvalu. To create the enabling environment for this EbA mainstreaming, the project will recommend revisions to relevant policies and strengthen the necessary institutional capacity (Outcome 2.1) to ensure long-term resilience in Tuvalu.

50. EbA-related national policies and procedures will be revised to align with the GoT's broader sustainability indicators and to streamline funding for adaptation priorities. These revisions will enable the upscaling of EbA, generation of CCA-related knowledge and CCA-related capacity building through the project (Output 2.1.1). Policy adjustments will be done in collaboration with national and local community leadership to ensure they align with the GoT's sustainability indicators. In addition, government officials – in particular technical officers, community representatives and coastal adaptation management professionals – will be trained on the integration of EbA, climate-resilient agriculture and SLM principles into policies and planning at both national and community levels (Output 2.1.2).

51. Under project Outcome 2.2, strategic action plans for streamlining EbA into national policy and planning frameworks will be developed and implemented. To date, there have been few attempts to streamline EbA and climate change-related SLM approaches in national policies owing to limited technical expertise and the absence of a coordinating body for SLM. Following the closeout of NAPA-I: 'increasing resilience of coastal areas and community settlements to climate change in Tuvalu', it was recommended to improve linkages between existing national development priorities and other initiatives under the project. In accordance, this outcome will create the enabling environment to ensure the streamlining of EbA and SLM approaches into national policies, specifically the: i) Te Kete (Tuvalu National Sustainable Strategy); ii) Vakafenua (Climate Change Policy); and iii) the Climate Change Resilience Act 2019, managed through the Ministry of Finance. Additionally, the project will review a section plan by the Public Works Department that was developed for pulaka pit protection as part of a previous project, in order to identify potential integration of the proposed project's objectives at the sub-national level. The strategic action plans for streamlining EbA into national policy will include: i) a Guidance Note for compliance monitoring and enforcement of EbA policy recommendations (Output 2.1.1); and ii) a land-use zoning plan developed to enable EbA, climate-resilient agriculture and SLM under existing land tenure systems (Output 2.2.2). The land-use zoning plan will include an updated land ownership database within the Department of Lands to indicate land ownership boundaries to facilitate stakeholder engagement and reporting arrangements in the context of Tuvalu's current land tenure system.

52. The uptake of EbA and climate-resilient agricultural practices will be enhanced through multi-level stakeholder decision-making programmes, knowledge management and awareness raising towards CCA (Outcome 2.3). Building on this output, gender-responsive best practice guidelines will be developed and disseminated to facilitate replication and upscaling of EbA and climate-resilient agricultural and land management practices across Tuvalu and other SIDS (Output 2.3.1). A complementary knowledge management and communication strategy for integrating EbA best practices and lessons learned into planning and policy (Output 2.3.2) will also be developed to ensure the sustainability of project interventions beyond the project lifespan. This strategy will be shaped by the knowledge and capacity needs identified by previous initiatives, specifically the NAPA-I and NAPA-I+ projects. Finally, continuous training and knowledge generation programmes for public sector officials will be developed (Output 2.3.3) based on the results of the direct capacity building of technical officers in Output 2.1.2. In particular, these training programmes will encompass a 'training of trainers' methodology to ensure the replication and upscaling of interventions across other island states. To complement the national-level capacity building activities in Component 2, community training groups will be established around pilot sites under Output 1.1.5 to upscale awareness and best practices of adaptation strategies among local-level stakeholders – particularly farmers and communities engaged in pulaka pit agriculture. This will provide community representatives with the appropriate tools, knowledge and methodologies for local adaptation. The project will seek to synergise its training objectives with existing networks, including the island councils, gender-based groups, youth groups, and religious groups.

53. Component 2 will address Barrier 2 by reinforcing an enabling environment for the mainstreaming of EbA and SLM within Tuvalu's national policies – given that this mainstreaming has been limited to date – particularly with regards to implementing CCA in the country. Coordination between national agencies on CCA will be strengthened through inclusive and collaborative stakeholder engagement at all levels of governance. Additionally, Barrier 3 will be addressed by targeted technical capacity building of core staff at government and community levels, while long-term capacity for CCA management in Tuvalu will be facilitated by continuous training and knowledge generation beyond the project's lifespan. This process will partly involve the establishment of training groups

at the community level, which will contribute to addressing Barrier 1. Finally, Barrier 4 will be addressed through the clarification of agricultural land ownership boundaries – based on the outcomes of targeted stakeholder engagements – which will enable more streamlined investment into and management of climate-resilient agriculture and SLM in Tuvalu's rural context.

**Table 2.** Numbers of direct beneficiaries, hectares of land under sustainable management and number of stakeholders receiving capacity development under the project.

Output	Direct beneficiaries	Area of land under sustainable management	Stakeholders receiving capacity development
1.1.1. Rehabilitation of <b>3</b> historically degraded pulaka pit areas carried out.	~4,200 people (50% men; 50% women) <a href="#">[89]</a>	10 ha	
1.1.2. Proven climate-resilient technologies and practices – such as raised beds and impermeable geomembranes to minimise saltwater intrusion – implemented in <b>~32</b> pulaka pit areas.	~4,200 people (50% men; 50% women)	13 ha	
1.1.3. Alternative irrigation strategies – such as drip irrigation from roof catchments and tanks/micro-dams – installed to improve water supply to <b>~32</b> pulaka pit areas.	~4,200 people (50% men; 50% women)		
1.1.4. Diversified cropping strategies introduced to <b>~32</b> pulaka pit areas to promote the use of climate-resilient crops that are able to withstand atoll conditions under current climate change and simultaneously enhance soil quality. These strategies will include raising plants around pulaka pits to generate organic material for remediation.	~4,200 people (50% men; 50% women)	13 ha	

1.1.5. <b>8</b> community training groups established around pilot sites to upscale awareness and best practices of adaptation strategies among stakeholders, particularly for farmers and communities engaged with the pulaka pit agriculture.	~4,200 people (50% men; 50% women)		~4,200 (50% men; 50% women)
1.2.1. <b>180 ha</b> of coastal ecosystems restored to enhance the provision of associated ecosystem services, including flood reduction and storm surge attenuation.		180 ha	
1.2.2. Groundwater recharge zones in and around <b>~32</b> pulaka pit areas protected using EbA buffer zones to improve soil quality and freshwater infiltration potential.		180 ha	
1.2.3. Diversified livelihoods strategies introduced for <b>800</b> people in local communities reliant on natural resource-based livelihoods to reduce pressure on and thereby conserve coastal ecosystems and their services.	~800 people (50% men; 50% women)		
2.1.2. Training conducted for 100 government officials, with a focus on technical officers and community representatives, on the integration of EbA, climate-resilient agriculture and SLM principles into policies and planning at both national and community levels.			100 (50% men; 50% women)

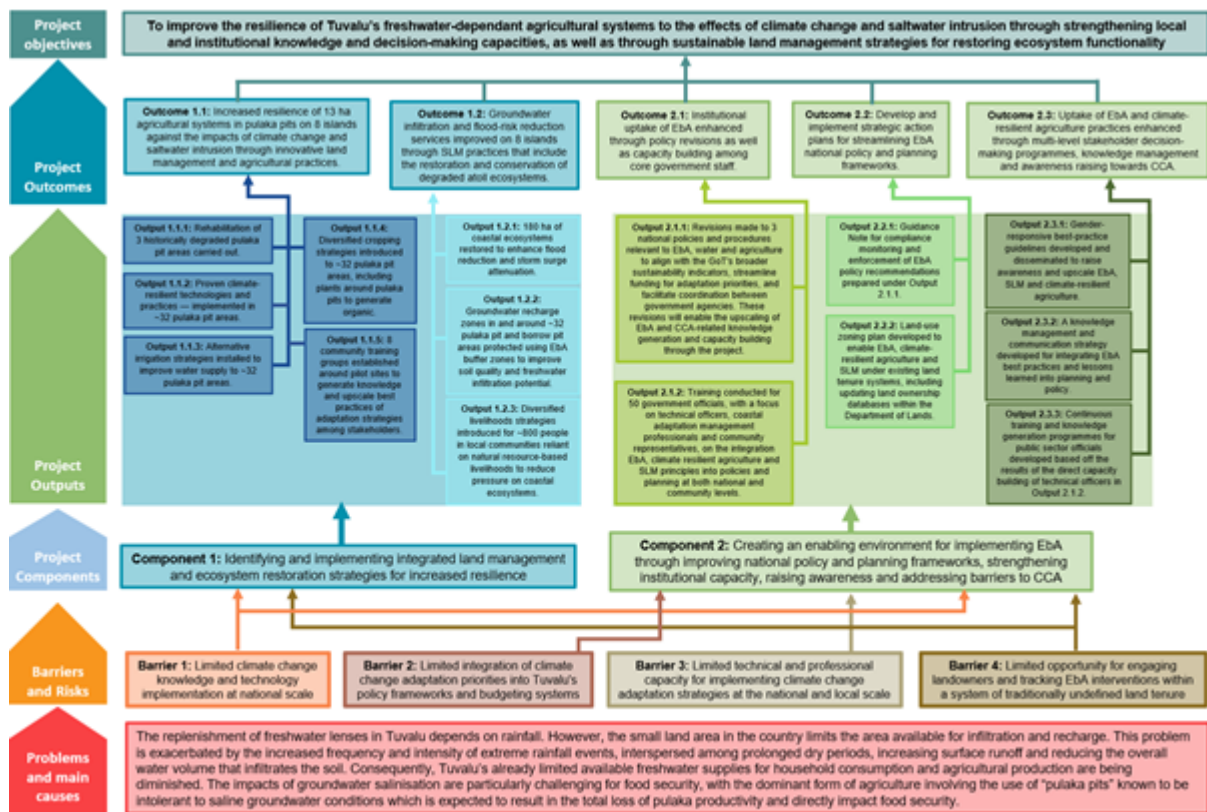


Figure 6. Theory of Change for the project's preferred approach.

*Alignment with the LDCF Impact Program's strategic objectives areas*

54. The proposed project is aligned with three LDCF Focal Areas, namely: i) CCA-1 – Reduce vulnerability and increased resilience through innovation and technology transfer for climate change adaptation; and ii) CCA-2 – Mainstream climate change adaptation and resilience for systemic impact. Details of how the project aligns with these focal areas are provided below.

Focal Area CCA-1: Reduce vulnerability and increased resilience through innovation and technology transfer for climate change adaptation



55. Under Component 1, the project will directly reduce the climate vulnerability of Tuvalu’s rural population by focussing on improving the resilience of pulaka pits to the impacts of climate change and in particular the increasing salt-water intrusion. Specifically, resilience will be increased by implementing innovative and proven climate-resilient technologies and practices, that are aimed at i) salt-water seepage prevention; ii) moisture retention; iii) alternative irrigation strategies; and iv) diversified cropping practices. The resilience of these agricultural systems will be complemented by increased ecosystem services provision in surrounding areas as a result of targeted ecosystem restoration.

Focal Area CCA-2: Mainstream climate change adaptation and resilience for systemic impact

56. Under Component 2, the project will facilitate climate change adaptation at the systemic level in Tuvalu by mainstreaming EbA and climate-focussed SLM into national development planning and policies related to water resources, agriculture and land management. These mainstreaming activities will strengthen climate change adaptation at the national level by streamlining funding for adaptation priorities and facilitate coordination between government agencies. Additionally, the capacity of government staff and local communities will be strengthened to identify climate risks and engage in adaptation measures through focussed training programmes on integrating EbA, climate-resilient agriculture and SLM principles into policies and planning. These capacity-building activities – in tandem with awareness-raising and improved knowledge management measures – will facilitate the upscaling of conservation, restoration and sustainable land and water resource management, ultimately strengthening enabling conditions for effective climate change adaptation within Tuvalu.

*Incremental/additional cost reasoning and expected contributions from the baseline*

57. Several recent and ongoing initiatives within Tuvalu have been designed to address baseline developmental challenges, climate hazards and barriers. These initiatives, however, do not adequately account for the additional impact presented by future climate change conditions, limiting their long-term effectiveness. Despite this limitation, these initiatives represent a baseline to which the proposed project will provide additional finance to address climate change and promote adaptation. Table 3 below provides a summary of the baseline scenario the proposed project will build on, as well as the project outcomes that will provide climate change additionality.

**Table 3.** Additional cost reasoning for the three components of the proposed project.

Component and additional cost	Baseline	Alternative scenario
<b>Component 1:</b> Identifying and implementing integrated land management and ecosystem restoration strategies for increased resilience	The salinisation of the Tuvalu’s freshwater lenses from increasing sea level rise (SLR) has considerably impacted freshwater supply, livelihoods, as well as agricultural productivity – specifically pulaka production which is understood	Under this component, GEF resources will increase the resilience of agricultural systems in pulaka pits on eight islands against the impacts of climate change and the resultant increasing saltwater intrusion through innovative land management

	<p>to be intolerant of saline groundwater conditions. To protect pulaka production from saltwater intrusion, ongoing efforts have successfully been piloted to raise the beds of pulaka pits. However, agricultural productivity is further compromised by the structure of atoll soils found in Tuvalu, which are already highly prone to nutrient deficiency, rapid drainage, low moisture retention capacity and minimal cation-exchange capacity. Consequently, these soils are generally unsuited to intensive agriculture, with many general soil remediation techniques and best practices from other regions difficult to implement in this context.</p>	<p>ent and agricultural practices such as soil remediation and diversified cropping strategies. This will promote the use of climate-resilient crops that can withstand atoll conditions and simultaneously enhance soil quality. Additionally, groundwater infiltration and flood-risk reduction services will be improved on the eight islands by climate change adaptation-focused sustainable land management (SLM) practices, restoration and conservation activities – such as mangrove planting and replanting of coastal vegetation – as well as diversified livelihood strategies for vulnerable farmers and community members in the form of sustainable fisheries as managed through the LMMA methodology.</p>
<p><b>Component 2:</b> Creating an enabling environment for implementing EbA through improving national policy and planning frameworks, strengthening institutional capacity, raising awareness and addressing barriers to CCA</p>	<p>Currently, the strategic importance of ecosystem-based adaptation (EbA) and SLM has not been integrated into the country's national policies and regulations because of the limited robust enabling environment for mainstreaming these activities. In addition, technical expertise is insufficient, a coordinating body for SLM is absent and there is a mismatch between budget estimations and information in existing CCA plans, strategies and activities. This has been exacerbated by insufficient appropriate tools, knowledge and methodologies both at the national, technical and grassroots levels which consequently limit climate change adaptation (CCA) actions being initiated at the local level. However, the Australian government has fu</p>	<p>GEF resources will be targeted to facilitate the institutional uptake of EbA interventions which are enhanced through policy revisions and capacity-building initiatives among core government officers and communities. Capacity building activities under the project will be strengthened through a 'training of trainers' approach. Moreover, the uptake of EbA and climate-resilient agricultural practices will be promoted and enhanced through multi-level stakeholder decision-making programmes and CCA-related knowledge management and awareness raising. Resources will also be directed towards developing and implementing strategic action plans for streamlining EbA into national policy and planning frameworks which has not been undertaken in previous a</p>

	<p>nded a multi-country programme entitled 'Climate and Ocean Support Program in the Pacific (COSPPac)' which aims to develop useful products and services to governments and communities, building resilience to the impact of climate change, climate variability and disasters.</p>	<p>daptation projects in Tuvalu to date, as well as through review of relevant sub-national plans. The mainstreaming of EbA in national policy is expected to enhance the enabling environment to facilitate upscaling of the proposed project interventions.</p>
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*Adaptation benefits*

58. Climate change impacts such as prolonged dry seasons and extreme rainfall events in combination with limited irrigation infrastructure have decreased the productivity of Tuvalu's small-scale rainfed agriculture. Simultaneously, climate change-induced sea level rise (SLR) has resulted in the salinisation of freshwater resources in Tuvalu – and is projected to be exacerbated under future climate conditions – which affects the access and quality of water required for household and agricultural use. In particular, saltwater intrusion into pulaka pits has adversely impacted the agricultural sector by reducing the production of pulaka, which is a saline-intolerant crop, and will continue to do so under future climate change scenarios. SLR, combined with sand mining, accelerates the process of saltwater intrusion by degrading agricultural land and reducing ecological buffers around agricultural areas. This process also contributes to coastal erosion which further reduces the country's limited freshwater availability and exacerbates the overall reduction of agricultural productivity in Tuvalu. Given the cultural importance of pulaka, the salinisation of freshwater resources not only threatens Tuvalu's food security but its cultural heritage as well. Finally, the climate change-induced degradation of traditional pulaka production systems in the outer islands are driving rural populations to migrate to Funafuti, decreasing the climate resilience of the capital city.

59. Long-term adaptation to climate change is underpinned by functional ecosystems that deliver valuable ecosystem services to moderate the impacts of climate change and support diversified climate-resilient livelihoods and enterprises. Restoring and conserving ecosystems strengthen these services to improve coastal protection and natural resource availability for local communities. Accordingly, the project aims to address the abovementioned challenges by restoring ecosystem functionality through integrated land management and the sustainable use of biodiversity, which will work synergistically with agricultural-focused interventions to reduce the vulnerability of Tuvalu's food production systems. Moreover, this approach will reduce ecological degradation while maintaining local knowledge and culture/traditions. The proposed project will deliver adaptation benefits aligned with two LDCF focal areas (Section 1a.), positively impacting ~4,200 direct beneficiaries (~3,400 people directly involved in agriculture, and ~800 people in rural areas receiving livelihood support) and ~7,500 indirect beneficiaries in the project's target sites. Because of Tuvalu's small size, direct beneficiaries comprise ~37% of the country's population (the proportion of rural households engaged in pulaka production), while indirect beneficiaries comprise the remainder of the population[90]. Benefits will reach the rural population through a suite of EbA interventions to support the agricultural adaptation focus of the project, as well as locally appropriate livelihood diversification options (such as fisheries) and strengthened training programmes and knowledge sharing. Both direct and indirect beneficiaries will benefit from

the increased resilience of rural livelihoods as households engaged in crop production are closely linked in Tuvalu's rural areas by traditional bartering arrangements. A co-benefit of the project will also be the reduced rural to urban migration of the population because outer island communities will become more favourable, reducing adaptation pressure in Funafuti. Moreover, indirect beneficiaries will be expanded through upscaling conservation, restoration and sustainable land and water resource management and knowledge as a result of continuous training and awareness raising at both community and national levels under Component 2.

60. Based on the best practices and lessons learned on sustainable land use and management from similar past and ongoing projects – such as the 'Building Capacity and Mainstreaming Sustainable Land Management (SLM) in Tuvalu' project – the proposed project will use an integrated management approach that implements appropriate land management and ecosystem restoration strategies. These strategies will use ecosystem-based adaptation (EbA) interventions to secure ecosystem services and community resilience in the target areas. Project activities will specifically enhance water security in vulnerable communities by: i) ensuring water availability during dry months; and ii) increasing the water retention and flood attenuation properties of local ecosystems. Moreover, installing climate-resilient drip irrigation systems will enable communities to harvest water from rainfall events, securing water provision despite saltwater intrusion into water lenses. Contributing to these activities, groundwater protection and restoration through EbA interventions will promote water conservation and groundwater recharge, resulting in flood reduction, increased groundwater recharge and improved surface water quality – particularly during extreme climate events. Combined, these interventions will promote diversified and sustainable livelihoods (agro- and non-agro-based) and reduce soil erosion and consequent saltwater intrusion in the outer island areas of Tuvalu, securing freshwater resources for domestic and agricultural use with the co-benefit of reduced rural-urban migration.

61. Complementing the project's ecosystem restoration interventions, strengthened policies and capacities will support the necessary enabling environment for long-term CCA in Tuvalu. Information sharing will improve access to locally appropriate scientific information and raise awareness of climate change impacts and adaptation among communities, farmers and public sector officials, ensuring the sustainability of interventions in Tuvalu beyond the proposed project's lifespan. Moreover, as co-benefits of the project, coastal communities, the private sector and local governments, as well as ecosystems in other islands will benefit from the increased institutional capacity of the GoT to implement similar adaptation interventions.

*Innovation, sustainability and potential for scaling up*

## **Innovation**

62. The proposed project will undertake an ecosystem-based adaptation (EbA) approach to improve land management and agricultural practices in and around Tuvalu's pulaka pits. Although interventions to raise pulaka pits for protection against saltwater intrusion have previously been implemented in Tuvalu, the proposed project will particularly utilise an integrated approach to raising these pits to simultaneously improve ecosystem health and build their climate

resilience. This solution will involve implementing innovative, locally appropriate and climate change adaptation-oriented sustainable land management (SLM) and ecosystem restoration strategies that maintain freshwater lenses by maximising the water capture and retention while reducing the rate of saltwater infiltration. This will ultimately enhance the resilience of agricultural production in the eight vulnerable islands (Outcomes 1.1 and 1.2).

63. To achieve these solutions, on-the-ground interventions will include locally appropriate land restoration strategies (Output 1.1.1) and proven climate-resilient technologies and practices – such as raised beds and impermeable geomembranes to minimise saltwater intrusion – implemented in and around pulaka pit areas (Output 1.1.2). These EbA interventions are based on best practices and lessons learned from past and ongoing projects in Tuvalu that have successfully piloted raising beds and remediating soil. The project will make use of environmentally neutral geotextile to ensure the ecological sustainability of this intervention<sup>[91],[92]</sup>. In the case of this project, impermeable sheeting will be used. The interventions will be accompanied by adopting appropriate diversified cropping strategies under Output 1.1.4 – such as raising plants around pulaka pits – to promote the use of climate-resilient crops that can withstand atoll conditions and simultaneously enhance soil quality. The selected cropping methods will contribute to slowing down surface flow of rainfall and floodwater, which is projected to intensify under future climate change impacts, resulting in improved infiltration and the protection of agricultural production from extreme rainfall events and its impacts. Additional project interventions to slow water flow include: i) concrete raised beds; ii) raised baskets of soil; iii) shading; iv) agroforestry; and v) mulching. The project will also utilise innovative irrigation strategies – such as installing drip irrigation from roof catchments and tanks/micro-dams (Output 1.1.3) – to improve access to clean water for household and agricultural use.

## **Sustainability**

64. The institutional, economic and social sustainability of the proposed interventions (detailed below) and their impacts beyond the project lifespan will be ensured by the project's integrated approach. Specifically, under Component 2 of the project, an enabling environment will be created by project-facilitated policy modifications – co-developed with relevant authorities and community leaders in target islands – that align with the Government of Tuvalu's (GoT) broader sustainability indicators, as well as the necessary capacity building to ensure long-term climate change adaptation (CCA) in Tuvalu. In this way, the project's sustainability will be promoted by continued stakeholder engagement throughout the project lifespan.

### *Institutional sustainability*

65. To promote the sustainability of institutional capacity in Tuvalu to adapt to climate change, 30 government officials – primarily technical officers and community representatives – will be trained on integrating EbA, climate-resilient agriculture and sustainable land management (SLM) principles into national- and community-level policies and planning. This intervention will be accompanied by a Guidance Note for monitoring compliance with and enforcing the EbA policy recommendations prepared under Output 2.1.1. As a result of these policy revisions and institutional capacity building, EbA principles and practices will be mainstreamed into Tuvalu's development planning and management. Moreover, continuous training and knowledge generation programmes for public sector officials will be developed (Output 2.3.3) based on the results of the direct capacity building of technical officers in Output 2.1.2.

### *Economic sustainability*

66. The economic sustainability of project interventions will be achieved by introducing diversified livelihoods strategies (under Output 1.2.3) to local communities dependent on natural resource-based livelihoods. This will be strengthened by the EbA, climate-resilient agricultural and SLM practices implemented under Outcome 1.2 to reduce pressure on and conserve coastal ecosystems and their services. The proposed project will also develop a land-use zoning plan to promote these sustainability practices under existing Tuvaluan land tenure systems.

### *Social sustainability*

67. The project will enable the social sustainability of the proposed interventions by supporting inclusivity, specifically by implementing EbA, climate-resilient agricultural and SLM practices that are gender-responsive. These practices will include locally appropriate soil fertility remediation strategies implemented in and around pulaka pit areas. In addition, the social sustainability of project interventions will rely on establishing community training groups around pilot sites (Output 1.1.5) to upscale awareness and best practices of adaptation strategies among stakeholders in Tuvalu, particularly for farmers and communities engaged in pulaka pit agriculture. These training groups will provide community representatives with the appropriate tools, knowledge and methodologies for sustained local adaptation. A complementary knowledge management and communication strategy for integrating EbA best practices and lessons learned into planning and policy (Output 2.3.2) will also be developed to ensure the sustainability of project interventions beyond the project lifespan, in addition to enabling the replication and upscaling of the project in other SIDS (detailed under Scalability below). Finally, a comprehensive stakeholder engagement strategy will be developed during the PPG phase to ensure extensive consultation with targeted community members to raise awareness on proposed land-zoning plans and enable the identification of potential social conflicts as a result of the land-zoning process.

### **Scalability**

68. At a local level, community training groups will be established around pilot sites to upscale awareness and best practices of adaptation strategies among all relevant stakeholders in Tuvalu, particularly farmers and communities engaged in pulaka pit agriculture (Output 1.1.5). This will provide community representatives with the appropriate tools, knowledge and methodologies for continued local adaptation. Building on this output, gender-responsive best practice guidelines will be developed and disseminated to facilitate replication and upscaling of EbA across Tuvalu and the Pacific region as a whole, along with climate-resilient agricultural and land management practices (Output 2.3.1). These interventions will be complemented by the abovementioned knowledge management and communication strategy promoting the integration of EbA best practices and lessons learned into planning and policy (Output 2.3.2), ensuring the sustainability of project interventions beyond the project lifespan. Notably, policy revisions will enable the upscaling of EbA and CCA-related knowledge generation and capacity building through the project (Output 2.1.1) to other SIDS with similar development and climate change challenges. Based on the capacity building of technical officers (Output 2.1.2), continuous training and knowledge generation programmes for public sector officials will be

developed (Output 2.3.3) to further ensure the replication and upscaling of interventions across other island nations. The continuous training and knowledge generation under Component 2 will increase upscaling by disseminating lessons learned to both direct and indirect beneficiaries, with indirect beneficiaries receiving additional adaptation benefits through the reduction of intra-island migration in Tuvalu, ultimately enhancing the resilience of communities beyond those directly targeted by the project.

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[1] Atolls are ring-shaped reefs, islands, or a chain of islands formed of coral.

[2] Topographically, the Tuvalu islands seldom rise more than four meters above sea level.

[3] Government of Tuvalu. 2016. Tuvalu National Biodiversity Strategy and Action Plan: Fifth National report to the Convention on Biological Diversity. Available at: <https://www.cbd.int/doc/world/tv/tv-nr-05-en.pdf>.

[4] Tuvalu. 2021. Available at: <https://www.britannica.com/place/Tuvalu>.

[5] Image retrieved from Google Earth.

[6] The transition zone refers to the area in the groundwater lens that separates freshwater and salt water from the seawater as depicted in Figure 2.

[7] Government of Tuvalu. 2016. Tuvalu National Biodiversity Strategy and Action Plan: Fifth National report to the Convention on Biological Diversity. Available at: <https://www.cbd.int/doc/world/tv/tv-nr-05-en.pdf>.

[8] Werner, A. 2017. Hydrogeology and management of freshwater lenses on atoll islands: Review of current knowledge and research needs. *Journal of Hydrology*.

[9] Broadleaf provides several ecosystem services such as serving as food, sealing steam into earth ovens for cooking, and as organic manure.

[10] Ruderal vegetation, often comprising weeds, is vegetation that is able to grow in severely disturbed habitats such as human dwellings.

[11] Government of Tuvalu. 2015. Second National Communication of Tuvalu. Available at: [https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452\\_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf](https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf).

[12] Government of Tuvalu. 2016. Tuvalu National Biodiversity Strategy and Action Plan: Fifth National report to the Convention on Biological Diversity. Available at: <https://www.cbd.int/doc/world/tv/tv-nr-05-en.pdf>.

[13] The El Niño Southern Oscillation (ENSO) refers to the warming of the ocean surface, or above-average sea surface temperatures in the central and eastern tropical Pacific Ocean. Rainfall increases over the tropical Pacific Ocean. The low-level surface winds, which normally blow from east to west along the equator instead weaken or, in some cases, start blowing from the other direction i.e., from west to east.

[14] Government of Tuvalu. 2015. Second National Communication of Tuvalu. Available at: [https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452\\_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf](https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf).

[15] A Westminster system comprises a sovereign, parliament, government, Prime Minister or Premier, ministry and independent judiciary: <https://sef.psc.nsw.gov.au/nsw-government-context/the-westminster-system>

[16] Cabinet position could await new Tuvalu MP. 2015. Available at: <https://www.rnz.co.nz/international/pacific-news/270875/cabinet-position-could-await-new-tuvalu-mp>.

Tuvalu Oceania: UN Women. 2021. Available at: <https://data.unwomen.org/country/tuvalu>

[18] According to the Falekaupule Act, the Falekaupule means "traditional assembly in each island ... composed in accordance with the Aganu of each island", with Aganu meaning traditional customs and culture. The Kaupule is the implementing and advisory branch of the Falekaupule.

[19] Australian Government. 2019. Pacific Women Shaping Pacific development: Tuvalu country summary. Available at: <https://www.dfat.gov.au/sites/default/files/pwspd-tuvalu-summary.pdf>.

[20] The World Bank. 2021. World Development Indicators. Available at: <https://datatopics.worldbank.org/world-development-indicators/>.

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[22] Taupo, T et al. 2018. Household vulnerability on the frontline of climate change: the Pacific atoll nation of Tuvalu. Environmental Economic Policy Studies.

[23] Central Statistics Division of the Government of Tuvalu. 2021. Tuvalu agriculture and fisheries report. Available at: [https://www.spc.int/DigitalLibrary/Doc/SDD/Agriculture\\_Survey/Tuvalu\\_agriculture\\_and\\_fisheries\\_report.pdf](https://www.spc.int/DigitalLibrary/Doc/SDD/Agriculture_Survey/Tuvalu_agriculture_and_fisheries_report.pdf).

[24] A dot tv license is the Internet country code top-level domain (ccTLD) for Tuvalu. Except for reserved names like com.tv, net.tv, org.tv and others, any person may register second-level domains in TV. The domain name is popular, because it is an abbreviation of the word television, and therefore economically valuable.

[25] Central Statistics Division of the Government of Tuvalu. 2021. Tuvalu agriculture and fisheries report. Available at: [https://www.spc.int/DigitalLibrary/Doc/SDD/Agriculture\\_Survey/Tuvalu\\_agriculture\\_and\\_fisheries\\_report.pdf](https://www.spc.int/DigitalLibrary/Doc/SDD/Agriculture_Survey/Tuvalu_agriculture_and_fisheries_report.pdf).

[26] Pulaka, or giant swamp taro (*Cyrtosperma merkusii*), is a gigantic rubber plant, that can grow up to four meters high. It grows in pits that are dug deep into the coral down to the freshwater lens.

[27] Government of Tuvalu. 2016. Tuvalu National Biodiversity Strategy and Action Plan: Fifth National report to the Convention on Biological Diversity. Available at: <https://www.cbd.int/doc/world/tv/tv-nr-05-en.pdf>.

[28] Webb, A. 2007. Tuvalu Technical report: Assessment of salinity of groundwater in swamp taro (*Cyrtosperma Chamissonis*) "Pulaka" Pits in Tuvalu. Available at: [https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite\\_download2.php?id=9675](https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite_download2.php?id=9675).

[29] Tuvalu technical report: Assessment of salinity of groundwater in swamp taro (*Cyrtosperma chamissonis*) "pulaka" pits in Tuvalu. March, 2007. Available at: file:///C:/Users/justk/OneDrive/Pictures/9675%20(1).pdf

[30] Thompson, Sue. 1982. *Cyrtosperma chamissonis* (araceae): Ecology, distribution and economic importance in the South Pacific. Available at: [https://www.persee.fr/doc/jatba\\_0183-5173\\_1982\\_num\\_29\\_2\\_3868#:~:text=Cyrtosperma%20chamissonis%20is%20cultivated%20primarily,foods%20such%20as%20coconut%20cream](https://www.persee.fr/doc/jatba_0183-5173_1982_num_29_2_3868#:~:text=Cyrtosperma%20chamissonis%20is%20cultivated%20primarily,foods%20such%20as%20coconut%20cream).



[31] Pulaka: A staple food of the people of Tuvalu. Available at: <https://ichcourier.unesco-ichcap.org/>

[32] Food security in the atoll countries of the South Pacific – with particular reference to Tuvalu. Available at: [https://www.gafspfund.org/sites/default/files/inline-files/Note%20.%20Multi-country\\_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf](https://www.gafspfund.org/sites/default/files/inline-files/Note%20.%20Multi-country_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf)

[33] Ibid.

[34] Ibid.

[35] McCubbin, S.G., Pearce, T., Ford, J.D., Smit, B. Social-ecological change and implications for food security in Fanufuti, Tuvalu. 2017. Available at: <https://www.jstor.org/stable/pdf/26270106.pdf>

[36] Food security in the atoll countries of the South Pacific – with particular reference to Tuvalu. Available at: [https://www.gafspfund.org/sites/default/files/inline-files/Note%20.%20Multi-country\\_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf](https://www.gafspfund.org/sites/default/files/inline-files/Note%20.%20Multi-country_GAFSP%20SIFWaP%20Tuvalu%20Market%20Study.pdf)

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- [78] These practices will include: i) concrete raised beds; ii) raised baskets of soil; iii) shading; iv) intercropping; v) mulching; and vi) composting.
- [79] Sweet potato.
- [80] Coconut-based integrated farming to enhance food security and build resilience to climate change in Tuvalu. Available at: <http://ccprojects.gsd.spc.int/wp-content/uploads/2016/06/TU6-Project-Concept-Note-final.pdf>
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- [87] The main crop will be pulaka (*Cyrtosperma merkusii*), also known as swamp taro. Supplementary climate-adapted crops will include: i) sweet potatoes (*Ipomoea batatas*); ii) taro (*Colocasia esculenta*); iii) banana (*Musa paradisiaca*); iv) sugarcane (*Saccharum officinarum*); as well as v) broad leaf vegetables.
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- [89] The sex-disaggregated targets are based on the ratio of men to women as provided by Tuvalu's 2017 Census data, which is housed under the national Central Statistics Division.
- [90] Central Statistics Division of the Government of Tuvalu. 2017. Tuvalu Agriculture and Fisheries Report. Available at: [https://spccfpstore1.blob.core.windows.net/digital-library-docs/files/62/6222aa68d1c4d739a85cb156f1c7e265.pdf?sv=2015-12-11&sr=b&sig=aPv%2B9denEu3SL%2BSQU9THboVcmE%2Fi6u66UCiwuCH0k0%3D&se=2022-07-27T08%3A39%3A01Z&sp=r&rsc=public%2C%20max-age%3D864000%2C%20max-stale%3D86400&rsct=application%2Fpdf&rscd=inline%3B%20filename%3D%22Tuvalu\\_agriculture\\_and\\_fisheries\\_report.pdf%22](https://spccfpstore1.blob.core.windows.net/digital-library-docs/files/62/6222aa68d1c4d739a85cb156f1c7e265.pdf?sv=2015-12-11&sr=b&sig=aPv%2B9denEu3SL%2BSQU9THboVcmE%2Fi6u66UCiwuCH0k0%3D&se=2022-07-27T08%3A39%3A01Z&sp=r&rsc=public%2C%20max-age%3D864000%2C%20max-stale%3D86400&rsct=application%2Fpdf&rscd=inline%3B%20filename%3D%22Tuvalu_agriculture_and_fisheries_report.pdf%22)
- [91] <https://www.sciencedirect.com/topics/materials-science/geotextiles>
- [92] Modern agricultural geotextiles are made from polymers which are chemically and biologically neutral, remaining stable between pH levels 1–14 and up to 150°C while having a life expectancy of more than 200 years when buried. In consultations with GoT and regional experts, it was noted that no EbA measure would sufficiently impede salinisation of the pulaka pits as compared to impermeable geomembranes. This conclusion was reached after Tuvalu had trialled various techniques to address soil salinisation.

## 1b. Project Map and Coordinates

Please provide geo-referenced information and map where the project interventions will take place.

### 1b. 1b. Project Map and Coordinates

69. The project will be implemented in eight of Tuvalu's nine atoll islands, namely Nanumea, Nanumaga, Niutao, Nui, Vaitupu, Nukufetau, Funafuti and Nukulaelae. The site selection was guided by technical assessments on groundwater salinity present in pulaka pits on these islands<sup>[1]</sup>, as well as assessments of previously productive land that was degraded through the impacts of Tropical Cyclone Pam. Consequently, in addition to restoring degraded pulaka pits on Nanumaga, Nui and Niutao, the project will target all the existing pulaka pits currently cultivated in Tuvalu because of: i) the relatively limited size of the combined area of these sites; and ii) the equal social and agroecological importance of pulaka production across all of the country's islands. Specific sets of locally appropriate interventions for each pit will be established through on-the-ground engagements at the PPG stage. Table 4 below provides the geographic coordinates of the atolls, as well as details on the area and conditions of specific pulaka pits that will be targeted by the project. The project maps, indicating the location of the target areas on each island, are presented in Annex A.

**Table 4.** Project locations with pit area sizes, geo-referenced information and on-the-ground observations. The aim of the project is to target all pits in the country.

Island	Coordinates	Specific Pits	Observations	Area
Nanumea	05°39'55"S; 176°06'45"E	Vaipulaka ate Faifeau	Pit grown with pulaka, in good health. Pits well managed by the kaupule (Island Council)  Pit grown with pulaka, in good health  5-6 pits	4000 m <sup>2</sup>
		Vaipulaka a Haumaefa & Lolua	Small pit grown with pulaka – plants in good health  11 pits	100 m <sup>2</sup> each
		Vaipulaka a Haulagi/Ranfo	Moderate size pit partially grown with p	1575 m <sup>2</sup>

		rd	ulaka – overgrown with weeds	
Nanumanga	06°17'15"S; 176°19'15"E	Vaipulaka i Tokelau	Tokelau pit well planted with pulaka, dalo and banana	300 m <sup>2</sup>
		Vaipulaka i Toga Pit 1	70 pits planted with pulaka, dalo and bananas	150 m <sup>2</sup>
		Vaipulaka i Toga Pit 2	Dalo, pulaka and bananas – all healthy	150 m <sup>2</sup>
		Vaipulaka i Toga Pit 3	Pulaka in good health	150 m <sup>2</sup>
		Vaipulaka i Toga Pit 4	Pulaka in good health	150 m <sup>2</sup>
		Vaipulaka i Toga Pit 5	Only pulaka grown in this pit – small but healthy	150 m <sup>2</sup>
		Degraded area	Previously functional pulaka pits that were degraded through the impacts of Cyclone Pam	585 m <sup>2</sup>
Niutao	06°06'30"S; 177°20'29"E	Tepela	Partially in use – planted with dalo, pulaka – only a few surviving  Plants. 3 Pits abandoned due to poor growing conditions	No data
		Vaipulaka Lasi (West)	Main village pulaka pit – divided in half with many owners  Pit grown with banana, pulaka, dalo and some sugarcane  Pulaka and other plants are healthy and growing well	3,500 m <sup>2</sup>
		Vaipulaka Lasi (Eastern)	People are cultivating these pulaka pits	

		vaipulaka Las (Lasitini)	People are cultivating these pulaka pits regularly	
		Matakakasi	Part of this pit is well cultivated while the other part is overgrown with weeds  Where dalo and pulaka are grown they are healthy	625 m <sup>2</sup>
		Pua te talo	Pulaka, dalo and sugarcane grown – all mostly healthy  People visit these pits daily	No data
		Talo Sualiki Lolouli	A small pit with healthy pulaka	800 m <sup>2</sup>
		Degraded area	Previously functional pulaka pits that were degraded through the impacts of Cyclone Pam	25,370 m <sup>2</sup>
Nui	07°13'29"S; 177°09'37"E	Tabontepike Vaipulaka Las	Only pulaka are grown in pit – healthy	15,500 m <sup>2</sup>
		Vai ate Faifeau	Pulaka and dalo and few sugarcane – some weeds but cultivation adequate	4,950 m <sup>2</sup>
		Vai pulaka Foliki	Plants are in good health	2,200 m <sup>2</sup>
		Unknown	Pulaka, dalo and sugarcane are healthy People visit this pit regularly	1,700 m <sup>2</sup>
		Degraded area	Previously functional pulaka pits that were degraded through the impacts of Cyclone Pam	78,300 m <sup>2</sup>

Vaitupu	07°28'S; 178°41'E	Matagi	A few surviving pulaka In fair condition	100 m <sup>2</sup>
		Motufoua Seuga	Pit grown with pulaka and dalo – used by a number of farmers Pulaka seems to be in good health	200 m <sup>2</sup>
		Vailaupupua	Series of small pits mostly connected to each other – pulaka mostly healthy	400 m <sup>2</sup>
		Te Matoo	Pulaka, dalo and sugarcane – all mostly healthy	300 m <sup>2</sup>
		Tino Mate	A small pit with healthy pulaka	1,000 m <sup>2</sup>
		Fakasafu	Pulaka, dalo are grown in this pit – all in good condition	200 m <sup>2</sup>
		Te pela	Pulaka, dalo are grown in this pit – health is poor	100 m <sup>2</sup>
		Fusi	Pulaka, dalo are grown in this pit – health is poor	No data
		Tepua	Pulaka in good health	No data
		Mulifenua	Main pit grown with pulaka – abundant, good health	100 m <sup>2</sup>



Nukufetau	08°00'S; 178°30'E	Fakasafu	Healthy pulaka and dalo in this pit	100 m <sup>2</sup>
		Tepuka	Healthy pulaka and dalo in this pit	200 m <sup>2</sup>
		Potasi	Only pulaka grown in this pit – healthy	400 m <sup>2</sup>
		Falekula	Healthy pulaka are grown in this pit – some weeds	500 m <sup>2</sup>
		Vaimouku	Parts of this pit are well cultivated with healthy pulaka other areas over grown with weeds	12,500 m <sup>2</sup>
		Telelua	Pulaka, dalo and sugarcane – all look healthy	6,250 m <sup>2</sup>
		Nukuea	No standing water at time of sampling – small with healthy pulaka	100 m <sup>2</sup>
		Vaiaoga	No standing water at time of sampling – small with healthy pulaka	100 m <sup>2</sup>
		Fagalepa	No standing water at time of sampling – small with healthy pulaka	100 m <sup>2</sup>
		Fakasali	No standing water at time of sampling	100 m <sup>2</sup>

			–small with healthy pulaka	
		Matasopoga	Pulaka, dalo and sugarcane – all in good condition  Pit visited regularly	100 m <sup>2</sup>
		Tealapae Kanava	No standing water at time of sampling - small with healthy pulaka	200 m <sup>2</sup>
		Tealalusi	No data	No data
Funafuti	08°31'S; 179°12'E	Pulaka Pit Vaiaku (Southern)	Pit partially in use, planted with dalo, pulaka and bananas – banana look poor  Many areas overgrown with weeds, only small patches near shallow edges are well cultivated  Growers indicated that plants died off during recent very high tides and heavy rainfall to the bank of the pit  Planted dalo and pulaka are of average health  Partially in use, planted with dalo, pulaka, bananas, sugar cane and breadfruit	9,500 m <sup>2</sup>
		Northern pulaka Pit (Fakaifou)	Overall, this pit seems better than the above two pits with pulaka in adequate health  Pulaka, dalo, banana and some sugarcane	12,500 m <sup>2</sup>

			ne are growing in this pit	
Nukulaelae	09°22'12"S; 179°48'31"E	Vaipulaka i Mataafale	One small pit planted with pulaka – in a dequate health Pits used for pulaka, sugarcane and banana  Plants in these pits are unhealthy with yellowish leaves	11,500 m <sup>2</sup>
		Vaipulaka ite Fakai	Pit in use, grown with pulaka only – health is good  The whole pit is in use planted with mostly pulaka – also some sugarcane and banana	36,250 m <sup>2</sup>
		Motutala Vaipulaka i Motutala	This pit is located on the islet called Motutala and is used for pulaka and banana	4,250 m <sup>2</sup>

[1] SOPAC. 2007. Tuvalu Technical Report Assessment of salinity of groundwater in swamp taro (*Cyrtosperma Chamissonis*) "pulaka" pits in Tuvalu. [https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite\\_download2.php?id=9675](https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite_download2.php?id=9675)

## 2. Stakeholders

Select the stakeholders that have participated in consultations during the project identification phase:

Indigenous Peoples and Local Communities Yes

Civil Society Organizations Yes

Private Sector Entities No

If none of the above, please explain why:

70. The *Falekaupule*<sup>[1]</sup> – which will be involved in the implementation of the proposed project – were consulted extensively during the identification of the proposed project. However, to deliver the complex responses needed to further accelerate and enhance the resilience of local communities in the Tuvalu, a cross-sectoral, community-based approach is required for the further development of the project. Throughout the PPG phase and implementation, the proposed project will uphold a participatory approach and conduct ongoing stakeholder consultation periods for all activities, in addition to those that necessarily require the engagement and participation of community members, such as capacity-building, awareness-raising, and resilient livelihood enhancement. To ensure this, a comprehensive stakeholder engagement strategy will be developed during the PPG phase to facilitate appropriate gender-responsive consultations and engagements with stakeholders, including government officials, NGOs, CSOs, community members and farmers. The stakeholder engagement strategy will promote bilateral engagements between the project teams and targeted beneficiaries to provide beneficiaries with a platform to raise concerns and grievances, as appropriate. Climate change adaptation and resilience interventions in Tuvalu generally require coordinated and cross-sectoral approaches, involving a range of stakeholders from the public, private and non-governmental sectors, particularly women and the youth. As a result, Tuvalu has established institutional frameworks, coordination committees, as well as consultative mechanisms – comprising the abovementioned range of stakeholders – to address climate change- and sustainable development-related matters. To ensure the appropriateness of the proposed project, the existing mechanisms will be utilised during the PPG phase, as well as during project implementation, given that the coordination committees are responsible for managing the implementation of climate-related projects. A non-exhaustive list of potential project partners and stakeholders, including government agencies as well as civil society, private sector, academic and community organisations are provided below. The relevance to the project and the expected roles/responsibilities of each stakeholder will be determined during the PPG phase and detailed in the stakeholder engagement plan.

**Table 5.** The project's stakeholders and their role in the project.

Stakeholder(s)	Role in the project
<p><b>National government agencies and ministries</b></p> <p><i>(Ministry of Finance;</i></p> <p><i>Ministry of Public Works &amp; Infrastructure, Environment, Labour, Meteorology and Disaster;</i></p> <p><i>Ministry of Home Affairs and Agriculture, National Advis</i></p>	<p>This stakeholder group will support project implementation and provide co-financing to the project. The relevant ministries will mainstream gender considerations, climate change adaptation, EbA and SLM principles into their policies and strategies and benefit from capacity development under the project. Other relevant ministries will be consulted as needed.</p>

<p>ory Council on Climate Change, Gender Affairs Department)</p>	
<p><b>International organisations</b> <i>(UNEP Regional Office and other UN agencies, GEF Focal Point, other multilateral organisations)</i></p>	<p>These stakeholders, specifically UNEP, will provide co-finance, guide the project and ensure it is implemented effectively. The project will collaborate and engage with existing UN agencies in the target districts for complementarity and efficient resource use. Where possible, the project will support joint planning, implementation and monitoring. By collaborating with these stakeholders, both their initiatives and the project will benefit from best international knowledge and practices through knowledge sharing.</p>
<p><b>Non-governmental organisations (NGOs) and civil society organisations (CSOs)</b> <i>(Tuvalu Association of Non-Government Organisations, Tuvalu National Private Sector Organisation, Tuvalu Climate Action Network, Pacific Women)</i></p>	<p>Existing NGOs and CSOs are already supporting and implementing related activities across Tuvalu. They have the potential to provide general partnership support to project implementation, as well as sharing experiences, best practices and lessons learned on similar interventions and gender mainstreaming in the project area.</p>
<p><b>Local governing bodies</b> <i>(Falekaupule, Kaupule)</i></p>	<p>This stakeholder group will support project implementation at the local level, including mainstreaming climate change adaptation and sustainable land management principles into their policies, strategies and development plans. These stakeholders will also benefit from capacity development under the project.</p>
<p><b>Local communities, including farmers</b></p>	<p>Local communities are the direct beneficiaries of the project. Buy-in from this stakeholder group into the project interventions is necessary, as without their support and participation, the interventions will not be successful. They will benefit from awareness-raising initiatives, capacity-building programmes and interventions related to incr</p>

easing the resilience of agricultural systems, specifically in pulaka pits, as well as restored ecosystem services to reduce vulnerability to climate hazards.

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[1] This refers to the individual Councils established for Tuvalu's islands and are responsible for island-level governance.

**In addition, provide indicative information on how stakeholders, including civil society and indigenous peoples, will be engaged in the project preparation, and their respective roles and means of engagement**

### 3. Gender Equality and Women's Empowerment

Briefly include below any gender dimensions relevant to the project, and any plans to address gender in project design (e.g. gender analysis).

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71. The Tuvaluan society is predominantly patriarchal, which constrains the country's progress towards gender equality. The objective of gender equality is further restricted by a limited understanding of this concept, driven by the fact that no equivalent word for 'gender' is used in the Tuvaluan language. Nevertheless, the Tuvalu National Gender Policy (TNGP) has acknowledged this constraint and seeks to promote gender equality by identifying three primary areas of concern, namely: i) violence against women; ii) women in wage employment; and iii) women and decision-making<sup>[1]</sup>. Domestic violence is the most common form of GBV, affecting ~37% of ever-partnered women aged 15–49 in Tuvalu<sup>[2]</sup>, yet these cases are widely underreported since traditional grievance mechanisms are often preferred as a prosecution measure<sup>[3]</sup>.

72. The TNGP's second thematic area addresses the limited number of women in wage employment in Tuvalu, with only ~57% of women employed compared to ~90% of men<sup>[4]</sup>. Female labour participation in the agricultural sector and informal economy is estimated at 47.9%, while the female rate of employment is estimated at 22.7% in the same sectors. These numbers result from the traditional and stereotypical perception in the country that women are solely responsible for domestic duties. According to traditional norms, men in Tuvalu participate in professions such as seamen and technical workers whereas women mostly participate in teaching and clerk jobs.

73. The final TNGP thematic area focusses on women in decision-making, particularly in local government. As mentioned in Section 1a, decisions at the local government level are made by the *Falekaupule* with the *Kaupule* as the primary advisors. Depending on the setting and regulations of each *Falekaupule*, women are generally prohibited from attending decision-making meetings<sup>[5]</sup>, because the male head of the household is considered to represent women. The absence of women's voices at the local government level has resulted in: i) island communities' limited understanding and interest in women's development concerns; and ii) women themselves being unaware of decisions on development matters at the local level. A woman *matai* (chief) may participate in the decision-making process but is not eligible to cast a vote. Although the Falekaupule Act 1997 paves the way for the inclusion of women in the traditional decision-making process – with women slowly beginning to use this opportunity – it does not replace the existing traditional structures for decision-making on each island, which still exclude women<sup>[6]</sup>.

74. UNEP, in collaboration with the GoT, is focussed on developing women leaders and promoting gender equity. In alignment with Tuvalu's National Gender Policy, the proposed project will identify opportunities to increase women's participation in the project's activities and decision-making processes. This will be achieved by ensuring women and representatives from women's groups participate in community training programmes and consultations (Output 1.1.5) and upscaling CCA-related knowledge and the capacity of men and women stakeholders involved in the project (Output 2.1.1). Gender targets – such as the specific number of men and women from local communities – for participation and fulfilment of responsibilities will be determined during the next phase of the project development for women and the youth in Tuvalu to enable their transition to more climate-resilient livelihoods. Outcome 2.3 will also contribute to building men and women's resilience to climate change impacts by: i) developing best practice guidelines to raise awareness as well as facilitate upscaling of

EbA, climate-resilient agriculture and land management practices (Output 2.3.1); ii) producing a gender-responsive knowledge management and communication strategy for integrating EbA best practices into national plans and policies (Output 2.3.2) ; and iii) establishing gender-responsive knowledge generation programmes for public sector officials (Output 2.3.3).

75. UNEP works to increase women and girls' opportunities by integrating strategies to promote gender equality and the empowerment of women in all development projects. Gender targets for participation and fulfilment of responsibilities will be determined during the next phase of the project development for women and the youth in Tuvalu to enable their transition to more climate-resilient livelihoods. A gender assessment will be conducted in the early stages of project development to identify gender-based barriers to, and socioeconomic factors and catalysts for, building resilience in different social groups. The assessment's findings will inform project design, as well as quantitative and qualitative indicators to measure the project's gender-sensitivity and responsiveness. During the PPG phase, a comprehensive gender action plan (GAP) will be developed – informed by an in-depth gender analysis – to include clearly defined activities and targets, as well as ensure adequate resources allocated. A Gender Specialist will form part of the Project Management Unit (PMU) to oversee and ensure the effective implementation of gender-related activities.

### *Gender equality and Covid-19*

76. UNEP's gender-based Covid-19 interventions are grounded in the overall UNEP Covid-19 response which comprises four key pillars in relation to transformational change for nature and people, investment into rebuilding and modernising global environmental governance. The overall UNEP response seeks to ensure that environmental dimensions are adequately captured in the management of the Covid-19 crisis and its aftermath. Key interventions that simultaneously address gender equality and Covid-19 include: i) the development of gender mainstreaming guidelines to address the intersection between gender, environmental management and the effects of Covid-19 during project implementation; ii) addressing increasing inequalities and protecting environmental conservationists during and after the crisis; iii) the collection of sex-disaggregated data and inclusion of gender analytical data to support the delivery of policy responses; and iv) the development of integrated gender responsive environment and health methodologies, tools and policies aimed at enhancing sound conservation practices and ecosystem management and restoration

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[1] Tuvalu National Gender Policy. 2017. Available at: [http://prdrse4all.spc.int/sites/default/files/tuvalu\\_national\\_gender\\_policy.pdf](http://prdrse4all.spc.int/sites/default/files/tuvalu_national_gender_policy.pdf).

[2] Central Statistics Division (TCSD), SPC and Macro International Inc., Tuvalu Demographic and Health Survey. 2007. Available at: [http://prism.spc.int/images/documents/DHS/2007\\_Tuvalu\\_DHS-Report.pdf](http://prism.spc.int/images/documents/DHS/2007_Tuvalu_DHS-Report.pdf).

[3] United Nations Human Rights Council Universal Periodic Review: Tuvalu 3rd Cycle: 30th Session. 2018. Available at: <https://uprdoc.ohchr.org>.

[4] Tuvalu National Gender Policy. 2017. Available at: [http://prdrse4all.spc.int/sites/default/files/tuvalu\\_national\\_gender\\_policy.pdf](http://prdrse4all.spc.int/sites/default/files/tuvalu_national_gender_policy.pdf).

[5] Tuvalu National Gender Policy. 2017. Available at: [http://prdrse4all.spc.int/sites/default/files/tuvalu\\_national\\_gender\\_policy.pdf](http://prdrse4all.spc.int/sites/default/files/tuvalu_national_gender_policy.pdf).

[6] Ibid.



Does the project expect to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment? Yes

closing gender gaps in access to and control over natural resources;

improving women's participation and decision-making; and/or

generating socio-economic benefits or services for women. Yes

Will the project's results framework or logical framework include gender-sensitive indicators?

Yes

#### 4. Private sector engagement

Will there be private sector engagement in the project?

No

Please briefly explain the rationale behind your answer.

This project is about working with subsistence farming to improve food security that is impacted by climate change.

## 5. Risks to Achieving Project Objectives

Indicate risks, including climate change, potential social and environmental risks that might prevent the Project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the Project design (table format acceptable)

77. The following risks were identified. Further details on mitigation actions will be provided during the PPG phase.

**Table 6.** Risks, likelihood and risk mitigation actions.

Description	Risk Category	Impact & Probability (1-5)	Management Measures
<p>Extreme weather events (such as droughts and floods) at project sites during implementation may damage or destroy EBA activities implemented through the project.</p>	<p>Environment</p>	<p>Impact: 3  Probability: 2</p>	<ul style="list-style-type: none"> <li>· The environmental and social management plan developed during the PPG phase will ensure that infrastructure design, location, and materials used as well as the plant species mitigate against climate change risks.</li> <li>· Project implementation activities will be timed to not coincide with periods of the year when extreme weather events are more prevalent.</li> <li>· Provision will be made in workplans and budgets to allow for weather-related interruptions to ensure that the project remains on schedule.</li> <li>· Project interventions are designed to address the impacts of future climate change and to themselves be resilient to climate change hazards.</li> </ul>
<p>Women may not be able to equally benefit from project activities.</p>	<p>Social</p>	<p>Impact: 3</p>	<ul style="list-style-type: none"> <li>· The development and implementation of the gender action plan (GAP), as well as the monitoring of gender-relevant</li> </ul>

ities, such as natural resource s, as well as from partaking in community consultations and decision-making processes d uring project implementation.		Probability: 3	activities in the proposed project, will be overseen by a Gender Specialist <ul style="list-style-type: none"> <li>· who will ensure that gender equity is maintained throughout the project period.</li> </ul>
National or regional restrictions resulting from the Covid-19 pandemic may result in project delays.	Safety and Security	Impact: 1  Probability: 1	<ul style="list-style-type: none"> <li>· A Covid-19 Strategy will be developed during the PPG stage that outlines contingencies and safety protocols to mitigate against Covid-19 during project implementation. Provisions will be made in the project workplan to ensure the project remains on schedule.</li> </ul>
Conflicts and misunderstandings among public institutions, private sector partners, NGOs and resource users undermine partnership approaches and implementation of cooperative governance arrangements.	Institutional; operational	Impact: 2  Probability: 1	<ul style="list-style-type: none"> <li>· During project preparation, numerous non-governmental organisations, private sector partners, and development institutions will be consulted on the project goals and strategies.</li> </ul>
High staff turnover in the government departments and implementing agencies.	Institutional	Impact: 3  Probability: 2	<ul style="list-style-type: none"> <li>· Appoint deputies and alternative representation during project inception to ensure sufficient continuity.</li> <li>· Recruit core stand-alone staff for the project that are independent of government departments.</li> <li>· Develop handbooks in English and local languages to guide new staff who are unfamiliar with the proposed project.</li> <li>· Technical capacity will be retained within the core government staff capacitated through the project, who will be responsible for the transferring of technical knowledge to new</li> </ul>

			staff within government departments and implementing agencies, allowing for the consolidation of technical expertise related to EbA at the institutional level.
Proposed land tenure arrangements for the demarcation of farm ownership boundaries and the conservation of ecological buffer zones may restrict access to resources, affect customary land rights, and create some level of economic displacement.	Social; environmental	Impact: 3  Probability: 3	<ul style="list-style-type: none"> <li>· An Environmental and Social Management Plan (ESMP) will be developed during the PPG phase to address safeguard risks identified during the screening process: 2,5 and 7 on climate change risks, displacement and involuntary settlement and indigenous peoples.</li> <li>· During the development of land-use plans, involuntary restriction of access to resources will be limited as far as possible.</li> <li>· During the development of land-use plans, negative impacts on land tenure will be limited as far as possible</li> <li>·</li> </ul>
Limited buy-in by community leaders because of insufficient awareness and engagement as well as cultural/religious barriers.	Social	Impact: 3  Probability: 3	<ul style="list-style-type: none"> <li>· Local awareness raising and stakeholder engagement will be carried out during the PPG phase and will continue throughout project implementation. Awareness raising will focus on climate risks, sustainable livelihood opportunities and adaptation options.</li> <li>· Project activities will be designed and implemented in a way that avoids the alteration, damage or removal of any physical cultural resources and sites, as well as any sites recognised as having unique value at the community, national or international level. Regional experts will be consulted (as necessary) to ensure compliance with national heritage legislation and that project design adheres to best practice guidelines.</li> </ul>
Risk of low community owner	Social; environ	Impact: 3	<ul style="list-style-type: none"> <li>· Regular stakeholder consultations and workshops invol</li> </ul>

ship of project activities and interventions post-project implementation.	mental	Probability: 2	<p>ving local people will be conducted to encourage community participation.</p> <ul style="list-style-type: none"> <li>· Awareness-raising will be conducted on the value and importance of project activities. This will be conducted in the months leading up to project initiation as well as throughout implementation.</li> </ul>
Limited technical on-the-ground expertise for implementing project interventions.	Technical	Impact: 3  Probability: 3	<ul style="list-style-type: none"> <li>· The capacity of relevant district and local officials will be built to implement and monitor project activities effectively.</li> <li>· Regular technical oversight missions will be undertaken by UNEP staff and/or technical advisors.</li> <li>· On-the-ground training will be provided to project implementers.</li> </ul>
Ineffective coordination between climate change adaptation initiatives	Operational	Impact: 2  Probability: 3	<ul style="list-style-type: none"> <li>· Research will be conducted to ascertain what climate change- and development-related projects are being implemented in Tuvalu, as well as the scope of each project.</li> <li>· Efforts will be made during the PPG phase to engage with existing and ongoing climate change initiatives and identify potential areas for collaboration or overlap.</li> </ul>
Conflict among community members and farmers as a result of the scarcity of resources.	Social	Impact: 3  Probability: 3	<ul style="list-style-type: none"> <li>· A stakeholder engagement strategy will be developed during the PPG phase to ensure extensive consultation with targeted community members to raise awareness on proposed land-zoning plans, as well as to enable the identification of potential social conflicts as a result of the land-zoning process.</li> </ul>

			<ul style="list-style-type: none"><li>· The land-zoning process will include updating the land ownership database within the Department of Lands, which will enable the identification of existing or potential land ownership disputes.</li></ul>
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## 6. Coordination

Outline the institutional structure of the project including monitoring and evaluation coordination at the project level. Describe possible coordination with other relevant GEF-financed projects and other initiatives.

### Coordination with other projects and programmes of relevance

78. The project will collaborate with and leverage gains and innovations from other climate change-related projects in Tuvalu as well as regionally, including: i) an enabling environment for medium- and long-term adaptation planning through the National Adaptation Plan (NAP) Readiness; ii) climate-related knowledge products and information services provided under the Climate and Oceans Support Program in the Pacific; iii) lessons on promoting and facilitating inclusivity, particularly social inclusivity from Tuvalu's First Resilience Development Policy Operation with a Catastrophe-Deferred Drawdown Option; and iv) financial resources available for climate change adaptation, including institutional capacity-building efforts from the Maritime Investment in Climate Resilient Operations and Tuvalu's Coastal Adaptation projects.

79. The lead Ministry for the Project is the Ministry of Finance, which is responsible for Climate Change and Sustainable Development in Tuvalu. The country has existing institutional frameworks, coordination committees and consultative mechanisms for Climate Change and Sustainable Development that involve all government ministries and agencies, island councils, the private sector, NGOs, churches and other CSOs. In collaboration with these stakeholders, the Government of Tuvalu (GoT) has formulated national documents such as Te Kakeega III, the National Environment Management Strategy (NEMS) and the National Adaptation Plan of Action (NAPA). Tuvalu also utilises these established coordination committees to manage the implementation of all projects, because the small size of government departments reduces the feasibility of establishing individual project mechanisms.

80. At the individual island level, the project will be implemented by the *Falekaupule* (Island Councils) that have been consulted in the identification of this project and will be involved in the formulation of the project document. In December 1997, a new form of governance — named the Falekaupule Act of 1997 — was established for all island communities in Tuvalu. This governance mechanism changed the authority of individual island governance from the *Kaupule* (central government) to the *Falekaupule* (island councils) to collaborate in addressing community affairs to promote decentralisation and decrease domestic urban migration. The merging of the new *Falekaupule* administration system with traditional systems is based on full community participation and a consensual approach to governance where all members of the community — including elders, men, women, the youth and religious entities — are represented.

**Table 7.** Co-financing projects.

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Project name	Amount of funding (US\$) and source	Co-finance rational
Government of Tuvalu (Staff time)	944,000; GoT	In-kind co-finance reflected in staff time and salaries as provided by GoT.
Climate and Oceans Support Program in the Pacific (COSPPAC, E13046, 2019–2022) <sup>[1]</sup> <sup>[2]</sup>	760,500; Government of Australia	COSPPAC 2 is an Australian-led multi-country programme established to address climate change and disaster resilience in the Pacific, particularly the Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Niue, Nauru, Papua New Guinea, Palau, Samoa, Solomon Islands, Tonga, Tuvalu – who will receive a proportion of 4.5% from the project – and Vanuatu. The objective of this programme is to address climate change and disaster resilience in the Pacific by developing useful products and services to governments and communities, building resilience to the impacts of climate change, climate variability and disasters. These products and services include the Ocean Portal, SCOPIC, Online Climate Outlook Forum (OCOF), Water Storage Outlook Model, tidal information, sea level data, Malaria Early Warning System, Drought Monitoring and Response System and the Climate Bulletin. The knowledge management and communication strategy will build from the knowledge products and services developed by COSPPAC to ensure adequate and meaningful upscaling and awareness-raising of ecosystem-based adaptation (EbA) and climate resilience.
Enhancing climate information and knowledge services for resilience in 5 island countries of the Pacific Ocean, (2021 – 2026)	3,781,145 GCF; UNEP	This programme was developed to implement integrated climate and ocean information services and impact-based MHEWS in Cook Islands, Niue, Palau, Republic of the Marshall Islands and Tuvalu, while simultaneously addressing the major barriers to coherent systems. The objective of this programme is to address the common vulnerabilities of the island populations, their livelihoods and assets to climate change impacts and multi climate-related hazards. The programme will ensure that integrated climate information and early warning systems are in place in the five islands and sustained in response to continued demand.
<b>Total</b>	<b>5,485,645</b>	

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[1] Development Portal. Tuvalu. COSPPAC – Climate and Oceans Support Program in the Pacific (E13046). Available at: [http://d-portal.org/ctrack.html?country\\_code=TV&sector\\_group=311%2C740%2C410&status\\_code=4%2C3%2C2%2C1#view=act&aid=NZ-1-ACT-0100240](http://d-portal.org/ctrack.html?country_code=TV&sector_group=311%2C740%2C410&status_code=4%2C3%2C2%2C1#view=act&aid=NZ-1-ACT-0100240)

[2] Australian Government. Bureau of Meteorology. Climate and Oceans Support Program in the Pacific. Available at: <http://cosppac.bom.gov.au/about-cosppac/>

## 7. Consistency with National Priorities

Is the Project consistent with the National Strategies and plans or reports and assessments under relevant conventions?

If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc

81. The project's goal of facilitating sustainable, climate-resilient pulaka production and reducing dependence on nutrient-poor imported staple foods will support the objectives of Tuvalu's National Strategy for Sustainable Development (2021–2030), which advocates for a 'healthier people'. The project also supports the goals of Tuvalu's National Climate Change Policy (2021–2030) which prioritise addressing the adaptation challenges facing traditional crops such as pulaka – particularly the challenges of saltwater intrusion, coastal flooding and prolonged dry periods. A priority action of the policy is to invest in and support innovative farming practices and planting of climate-resilient crop varieties that are appropriate for Tuvalu's conditions to enhance household food security and climate-resilient agricultural practices in the country. Additionally, pulaka's ability to withstand cyclones in combination with an increased resilience to saltwater will support Tuvalu's National Adaptation Plan of Action (2007), which identifies several adaptation strategies targeted for alleviating the most prevalent impacts of climate change in Tuvalu, including the reduction of pulaka pit salinisation as a result of saltwater intrusion. The project's consistency with Tuvalu's national development and adaptation priorities is described in further detail below.

82. **Tuvalu National Strategy for Sustainable Development (Te Kete, 2021–2030)**<sup>[1]</sup> – which succeeds Te Kakeega, Te Kakeega II and Te Kakeega III – has an overarching vision of achieving a more protected, secure and prosperous Tuvalu; with healthier people who are more engaged in national, regional and international forums; and a government fully committed to honouring Tuvalu's international commitments and respecting its partnerships. Te Kete comprises five strategic priority areas, and while the proposed project will contribute to the achievement of each priority area, the project particularly aligns with the first strategic priority which aims to, *inter alia*, increase climate change and disaster resilience. The proposed project complements several strategic actions identified in Te Kete, including implementing a land rehabilitation and reclamation framework that strengthens resilience to sea level rise and other climate impacts.

83. **Tuvalu National Climate Change Policy (Te Vaka, 2021–2030)** aims to use adaptive management to build the resilience of Tuvalu's people and natural ecosystems to climate change impacts by 2030. Te Vaka was developed in accordance with Tuvalu's Climate Change Resilience Act (2019) and in alignment with with Te Kete. The proposed project aligns with and contributes to 'Outcome 2: Reduced vulnerability to climate change impacts through enhanced resilience' of Te Vaka, particularly by adopting adaptation planning and building the resilience of the identified priority sectors, including agriculture and coastal management. Te Vaka notes the negative impact the decline of traditional crops, such as pulaka, has on the health and cultural wellbeing of Tuvaluans. Resultantly, the policy identifies the investment and support of farming practices and planting of climate-resilient crop varieties that are appropriate for Tuvalu's conditions as a priority adaptation action.

84. **The Tuvalu State of the Environment Report (2022)**<sup>[2]</sup> highlights the country's particular vulnerability to sea-level rise, changes in rainfall variability, as well as the intensity and frequency of extreme weather events. The report provides, as recommendations for building climate resilience, the guiding principles on which the preceding National Climate Change Policy (2012) was based. The principles the proposed project will directly contribute to include, *inter alia*: i) strengthening adaptation actions to address current and future vulnerabilities; and ii) improving understanding and application of climate change data information and site-specific impacts assessment to inform adaptation and disaster risk reduction programmes.

85. **Tuvalu Climate Change Resilience Act (2019)**<sup>[3]</sup> was developed to, *inter alia*: i) provide the legal basis for climate change resilience policy and law and complements climate-related provisions in other laws; ii) establish the role of the GoT in coordinating climate change actions and establishing effective governance structures for the implementation of sound climate change policies; and iii) promote public awareness and involvement in climate change concerns and preserve Tuvalu's cultural heritage as it relates to the natural ecosystems. The policy objectives of which the proposed project contributes to include, *inter alia*: i) building the resilience of Tuvalu's infrastructure, built environment and communities through effective adaptation and disaster preparedness actions; and ii) managing Tuvalu's natural resources, environment, ecosystems and biodiversity to promote their resilience to the impacts of climate change.

86. **The National Disaster Management Act of 2007 (revised in 2008)**<sup>[4]</sup> provides for the management of the pre- and post-effects of natural disasters and the institutional framework, plans and procedures for disaster management, such as the implementation of contingency plans, early warning systems and communication protocols. Under this Act, the National Disaster Committee (NDC) was established, which functions as an advisory and coordination body for disaster mitigation, preparedness, response and recovery. In addition, the **Tuvalu National Disaster Plan (1997)**<sup>[5]</sup> defines the actions to deal with disasters in Tuvalu, including determining roles and actions for the GoT and NGOs. Although the proposed project will not directly contribute towards disaster risk management, the interventions will facilitate strengthened institutional and organisational capacities of stakeholders for addressing climate-related disasters and contribute towards Tuvalu's resilience to disasters.

87. Tuvalu submitted their **Intended Nationally Determined Contributions (INDCs)**<sup>[6]</sup> to the UNFCCC Secretariat on 27 November 2015. Further revisions to the INDC were not undertaken and the same document was endorsed and submitted as the first **Nationally Determined Contributions (NDC)** on 22 April 2016<sup>[7]</sup>. The INDC primarily focusses on mitigation and Tuvalu commits to reducing GHG emissions from the electricity generation sector by 100% by 2025. To meet these targets, Tuvalu aims to i) generate electricity using renewable energy in all nine islands; ii) improve energy efficiency – which will be initially targeted on Funafuti and supported by public education, energy audits and technology improvements; and iii) introduce legislation to promote energy efficiency and control the importation, use and sale of inefficient electrical appliances.

88. The **Second National Communications of Tuvalu (SNC, 2015)**<sup>[8]</sup> identifies seven sectors which are highly vulnerable to climate change and require actions to enhance their adaptive capacity. These include: i) coastal protection; ii) water resources; iii) biodiversity; iv) agriculture; v) energy; vi) waste management; and vii) human health. Although Tuvalu has made efforts towards building the country's resilience to climate change, considerable barriers

remain with regards to technology transfer, climate change research, education, training and awareness, as well as capacity building and data availability. The proposed project aligns with the SNC and will contribute towards building the adaptive capacity of coastal ecosystems, water resources and agriculture.

89. **Tuvalu's National Gender Policy (TNGP, 2014)**<sup>[9]</sup> aims to achieve the recognition of women and girls in Tuvalu as partners and beneficiaries equal to men and boys in all aspects of development and decision-making, as well as to ensure the progressive realisation of women's human rights. The proposed project's gender-responsive approach aligns with three out of five priority outcomes<sup>[10]</sup> highlighted in the TNGP, namely: i) increasing capacity within all sectors of the GoT to address primary concerns in achieving gender equality and women's empowerment; ii) reflecting the GoT's commitments to gender equality and women's empowerment in legislation and sector policies affecting government and civil society; and iii) implementing measures to ensure women and men's equal access and full participation in decision-making to enhance women's leadership and governance at all levels.

90. Tuvalu's **National Adaptation Plan of Action (NAPA, 2007)**<sup>[11]</sup> highlighted climate change impacts which present considerable challenges to the population. These include: i) coastal erosion, saltwater intrusion and increasing vector- and water-borne diseases as a result of sea level rise; ii) inadequate potable water as a consequence of less rainfall and prolonged droughts; iii) pulaka pit salinisation as a result of saltwater intrusion; and iv) decreasing fish stocks. The NAPA provides several adaptation projects which will contribute to enhancing the resilience to these impacts, including: i) 'Increasing subsistence pit grown pulaka productivity through introduction of a salt-tolerant pulaka species' – on which the proposed project will particularly build; ii) 'Adaptation to frequent water shortages through increasing household water capacity, water collection accessories, and water conservation techniques'; and iii) 'Increasing resilience of Coastal Areas and Settlement to climate change'.

91. The aim of the **National Action Plan to Combat Land Degradation and Drought (2006)**<sup>[12]</sup> is to address the underlying causes of land degradation and drought and identify measures to prevent and rehabilitate degraded land. This plan identifies the major causes of land degradation as, *inter alia*, SLR – which will be exacerbated under future climate change, unsustainable agricultural practices, ineffective land-use planning and unsustainable use of watersheds. The NAP highlighted priority activities and prioritised projects and programmes aligning with these activities, effectively contributing to Tuvalu meeting its sustainable development goals. These priority activities relate to, *inter alia*: i) providing enabling activities, such as strengthening institutional capacity of institutions and organisations to effectively address land degradation and sustainable development; ii) monitoring and creating an inventory of land degradation; iii) preventing land degradation; iv) rehabilitating degraded land; v) establishing sustainable land management plans; vi) monitoring and mitigating the impacts of drought; and vii) integrating Indigenous and traditional knowledge into modern technology. The interventions under the proposed project will directly contribute towards sustainable development by promoting and enabling sustainable land management practices.

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<sup>[1]</sup> Government of Tuvalu. Te Kete: National Strategy for Sustainable Development (2021–2030). Available at: <https://australiaawardsfijiandtuvalu.org/wp-content/uploads/2021/01/Te-Kete-2021-2030-National-Development-Strategy.pdf>

- [2] Pacific Regional Environment Programme. Tuvalu: State of the Environment. Available at: <https://library.sprep.org/content/tuvalu-state-environment-report-2022>
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## 8. Knowledge Management

**Outline the knowledge management approach for the Project, including, if any, plans for the Project to learn from other relevant Projects and initiatives, to assess and document in a user-friendly form, and share these experiences and expertise with relevant stakeholders.**

92. Knowledge management will contribute substantially towards the project's outcomes by enabling the replication and upscaling of the adaptation strategies mentioned above in Section 1.a. First, gender-responsive training programmes – based on best practices and lessons learned – will be structured to inform local communities, farmers and public sector officials of climate change impacts and the adaptation strategies available for adoption and implementation. In particular, eight community training groups will be established around the pilot sites – comprising farmers and communities engaged with pulaka pit agriculture – to upscale best practices and awareness of adaptation strategies among stakeholders. Notably, the proportional representation of women and the youth will be ensured by encouraging the participation of women and women's groups. This diverse representation will be underpinned by a detailed gender analysis conducted during the PPG phase to assess appropriate methodologies to establish effective gender-responsive training groups. In addition, 50 government officials, including officers and community representatives, will receive training on how to integrate EbA, climate-resilient agriculture and SLM principles into policy and planning at national and community levels.

93. Following the training programmes, a comprehensive communication strategy will be developed to facilitate the distribution of gender-responsive and locally-appropriate scientific information. Complementary to these training programmes, these communication tools will inform stakeholders of best practices regarding the integration of EbA and lessons learned into planning and policy at national and community levels. These communication tools will strengthen the institutional capacity of Tuvalu to climate change adaptation and promote the inclusivity of women and the youth into EbA practices. Tuvalu's National Adaptation Plan (NAP) Readiness Proposal includes the development of guidelines to support the integration of gender and youth challenges into climate change adaptation (CCA) planning and programming in the priority sectors. The proposed project's communication strategy will adopt these guidelines to ensure continued gender mainstreaming during the implementation of the project. At present, there are limited tools and methodologies available for the distribution of relevant information (Barrier 1), preventing the uptake of CCA actions at the local level. The project will address this problem by improving access to and understanding of relevant scientific data, focusing on the uptake of EbA and climate-resilient agriculture. Importantly, the project recognises the cultural and religious barriers to the acceptance and understanding of climate-related data, even where readily available. The communication strategy will, therefore, be appropriately designed to deal with misconceptions around climate change in a culturally sensitive manner.

94. Finally, a knowledge management system – informed by the communication strategy – will be implemented to facilitate the uptake of information by relevant stakeholders and integrate new information and lessons learned throughout the project. The knowledge products included in the management system will be developed in a gender-responsive manner – considering the gender landscape in Tuvalu as per the gender analysis – to ensure their appropriateness and inclusivity and promote action and agency from men, women and the youth. Accordingly, the project's knowledge management approach will include gender-sensitive principles such as: i) using male and female knowledge product and public education material developers for a diversity of perspectives and approaches, as well as male and female reviewers of these products; ii) using gender-sensitive language and gender balanced images (women not presented as victims but as agents of change); iii) checking context and content (using gender analysis; using convincing gender arguments

based on reliable sources and qualitative and quantitative data including sex disaggregated data); and iv) referring to (inter-)national policy framework, policies, strategies and plans, as applicable and appropriate. In addition, this knowledge management system will provide the necessary foundation for the continued management and dissemination of relevant information both during and after the project's lifecycle. This will also enable the upscaling and replication of best practices across other SIDS as mentioned under Scalability above. Combined, the training programmes, communication strategy and knowledge management system will collectively facilitate the permanent adoption of gender-responsive, climate-resilient agricultural practices and enable local farmers and community members to implement these adaptive strategies after the completion of the project.

### 9. Environmental and Social Safeguard (ESS) Risks

Provide information on the identified environmental and social risks and potential impacts associated with the project/program based on your organization's ESS systems and procedures

**Overall Project/Program Risk Classification\***

PIF	CEO Endorsement/Approval	MTR	TE
Medium/Moderate			

**Measures to address identified risks and impacts**

Provide preliminary information on the types and levels of risk classifications/ratings of any identified environmental and social risks and potential impacts associated with the project (considering the GEF ESS Minimum Standards) and describe measures to address these risks during the project design.

Find attached, the UNEP Safeguard Risk Identification Form (SRIF) checklist attached below with preliminary information on the types and levels of risk classifications/ratings of any identified environmental and social risks and potential impacts associated with the project (considering the GEF ESS Minimum Standards).



**Supporting Documents**

Upload available ESS supporting documents.

**Title**

**Submitted**

SRIF PIF\_Tuvalu\_9 May 2022

SRIF PIF\_Tuvalu

**Part III: Approval/Endorsement By GEF Operational Focal Point(S) And GEF Agency(ies)**

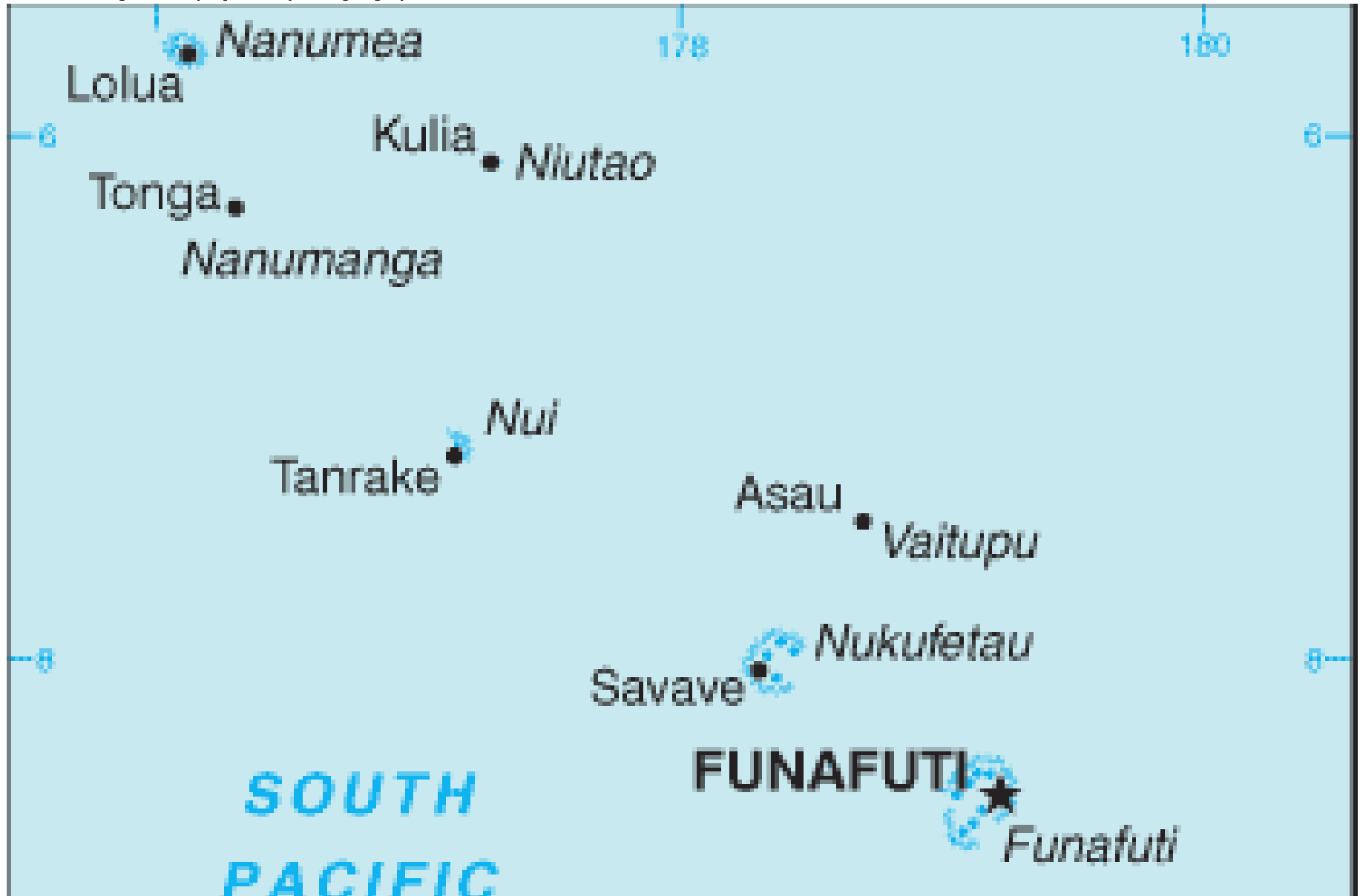
**A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S): (Please attach the Operational Focal Point endorsement letter with this template).**

<b>Name</b>	<b>Position</b>	<b>Ministry</b>	<b>Date</b>
Tilia Tima	Director of Environment	GEF operational Focal Point	2/17/2022

ANNEX A: Project Map and Geographic Coordinates

Please provide geo-referenced information and map where the project intervention takes place

Annex A: Programme/project map and geographic coordinates



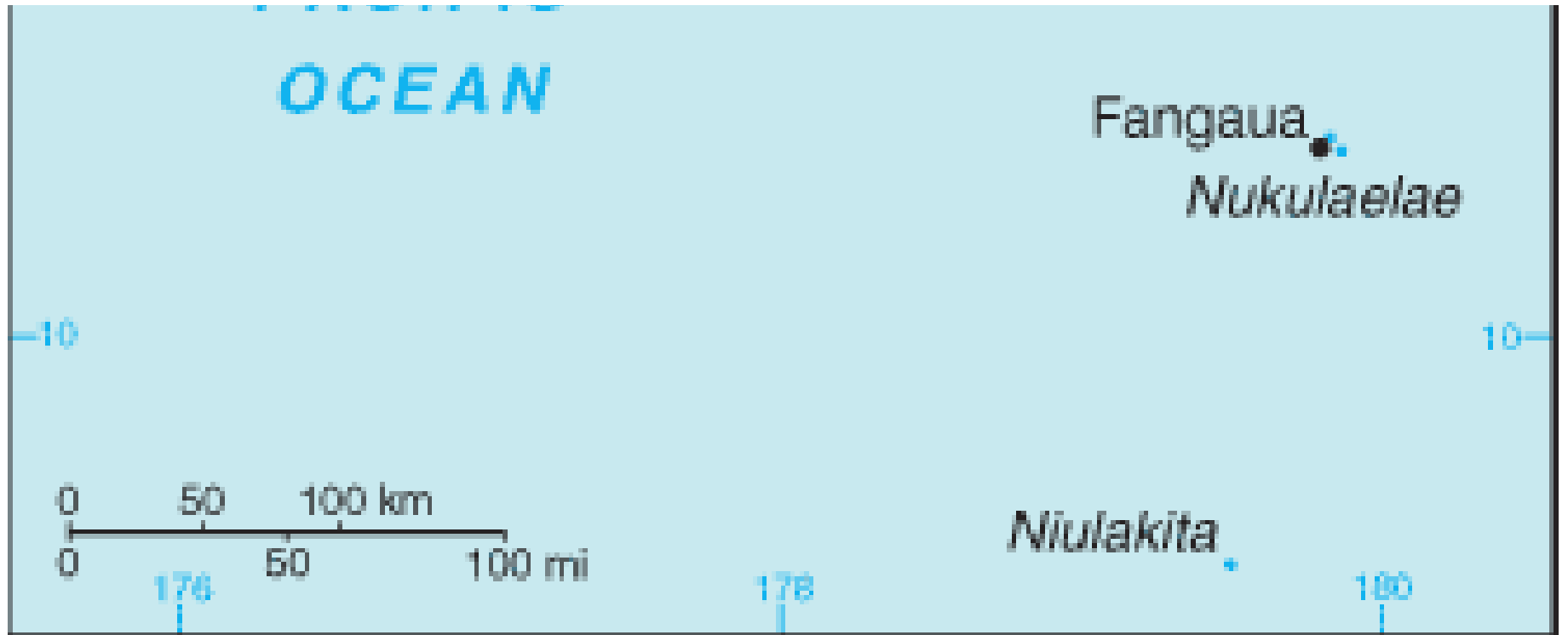


Figure 7. Map of Tuvalu, with the geographic positions of the target atolls, Nanumea, Nanumaga, Niutao, Nui, Vaitupu, Nukufetau, Funafuti and Nukulaelae shown[1].





Figure 8. Map of target pulaka pit locations on Nanumea atoll.









Figure 9. Map of target pulaka pit locations on Nanumaga atoll.



Figure 10. Map of target pulaka pit locations on Niutao atoll.

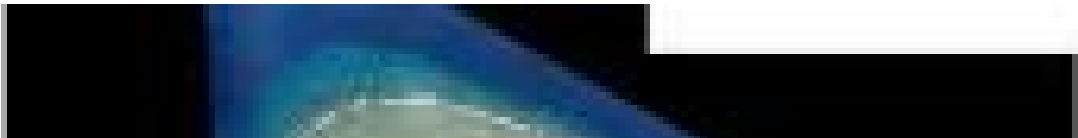






Figure 11. Map of target pulaka pit locations on Nui atoll.

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[1] CIA World Fact Book. 2006. Available at: <https://upload.wikimedia.org/wikipedia/commons/9/95/Tv-map.png>