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

Sector
Climate Change Adaptation Sector

Taxonomy

Focal Areas, Climate Change, Climate Change Adaptation, Influencing models, Strengthen institutional capacity and decision-making, Stakeholders, Private Sector, Financial intermediaries and market facilitators, Local Communities, Gender Equality, Gender Mainstreaming, Gender results areas, Capacity Development, Participation and leadership, Capacity, Knowledge and Research, Enabling Activities, Civil Society, Community Based Organization, Type of Engagement, Information Dissemination, Partnership, Communications, Awareness Raising, Education, Access and control over natural resources, Sex-disaggregated indicators, Gender-sensitive indicators, Women groups, Knowledge Exchange, Learning

Rio Markers

Climate Change Mitigation

Significant Objective 1

Climate Change Adaptation

Principal Objective 2

Biodiversity

Significant Objective 1

Land Degradation

Significant Objective 1

Submission Date

6/23/2023

Expected Implementation Start

1/1/2024

Expected Completion Date

1/1/2029

Duration

60In Months

Agency Fee($)

419,540.00

A. FOCAL/NON-FOCAL AREA ELEMENTS

Objectives/Programs	Focal Area Outcomes	Trust Fund	GEF Amount($)	Co-Fin Amount($)
CCA-1	Outcome 1.1: Technologies and innovative solutions piloted or deployed to reduce climate-related risks and/or enhance resilience	LDCF	3,091,347.00	4,619,410.00
CCA-2	Outcome 2.1: Strengthened cross-sectoral mechanisms to mainstream climate adaptation and resilience Outcome 2.2: Adaptation considerations mainstreamed into investments Outcome 2.3: Institutional and human capacities strengthened to identify and implement adaptation measures	LDCF	1,324,863.00	9,497,264.00
		Total Project Cost($)	**4,416,210.00**	**14,116,674.00**

B. Project description summary

Project Objective

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

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
1. Identifying and implementing integrated land management and ecosystem restoration strategies for increased resilience.	Investment	1.1. Restoration and increased resilience of 46 ha of agricultural systems on 8 islands against the impacts of climate change and salt-water intrusion through innovative land management and agricultural practices.	1.1.1. National pulaka pit health and groundwater assessment undertaken on all 8 target islands. 1.1.2. 449 raised concrete beds introduced to 8 target islands to upscale the Climate Proofing Project.1.1.3. Alternative irrigation strategies, including drip irrigation, rooftop rainwater harvesting and water tanks installed to facilitate water supply to 449 raised concrete beds introduced on each of the 8 target islands. 1.1.4. Diversified cropping strategies introduced to 449 raised concrete beds and pulaka pits to promote the use of climate-resilient crops. 1.1.5. 8 community	LDCF	2,192,208.00	4,244,410.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
			training groups ? including representatives from women?s groups ? established around target sites to generate knowledge of appropriate methodologies and upscale best practices of adaptation strategies among stakeholders.			

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
1. Identifying and implementing integrated land management and ecosystem restoration strategies for increased resilience.	Investment	1.2. Groundwater infiltration and flood-risk reduction services improved on 8 islands through SLM practices that include the restoration and conservation of degraded atoll ecosystems.	1.2.1. 534 ha of coastal ecosystems restored or conserved to enhance the provision of associated ecosystem services, including flood reduction and storm surge attenuation. 1.2.2. Groundwater recharge zones in and around ~62 active pulaka pits areas protected using Ecosystem-Based Adaptation (EbA) buffer zones to improve freshwater infiltration potential. 1.2.3. Sustainable, diversified livelihoods strategies introduced for ~800 people (400 women and 400 men) in local communities	LDCF	922,988.00	

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
			reliant on natural resource-based livelihoods including sustainable fisheries management to conserve coastal ecosystems and their services.			

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
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.	Technical Assistance	2.1. Institutional uptake of EbA enhanced through policy revisions and capacity building among core government staff, professionals and community reprsentatives.	2.1.1. Revisions made to 3 national policies and procedures relevant to EbA, water and agriculture to align with the Government of Tuvalu (GoT)'s broader sustainability indicators, streamline funding for adaptation priorities and facilitate coordination between government agencies 2.1.2. Training conducted for 100 government officials, with a focus on technical officers, coastal adaptation management professionals, gender experts, representatives from women?s groups and community representatives on the integration of EbA, climate-resilient agriculture and Sustainable Land Management	LDCF	545,402.00	3,567,607.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
			(SLM) principles into policies and planning at both national and community levels.			
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.	Technical Assistance	2.2. Develop and implement strategic action plans for streamlining EbA national policy and planning frameworks	2.2.1. Guidance Note for compliance monitoring and implementation of EbA policy recommendations prepared under Output 2.1.1. 2.2.2. Land-use Zoning Plan developed to enable EbA, climate-resilient agriculture and SLM under existing land tenure systems.	LDCF	335,632.00	5,056,000.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
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.	Technical Assistance	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.	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	LDCF	209,770.00	498,657.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
			using the results of the direct capacity building of technical officers in Output 2.1.2.			
				Sub Total ($)	**4,206,000.00**	**13,366,674.00**
Project Management Cost (PMC)						
				LDCF	210,210.00	750,000.00
				Sub Total($)	**210,210.00**	**750,000.00**
				Total Project Cost($)	**4,416,210.00**	**14,116,674.00**

Please provide justification

C. 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($)
Recipient Country Government	Government of Tuvalu	In-kind	Recurrent expenditures	750,000.00
Donor Agency	The Tuvalu Coastal Adaptation Project (TCAP	Grant	Investment mobilized	8,201,000.00
Donor Agency	Enhancing climate information and knowledge services for resilience in 5 island countries of the Pacific Ocean, (2021 ? 2026)	Grant	Investment mobilized	4,182,674.00
Donor Agency	Small Islands Food and Water Project (SIFWaP)	Grant	Investment mobilized	983,000.00
			Total Co-Financing($)	**14,116,674.00**

Describe how any "Investment Mobilized" was identified

In consultation with key stakeholders, three grant co-financing sources through investment mobilized have been identified to support the proposed project, including through the ?The Tuvalu Coastal Adaptation Project (TCAP)?, ?Enhancing climate information and knowledge services for resilience in 5 island countries of the Pacific Ocean? and ?Small Islands Food and Water Project (SIFWaP)? projects. The ?Enhancing climate information and knowledge services for resilience in 5 island countries of the Pacific Ocean? project, implemented by UNEP was identified for co-financing during the PIF stage and confirmed to still be relevant during the PPG stage through discussions with the Tuvalu Ministry of Finance (MoF). During the PPG stage, The TCAP and SIFWAP projects were also identified as potential sources by the MoF. For each project, the expected implementation period was confirmed to align with that expected for the proposed project and a comparison undertaken to determine the specific outcomes for each project that contribute to the achievement of the proposed project?s objectives.

D. 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($)
UNEP	LDCF	Tuvalu	Climate Change	NA	4,416,210	419,540	4,835,750.00
			Total Grant Resources($)		**4,416,210.00**	**419,540.00**	**4,835,750.00**

E. Non Grant Instrument

NON-GRANT INSTRUMENT at CEO Endorsement

Includes Non grant instruments? **No**

Includes reflow to GEF? **No**

F. 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($)
UNEP	LDCF	Tuvalu	Climate Change	NA	150,000	14,250	**164,250.00**
			Total Project Costs($)		**150,000.00**	**14,250.00**	**164,250.00**

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

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

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

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

Agriculture	**20.00%**
Natural resources management	**15.00%**
Climate information services	**5.00%**
Coastal zone management	**20.00%**
Water resources management	**20.00%**
Disaster risk management	**10.00%**
Other infrastructure	**5.00%**
Health	**5.00%**
Other (Please specify:)	**0.00%**
Total	**100%**

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

Sea level rise true
Change in mean temperature true
Increased climatic variability true
Natural hazards true
Land degradation true
Coastal and/or Coral reef degradation true
Groundwater quality/quantity true

Core Indicators - LDCF

CORE INDICATOR 1

Total
Male
Female
% for Women
Total number of direct beneficiaries
4,200
2,100
2,100
50.00%

CORE INDICATOR 2

Area of land managed for climate resilience (ha)

567.00

CORE INDICATOR 3

Total no. of policies/plans that will mainstream climate resilience

4

CORE INDICATOR 4

Male

Female

% for Women

Total number of people trained

4,300

2,150

2,150

50.00%

To calculate the core indicators, please refer to Results Guidance

OBJECTIVE 1

Reduce vulnerability and increase resilience through innovation and technology transfer for climate change adaption

OUTCOME 1.1

Technologies and innovative solutions piloted or deployed to reduce climate-related risks and / or enhance resilience

View

OUTCOME 1.2

Innovative financial instruments and investment models enabled or introduced to enhance climate resilience

View

OBJECTIVE 2

Mainstream climate change adaption and resilience for systemic impact

OUTCOME 2.1

Strengthened cross-sectoral mechanisms to mainstream climate adaption and resilience

View

OUTCOME 2.2

Adaptation considerations mainstreamed into investments

View

OUTCOME 2.3

Institutional and human capacities strengthened to identify and implement adaptation measures

View

OBJECTIVE 3

Foster enabling conditions for effective and integrated climate change adaption

OUTCOME 3.1

Climate-resilient planning enabled by stronger climate information decision-support services, and other relevant analysis, as a support to NAP process and/or for enabling activities in response to COP guidance

View

OUTCOME 3.2

Increased ability of country to access and/or manage climate finance or other relevant, largescale, pragmatic investment, as a support to NAP process and/or for enabling activities in response to COP guidance

View

OUTCOME 3.3

Institutional and human capacities strengthened to identify and implement adaptation measures as a support to NAP process and/or for enabling activities in response to COP guidance

View

Part II. Project Justification

1a. Project Description

No major changes have been made for Component 2 of the project. For Component 1, however, several design changes have been made based on field visits and stakeholder consultations undertaken during the PPG phase. Output 1.1.1 has been changed from the rehabilitation of degraded pulaka pits to the development of a comprehensive pulaka pit salinity and health assessment. Clarity has been provided for Output 1.1.2 regarding the use of raised concrete beds, which will not be implemented within pulaka pit area, but rather as separately located structure that upscale the approach taken by the Climate Proofing Project. Additionally, the area of agricultural areas made more climate-resilient and ecosystems restored or conserved has been increased. Further descriptions of the changes in these outputs from the PIF stage are provided in Table 3. The co-financing amount for the proposed project has been increased from the estimated amount in the PIF of US$5,485,645 to US$14,116,674. This was based on the addition of new projects eligible for co-financing, including the "Tuvalu Coastal Adaptation Project? and ?Small Islands Food and Water Project?, in addition to the ?Enhancing climate information and knowledge services for resilience in 5 island countries of the Pacific Ocean? project already identified in the PIF. The ?Climate and Oceans Support Program in the Pacific? project originally proposed for co-financing in the PIF has been excluded as it has reached the end of its implementation period.

Table 3. Changes to the outcomes and outputs from the PIF made during the PPG phase.

Outcome/Output wording at PIF stage	Outcome/Output wording at PPG stage and changes made
Outcome 1.1. Restoration of 10 ha of degraded pulaka pits and increased resilience of 13 ha of agricultural systems on 8 islands against the current impacts of climate change and saltwater intrusion through innovative land management and agricultural practices.	Outcome 1.1. Restoration and increased resilience of 46 ha of agricultural systems on 8 islands against the impacts of climate change and salt-water intrusion through innovative land management and agricultural practices. The total agricultural area to be made more climate-resilient has been increased from 23 ha to 46 ha because of the inclusion of intercropping zones around the identified pulaka pits.

Output 1.1.1. Rehabilitation of 3 historically degraded pulaka pit areas carried out.	Output 1.1.1. National pulaka pit health and groundwater assessment undertaken on all 8 target islands. This output has been changed from the PIF stage based on field visits and consultations to not include the rehabilitation of 3 historically degraded pits. This decision was made for several reasons: i) on Nanumanga, there is limited interest among the community to restore the degraded pulaka pit which is not on the beach and is the location for a planned harbour development; ii) on Nui, much of the pulaka pit area originally identified as being degraded has already been rehabilitated (the area has instead been incorporated under Output 1.1.4); iii) on Nuitao, the location and extent of the originally identified pulaka pit area is unclear and there is limited interest among the community to restore it; iv) the relocation of degraded pulaka pits presented several challenges, including conflicts with landowners; and v) the irrigation strategies needed to support these large areas of pulaka pits would have been too large a scale for the proposed project. The output has instead been changed to undertake a revised pulaka pit health assessment, building on the one completed in 2007. This assessment will provide critical insight for the proposed project and will inform future pulaka pit initiatives.
Output 1.1.2. Proven climate-resilient technologies and practices ? such as raised concrete beds and impermeable geomembranes to minimise saltwater intrusion under current climate change ? implemented in ~32 pulaka pit areas.	Output 1.1.2: 449 raised concrete beds introduced to 8 target islands to upscale the Climate Proofing Project. The wording of the output has been changed to reflect the number of raised concrete beds proposed by the Ministry of Finance (MoF), namely 449 concrete beds. The intention of this output has also been clarified following discussions with the MoF, from using concrete beds and impermeable geomembranes on active pulaka pit areas, to the introduction of raised concrete beds in addition to and separate from existing pulaka pit areas, thereby upscaling the Climate Proofing Project. Community members indicated a preference for concrete beds closer to their homes. Also, the introduction of impermeable membranes on pulaka pits poses complications regarding the provision of sufficient water for the pulaka pit. Lastly, the country?s complex landownership system means that introducing permanent structures such as concrete beds to existing pulaka pits may result in conflicts between landowners in the future[1][1].

Output 1.1.3. Alternative irrigation strategies ? such as drip irrigation from roof catchments and tanks/micro-dams ? installed to improve water supply to ~32 pulaka pit areas.	Output 1.1.3. Alternative irrigation strategies, including drip irrigation, rooftop rainwater harvesting and water tanks installed to facilitate water supply to 449 raised concrete beds introduced on each of the 8 target islands. The wording of the output ? specifically regarding the number of raised concrete beds and the number of islands they will be introduced to ? has been changed to align with changes and clarifications provided in Output 1.1.2. It is made clearer that irrigation technology will specifically support the raised concrete beds introduced in Output 1.1.2.
Output 1.1.4. Diversified cropping strategies introduced to ~32 pulaka pit areas to promote the use of climate-resilient crops that are able to withstand atoll conditions under climate change while simultaneously enhancing soil quality. These strategies will include raising plants around pulaka pits to generate organic material for remediation.	Output 1.1.4: Diversified cropping strategies introduced to 449 raised concrete beds and 62 pulaka pits to promote the use of climate-resilient crops. Pulaka pit area has been replaced with ?concrete beds and pulaka pits? to provide more clarity. The wording has been made more succinct, with details provided in the project descriptions.
Output 1.1.5. 8 community training groups ? including representatives from women?s groups [1] ? 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.	Output 1.1.5. 8 community training groups ? including representatives from women?s groups ? established around target sites to generate knowledge of appropriate methodologies and upscale best practices of adaptation strategies among stakeholders. The wording has been shortened to make the output more succinct. Pilot sites has been modified to target sites to capture the larger extent of the project interventions.
Outcome 1.2 Groundwater infiltration and flood-risk reduction services improved on 8 islands through SLM practices that include the restoration and conservation of degraded atoll ecosystems.	No change.
Output 1.2.1. 180 ha 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.	Output 1.2.1. 430 ha of coastal ecosystems restored or conserved to enhance the provision of associated ecosystem services, including flood reduction and storm surge attenuation. The area of ecosystems to be restored and conserved has been increased to 430 ha, based on the establishment of proposed terrestrial and marine conservation areas.
Output 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.	Output 1.2.2. Groundwater recharge zones in and around ~62 active pulaka pit areas protected using EbA buffer zones to improve freshwater infiltration potential. 32 pulaka pit areas have been replaced with ~62 active pulaka pit areas following further investigations during the PPG phase.

Output 1.2.3. Diversified livelihoods strategies introduced for ~800 people in local communities reliant on natural resource-based livelihoods based on sustainable fisheries management to conserve coastal ecosystems and their services.	Output 1.2.3. Diversified livelihoods strategies introduced for ~800 people (400 women and 400 men) in local communities reliant on natural resource-based livelihoods based on sustainable fisheries management to conserve coastal ecosystems and their services. No change. Gender disaggregation for the number of people trained has been included in the Output wording.
Outcome 2.1. Institutional uptake of EbA enhanced through policy revisions and capacity building among core government staff.	Outcome 2.1. Institutional uptake of EbA enhanced through policy revisions and capacity building among core government staff, professionals and community groups. No change. The range of beneficiaries has been increased in the Outcome wording to include professionals and community representatives.
Output 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.	Output 2.1.1. Revisions made to 3 national policies and procedures 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. The wording has been shortened to make the output more succinct.
Output 2.1.2. Training conducted for 100 government officials, with a focus on technical officers, coastal adaptation management professionals, representatives from women?s groups [1] and community representatives 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. Training conducted for 100 government officials, with a focus on technical officers, coastal adaptation management professionals, gender experts, 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. No change. Gender experts have been included in the list of stakeholders receiving capacity building.
Outcome 2.2. Develop and implement strategic action plans for streamlining EbA national policy and planning frameworks.	No change
Output 2.2.1. Guidance Note for compliance monitoring and enforcement of EbA policy recommendations prepared under Output 2.1.1.	No change

Output 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.	Output 2.2.2. Land-use Zoning Plan developed to enable EbA, climate-resilient agriculture and SLM under existing land tenure systems. The wording has been shortened to make the output more succinct, with details provided in the project descriptions.
Outcome 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.	No change
Output 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.	No change
Output 2.3.2. A gender-responsive knowledge management and communication strategy developed for integrating EbA best practices and lessons learned into planning and policy.	No change
Output 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.	No change

1a. *Project Description*. Elaborate on: 1) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed (systems description); 2) the baseline scenario and any associated baseline projects; 3) the proposed alternative scenario with a brief description of expected outcomes and components of the project; 4) alignment with GEF focal area and/or Impact Program strategies; 5) incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing; 6) global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF); and 7) innovativeness, sustainability and potential for scaling up. ?

Country context

Geographical context

Tuvalu is a Polynesian Small Island Developing State (SIDS) in the South Pacific Ocean, 4,000 km northeast of Australia (Figure 1). It is the fourth smallest country in the world and consists of nine islands spanning a land area of ~26 km2, with an average elevation of one metre above sea level. From north to south, the islands are Nanumea, Nuitao, Nanumanga, Nui, Vaitupu, Nukufetau, Funafuti, Nukulaelae and Niulakita (Figure 1)[2][2].

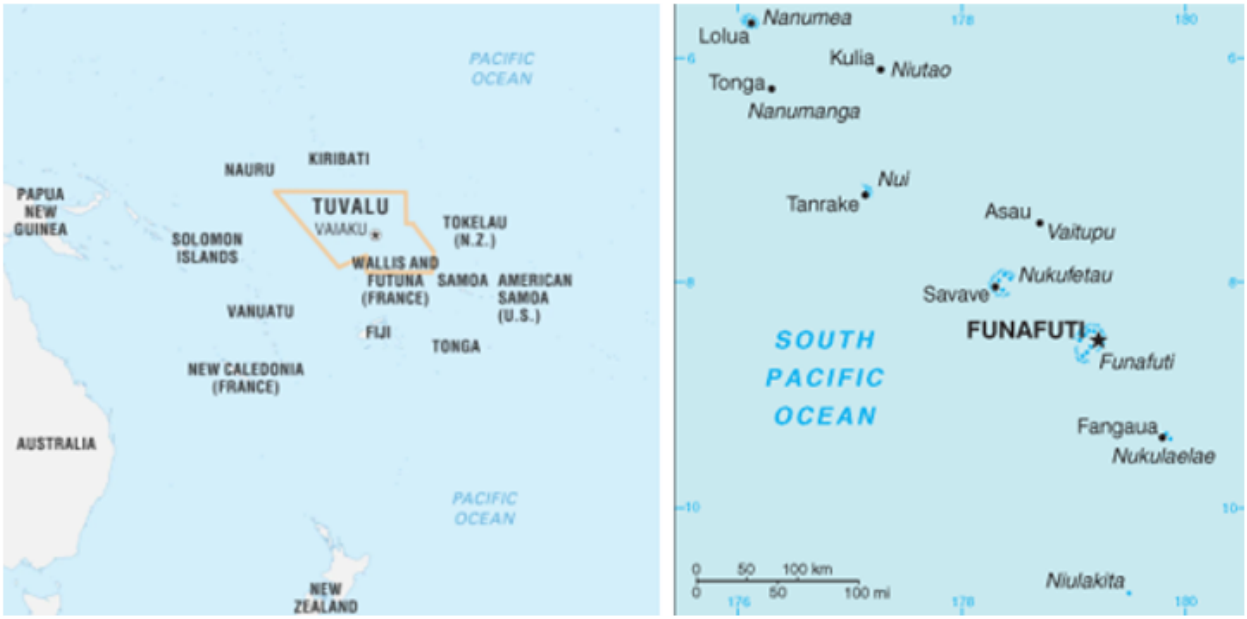

Figure 1. Map of Tuvalu?s location in the South Pacific Ocean[3]3 (left) and the nation?s nine islands (right).

Tuvalu?s nine islands are classified into three groups. The first group consists of five true atolls, namely Nanumea, Nui, Nukufetau, Funafuti and Nukulaelae[4][4]. The second group includes three raised limestone reef islands, namely Nanumanga, Nuitao and Niulakita. The third group is made up of a combination of a reef island and a small atoll, Vaitupu, with the southern part being a reef and the northern part having the characteristics of an atoll[5][5]. Coarse coralline gravels and sands make up the islands of Tuvalu, which results in poor soil quality. The shallow and porous nature of these soils makes them alkaline and nutrient deficient, resulting in a limited ability retain water and high susceptibility to erosion[6][6]. These soil conditions negatively impact water resource provision, ecosystem function, and agriculture in Tuvalu. The islands cannot sustain any surface freshwater sources, such as rivers or lakes, and can only support a narrow range of terrestrial flora and food crops, thereby limiting the possibilities for agriculture[7][7].

Climate baseline

Tuvalu has a hot and humid tropical rainforest climate[8]8,[9]9 with an average temperature of 29?C, and a narrow range of 6?C between the average minimum and maximum temperatures[10]10. Average annual rainfall across the country is 3,095 mm.

The country?s climate has three main influences: the El Ni?o Southern Oscillation (ENSO), the movement of the Southern Pacific Convergence Zone (SPCZ) and the West Pacific Monsoon. ENSO is

a climate pattern that develops over the tropical Pacific Ocean[11]11. In Tuvalu, the cooler La Ni?a phase is associated with rainy years - twice the precipitation of the dry years, while the warmer El Ni?o phase brings drier years ? with phases shifting every two to seven years[13]12. The SPCZ is a diagonal band of pronounced atmospheric convergence in the western Pacific that is associated with increased rainfall[14]13. The position of this convergence zone and its rainfall intensity shifts seasonally, bringing increased precipitation to the southwestern Pacific Ocean during the southern hemisphere summer (December?February). Changes in ENSO cause interannual variations in the intensity and position of the SPCZ. Rainfall in Tuvalu is also influenced by the West Pacific Monsoon, which is driven by temperature differences between the Pacific Ocean and the Asian land masses to the west, usually bringing abrupt shifts from very dry to very wet conditions[15]14.

Tuvalu has two distinct seasons: a dry season during the southern hemisphere?s winter (May?October) and a wet season in the summer months (November?April)[16]15. These seasons are defined by differences in rainfall rather than temperature, which remain consistent throughout (Figure 2). The average rainfall during the dry season is 1,307 mm, compared with 1,788 mm in the wet season.

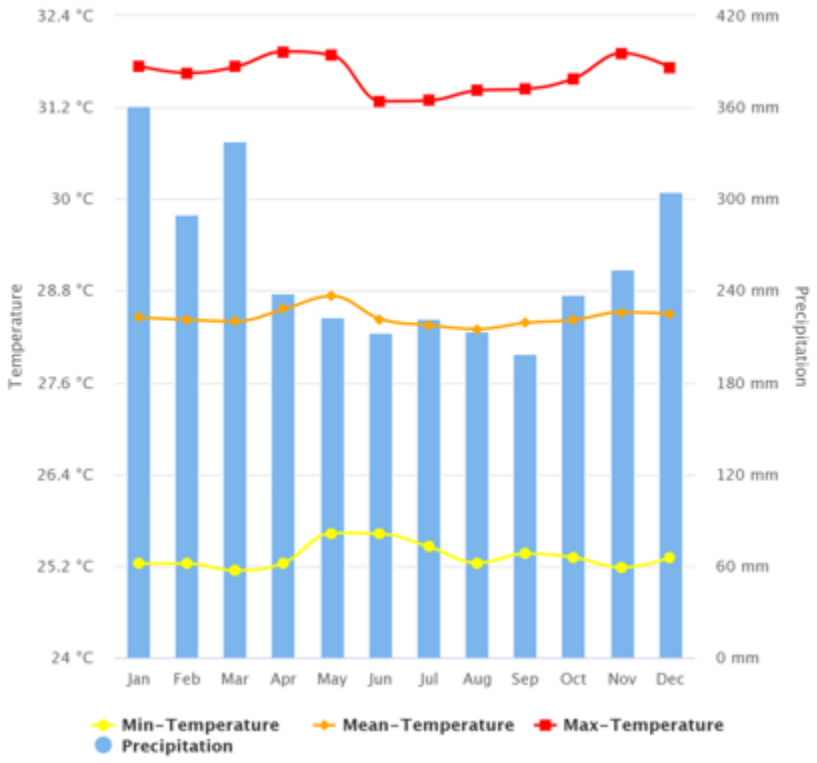

Figure 2. Monthly average temperature (?C), minimum temperature (?C), maximum temperature (?C) and precipitation (mm) for Tuvalu from 1991 to 2020.

The average temperature is consistent across Tuvalu?s islands[17]16. Rainfall amounts, however, are variable, driven primarily by the distance between the northern and southern extent of the country and

each island?s position relative to the SPCZ. Generally, the northern islands are drier[18]17 than the central or southern islands[19]18 as they are situated near the northern extent of the SPCZ during the wet season. The central island of Funafuti receives an average annual rainfall of 3,422 mm.

Tuvalu?s communities and ecosystems are exposed to several natural climate hazards, which are closely tied to the ENSO cycle[20]19. These hazards are primarily linked to high rainfall variability between wet and dry years. Flooding and storm surges occur from extreme rainfall events or tropical cyclones during the wet season, particularly during wetter years. Conversely, consecutive dry years result in meteorological drought periods, which impact the already limited water availability of Tuvalu?s islands. These climate hazards and their impacts are described in Section 2.1.7 of the Project Document.

Water resources

Tuvalu?s geographical features, including its small size, low elevation and porous limestone base, result in the country lacking surface freshwater resources such as rivers or lakes. Since there are no surface water resources, the country?s only permanent source of freshwater is groundwater, which is supplied by rainfall[21][20]. As rainfall infiltrates the ground, it forms a pocket of freshwater ? known as a lens ? that floats hydrostatically above the higher-density seawater below. Tuvalu?s relatively small size means its groundwater lenses are also relatively small, although the islands of Nanumea, Nui and Nukufetau have historically had reliable groundwater lenses. The viability of freshwater lenses on Tuvalu?s islands varies depending on the degree of impact of climate change and anthropogenic activities that contribute to increased salinity and contamination.

Some islands still have viable groundwater in terms of salinity, whereas on others, such as Funafuti, the groundwater salinity is over the level suitable for human consumption. Although groundwater in Funafuti is no longer suitable for drinking and is used only for non-potable uses, historical evidence suggests that the island?s groundwater was still potable in the early 1940s. The subsequent hydrological changes on the islet have been linked to extensive earthworks and engineering that occurred during the US military build-up of 1942?1943[22][21]. More recent development and population pressures have exacerbated the situation.

Extreme climate events such as sea level rise (SLR), storm surges and droughts have also contributed to the increasing salinity of Tuvalu?s groundwater lenses. As sea levels rise, the transitional brackish zone between the freshwater lens and the seawater below moves further up the aquifer, decreasing the thickness of the freshwater lens and, as a result, the availability of freshwater. Storm surges cause saltwater intrusion into groundwater lenses from above, while drought conditions increase salinity when: i) extended periods of low rainfall cause groundwater lenses to contract and saline transition zones to move inland; and ii) excessive groundwater is extracted from wells when rainwater supply is low, causing the groundwater lens to contract.

There is limited data on levels of contamination across the country, but there are several indications that settlements located near dependable groundwater sources have contributed to anthropogenic contamination, rendering the groundwater sources unsuitable for consumption[23][22]. Activities contributing to groundwater contamination in Tuvalu include: i) use of pit latrines and septic tanks near open wells; ii) livestock waste; and iii) indiscriminate dumping of toxic waste such as medical waste, batteries, oils and agricultural chemicals.

As a result of the combined negative impacts of human activities and climate impacts on groundwater sources, measures have been implemented throughout the country to provide alternative freshwater sources and reduce reliance on freshwater lenses. These measures include desalination plants, rainwater harvesting tanks and community cisterns[24][23]. Desalination plants were installed on Funafuti, Vaitupu and Nanumanga islands in response to the water crisis of 1999[25][24]. From 2009?2013, the GoT distributed rainwater harvesting tanks with a capacity of 10,000 litres to communities across the country[26][25]. Two community cisterns have been installed on Fongafale Islet, Funafuti since 2012; the first was installed in the Lofegai community and has a capacity of 700,000 litres, and the second was installed in the Tekavatoetoe community and has a capacity of 288,000 litres[27][26].

Despite Tuvalu?s high mean annual rainfall (3,095 mm), and the above-mentioned measures to improve potable water supply, the country?s freshwater resources continue to be threatened by both anthropogenic activities and the adverse impacts of climate change.

Ecosystems

Tuvalu encompasses diverse terrestrial, coastal and marine ecosystems, which support a wide range of biodiversity and offer essential ecosystem services. These services include soil stabilisation, nutrient cycling, carbon sequestration, coastal protection, food provision, and various cultural benefits. Many of these ecosystems are experiencing increasing degradation as a result of both anthropogenic activities and climate change impacts, which has implications for Tuvalu?s social, economic and environmental stability[28][27]. To ensure multiple benefits, including enhanced resilience to climate change, measures are required to protect and restore the nation?s natural ecosystems. The sections below provide an overview of the country?s terrestrial, coastal, and marine ecosystems.

Terrestrial ecosystems

The main terrestrial ecosystems in Tuvalu are: i) inland broadleaf forests and woodlands; ii) coastal littoral forests and scrub; iii) mangroves and wetlands; iv) coconut woodlands and agroforests; and v) ruderal vegetation[29][28]. Despite the low number of indigenous plant species compared to larger islands, due to cross-ocean plant dispersal challenges and harsh conditions, these species have adapted to the islands? unique environment. They can withstand loose, shifting sands, soil-less limestone and rock outcrops, intense wave action, high salinity and sea spray, periodic flooding, potent sunlight, strong winds and drought. However, Tuvalu?s ecosystems face degradation due to anthropogenic activities, including: i) selective removal of indigenous species for numerous anthropogenic purposes, including construction, boat-building, firewood, agriculture, medicine, tools and handicrafts; ii) introduction of non-indigenous plants, both intentionally and unintentionally; and iii) planting of monocultural coconut plantations for coconut oil and copra production. Out of the 362 vascular plant species reported on Tuvalu, only ~60 (16%) are indigenous[30][29].

Coastal and marine ecosystems

Although Tuvalu has very limited terrestrial biodiversity, there is vast marine biodiversity within its 900,000 km2 Exclusive Economic Zone (EEZ). This biodiversity provides Tuvaluans with food and livelihoods and is important for environmental and cultural security. Tuvalu consists of five main coastal

and marine ecosystems: i) mangroves and wetlands; ii) intertidal flats; iii) subtidal lagoon areas; iv) subtidal oceanside reefs; and v) open water ocean. Each of these habitats supports unique communities of phytoplankton (microalgae), zooplankton, seaweeds (macro-algae), corals, molluscs, crustaceans, other marine invertebrates, finfish, sea turtles and sea birds, many of which move between two or more of these habitats during their different life stages or cycles. These biological communities also play a vital role in producing the biogenic sand and sediments that are necessary for the formation of islands, as well as for preserving and replenishing the beaches and lagoons[31][30].

Ecosystem services

Ensuring the provision of vital services like food, energy, water, and environmental and cultural security, as well as sustainable livelihoods, depends heavily on maintaining healthy terrestrial, coastal and marine ecosystems. This is particularly important given Tuvalu?s limited opportunities for commercial development. Unfortunately, baseline and climate drivers of degradation pose a threat to the country?s biodiversity and ecosystem services. The increasing degradation has had a significant impact on several ecosystems, including coastal forests and vegetation, mangroves, coral reefs, beaches, nearshore lagoon ecosystems, and oceanside marine ecosystems. The primary direct baseline drivers of degradation include habitat loss due to urban expansion, overexploitation of resources, and invasive species. The negative impact of climate change has compounded the situation, with droughts, saltwater inundation, erosion, and damage from tropical cyclones exacerbating degradation. Therefore, it is essential to prioritise the conservation, restoration and sustainable use of natural resources in Tuvalu[32][31].

Socio-economic, political and administrative context

Demographic profile

Tuvalu?s population was recorded at ~11,000 people in 2021, with more than half of the population living in the capital island, Funafuti[33]32. In 2020, the majority of the population was aged between 25 and 54, indicating a high ratio of working-age individuals relative to the older population. There is a considerable rate of internal migration from the outer islands to Funafuti. This is attributed to extreme climate events, favourable job availability, as well as improved accessibility to healthcare and educational facilities[34]33. Tuvaluans also migrate to Australia and New Zealand through labour schemes.

Governance structure

The country's governance structure is democratic, under a Westminster system with 15 elected members, and only three women elected since independence in 1978 [35]34, [36]35. Since there are no formal political parties, election campaigns tend to rely heavily on personal connections, family affiliations, and individuals' reputations. Traditional governance is employed at the island level through the *Falekaupule*[37]36 and *Kaupule*[38]37 systems. The Local Government Department (LGD) works with the *Kaupule* and *Falekaupule* and serves as a conduit for coordinating local and national governments, as well as coordinating formal visits to the islands and assisting the *Kaupule* in developing by-laws for each island[39]38. Women's representation in leadership is improving, with more women included in *Kaupule* and local government departments[40]39.

Economy

Tuvalu's economy is small, with a gross domestic product (GDP) of ~US$63 million in 2021[41]40. Agriculture represented 22% of the total GDP, with 90% of households participating in subsistence agricultural activities, including livestock production, subsistence crop farming, fishing, and handicrafts[42]41. Tuvalu's remoteness from local and global markets makes trade challenging, and the country is highly dependent on external aid and remittances, such as The Tuvalu Trust Fund (TTF) which has grown to ~US$107 million in 2015[43]42. The TTF serves as the most critical capital resource to finance recurrent government expenditure during fiscal downturns. Moreover, the *Falekaupule* Trust Fund (FTF) was established to enable the *Kaupule* to finance development initiatives at the island level[44]43. Both TTF and FTF trust funds? long-term goals are to reduce Tuvalu?s reliance on foreign aid[45]44. Additional revenue is sourced from taxes, customs duties, postage stamp sales, issuing fishing licenses to foreign vessels, remittances, and ?dot TV? domain licenses[46]45,[47]46.

Livelihoods, employment and education

Tuvalu's population consists mostly of subsistence farmers engaged in livestock rearing and crop production, with women responsible for collecting natural resources[48]47. Women also contribute towards the family's livelihood through value-added activities such as fish drying, weaving and coconut oil production [49]48,[50]49. The predominant form of crop agriculture involves growing pulaka[51]50 ? a staple food source ? in large pits of composted soil below the water table level[52]51. Pulaka is an important aspect of Tuvalu?s local cultural heritage, as the pits are dug and maintained by individual families over generations[53]52. However, several challenges constrain the sustainability of agricultural livelihoods, including limited land availability, poor soil quality, and insufficient freshwater availability[54]53. Private sector employment opportunities are limited, with most jobs being under government employment, resulting in no apparent income disparity among the people of Tuvalu[55]54. Private sector employment opportunities are limited, with foreign fisheries being one of the primary sectors.

Education

Given the remoteness of Tuvalu, education data is limited. Primary school education from the age of seven is compulsory for children in Tuvalu, therefore, most seven-year-old children are enrolled in primary school and achieve a 99% literacy rate[56]55. However, as a result of the country?s low teacher-to-student ratio, many children do not attend secondary school[57]56. Tuvaluans interested in tertiary education often migrate to New Zealand for graduation and, thereafter, employment opportunities[58]57.

Land use and agricultural systems

Land use and tenure

Land use in Tuvalu can be classified into several types, with coconut woodland being the most prevalent, covering 54% of the total land area[59]58. This is followed by mangroves (17%), scrubs (14%), villages and buildings at 6%, and broadleaf woodland at 4%[60]59. Tuvalu has two communal land-tenure systems: *Fakangamua*[61]60 and *Kaitasi*[62]61. *Fakangamua* comprises i) chieftaincy land and ii) community managed land, where the former is communally owned and subject to the chief's authority, while the latter is collectively owned and managed by households on the island[63]62. The *Kaitasi* land-tenure system, on the other hand, is privately held by individuals, and the land is registered under the family group's head[64]63,[65]64. The land tenure system is customary, and both patrilineal and matrilineal lines inherit land, with men typically being the primary heirs.

Agriculture

In Tuvalu, agriculture comprises crop cultivation, livestock production, forestry, hunting and fishing[66]65. The agricultural sector employs 11% of the population, making it the second-largest employer after the public administration and defence sector, which accounts for 16% of total employment[67]66. Tuvalu faces several constraints to food production, such as limited freshwater water, poor soils, and the impact of climate change[68]67. Access to trade and marketing opportunities are also limited, attributable to the high cost of shipping and distance to export markets[69]68. In 2017, 90% of households in Tuvalu engaged in subsistence agriculture as a main source of livelihood; 92% of this category were men. The main crops grown in Tuvalu include: i) coconut; ii) pulaka (swamp taro); iii) taro; iv) breadfruit; v) pandanus[70]69; iv) banana; v) pumpkin; vi) sweet potatoes; and vii) pawpaw[71]70.

Pulaka pits

Subsistence agriculture is the main source of livelihood, with the cultivation of pulaka (*Cyrtosperma merkusii*)[72]71 being prevalent[73]72. The method of cultivating pulaka in pulaka pits is a sustainable form of organic farming[74]73 ,[75]74. Pulaka pits have natural fertilisation from the organic materials used to fill the pits or rings, reduced water usage due to the surrounding water helping to irrigate the plants, reduced soil erosion due to the circular shape of the rings holding the soil in place, and increased biodiversity from the healthy soil environment created by the natural fertilization. Other crops such as banana and sweet potato can also be grown in pulaka pits. Unfortunately, many of these pits have been abandoned over the past two decades due to changing dietary preferences, declining interest in pulaka cultivation, periodic droughts, and saltwater intrusion [76]75, [77]76. In the past two decades, 50?80%

of the pulaka pits in Funafuti have been abandoned[78]77. The shift towards imported food has led to a decline in the consumption of traditional local foods, in favour of processed, imported foods[79]78. The consumption of non-traditional foods poses a threat to national food security and is associated with the rise of non-communicable diseases such as diabetes and obesity[80]79, [81]80. The impact of saltwater intrusion on pulaka cultivation has been significant, as the roots of the crop are sensitive to salt above 1,000 ?/cm. The intrusion of saltwater affects not only the growth of the crop, but also the yield and quality of the produce, forcing farmers to abandon their pits or seek new areas for cultivation. Additionally, limited farm management training in the country has prevented the growth of pulaka cultivation. Without the necessary skills and knowledge, farmers are unable to implement effective strategies to manage the impacts of droughts and saltwater intrusion on their crops.

Livestock and fishing

In 2017, 84% of households in Tuvalu raised livestock, with pigs being the most commonly raised animals, followed by chickens and ducks[82]81. One of the main challenges to livestock farmers is the cost of animal feed as Tuvalu is heavily dependent on imported goods. The increased global prices of animal feed have made it difficult for farmers to afford this necessity, which limits the size and productivity of their passels or flocks[83]82. Subsistence fishing is a crucial source of livelihood for Tuvalu residents, with 90% of them engaged in it[84]83. Recognising the importance of sustainable ocean resource management, the Tuvaluan government has prioritised increasing local residents? involvement in tuna fishing, which is the region's most valuable resource.

Observed and predicted climate change

Anthropogenic climate change is causing a rise in temperatures and sea levels, increased rainfall variability and more frequent intense tropical cyclones in Tuvalu. As a result, the country is experiencing a range of negative impacts on the its natural, socio-economic and agricultural systems, as described in the above sections, including: i) health impacts and stress on crops and ecosystems from increasingly frequent heatwaves; ii) water insecurity and reduced crop productivity from an increase in prolonged dry periods; iii) land loss and damage to ecosystems and agricultural land as a result of flooding and erosion linked to high-intensity rainfall events or tropical cyclones; and iv) reduced water quality and crop losses from saltwater surface inundation and groundwater intrusion resulting from rising sea levels. These impacts have had negative ramifications on the economic, water and food security of communities in Tuvalu, repercussions that are further compounded by the impacts of climate change on ecosystem health. The consequent reduction in services these ecosystems provide affects the resilience of Tuvalu?s agricultural and water sectors to worsening climate change hazards and SLR. Multi-model climate projections indicate that the impacts of climate change will likely escalate in the future, further increasing the vulnerability of communities and ecosystems to climate change hazards. The following sections describe current and projected climate change, and the impacts on the water sector, agricultural systems and ecosystems.

Temperature

Average annual temperature in Tuvalu has increased significantly at an average rate of 0.1?C per decade over the last half a century, from 27.9?C in 1970 to 28.5?C in 2021[85][84]. This rate of increase has become more pronounced in recent decades, increasing to a 0.2?C per decade rise from 1990?2020.

Temperatures are predicted to continue rising under future climate change conditions, according to the Coupled Model Intercomparison Project (CMIP5) multi-model ensemble[86][85]. By 2050, average annual temperatures are expected to increase from the observed 2005 values by 0.9?C under a RCP4.5 scenario and by 1.2?C under a RCP8.5 scenario[87][86] (Figure 3). By the end of the century, temperatures are predicted to increase further by 1.4?C under a RCP4.5 scenario and by 3.1?C under a RCP8.5 scenario.

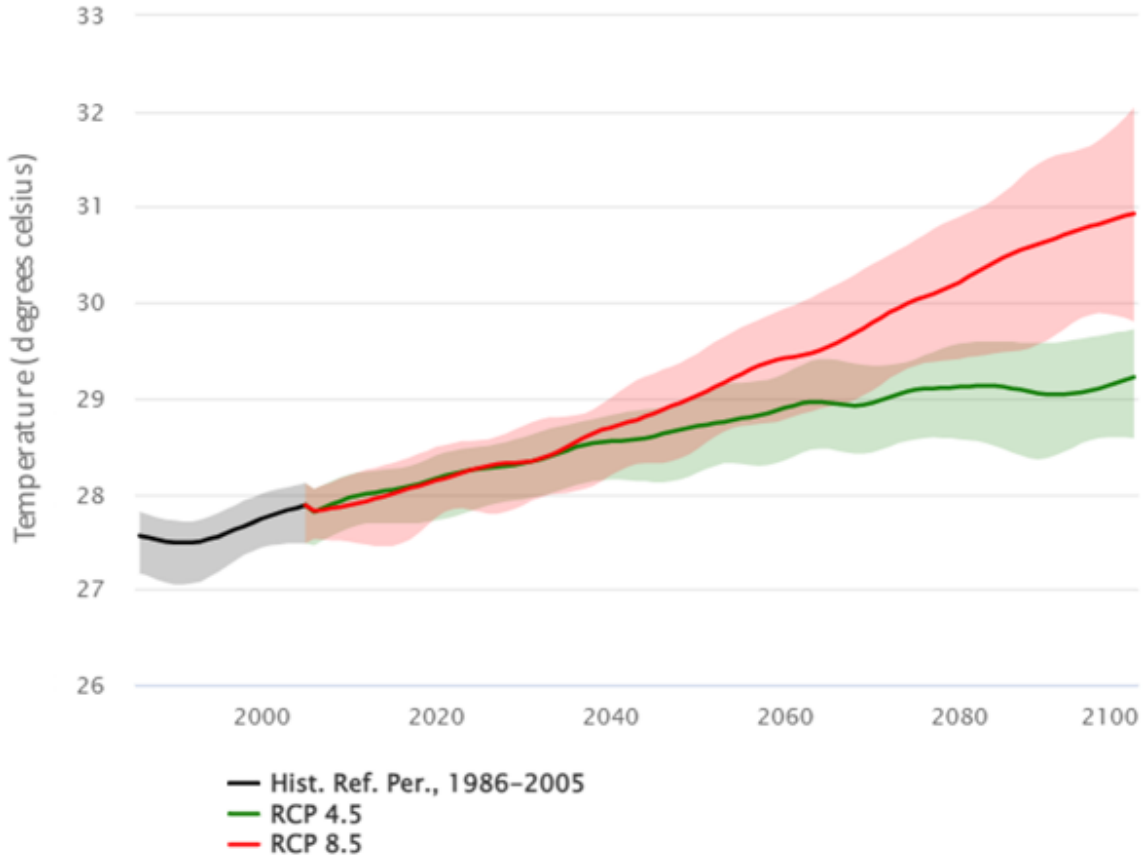

Figure 3. Projected average annual temperature for Tuvalu from 2005?2100 for RCP4.5 (green) and RCP8.5 (red) scenarios, using a historical reference period from 1986?2005[88][87].

Rising average annual temperatures are expected to be accompanied by an increase in the number of days with a heat index above 35?C (Figure 4)[89][88]. The heat index refers to what the perceived temperature is to the human body when combined with the influence of humidity[90][89]. A heat index above 35?C is defined as the number of days when individuals have a moderate risk of experiencing heat-related illnesses such as heat exhaustion, cramps or stroke. As of 2005, Tuvalu experienced an average of four days with a heat index above 35?C annually. By 2050, the number of such days is expected to increase by 121 under an RCP4.5 scenario, and by 223 under RCP8.5, compared with 2005 values. By the end of the century, an RCP4.5 scenario would result in an increase of 261 days compared with 2005 values.

Under an RCP8.5 scenario the number would reach 365 days, meaning individuals would be at risk of heat-related illnesses on a daily basis.

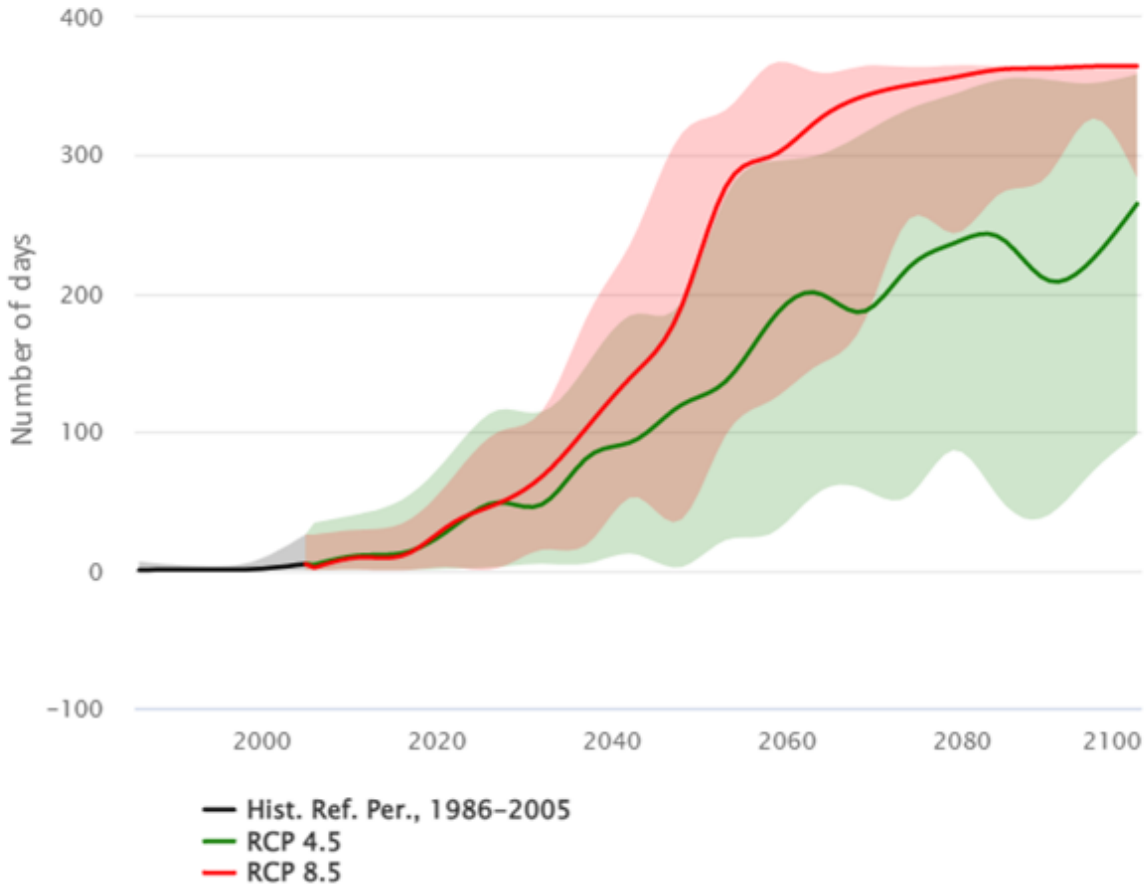

Figure 4. Projected days with heat index above 35?c for Tuvalu from 2005?2100 for RCP4.5 (green) and RCP8.5 (red) scenarios, using a historical reference period from 1986?2005[91][90].

Rainfall

Precipitation has shown a slight, non-significant increase of ~15 mm per decade from 1951?2020[92][91]. The number of consecutive dry days (CDD)[93][92], however, has increased significantly by ~0.3 days per decade over the same period. In addition, the largest five-day cumulative precipitation value increased significantly ? by ~30 mm per decade ? from 1991?2020. This indicates that, although precipitation values have remained largely the same historically, seasonal rainfall variability has increased, with an increase in both extreme rainfall events and prolonged dry periods.

As a result of the limited capacity of climate models to simulate fine-resolution changes in precipitation, there is a high degree of uncertainty regarding rainfall projections for Tuvalu[94][93]. The CMIP5[95][94] multi-model dataset indicates minor changes in annual rainfall by 2050 and 2100, compared with historical values (1986?2005)[96][95]. Compared with 2005, by 2050 and 2100 the number of CDDs under an RCP8.5 scenario will increase by one and two days, respectively. Again compared with 2005, the largest five-day cumulative precipitation will also increase by 17?18 mm by 2050 and 35?45 mm by 2100 under RCP4.5 and RCP8.5 scenarios. Similarly to annual precipitation, it should be noted that both the projected number of CDDs and largest five-day precipitation values are highly variable between climate models.

Interannual changes in rainfall variability are also likely to change in the future as a result of the impact of climate change on the ENSO cycle. There is high confidence that ENSO will remain the dominant driver of interannual variability in tropical regions, including Tuvalu. Moreover, it is very likely that rainfall variability associated with ENSO will be substantially intensified by the latter half of the century under multiple emission scenarios[97][96]. The frequency of extreme El Ni?o and La Ni?a events ? which respectively cause wetter and drier years for Tuvalu? will increase from one in every 20 years to one in every 10 years by the end of the century[98][97].

Tropical cyclones

Tuvalu falls within the South Pacific TC belt and is exposed to TCs in the summer months, from November to April[99][98]. On average, approximately eight TCs pass within 400 km of the country?s islands annually. However, TC frequency is highly variable ? they have been known to impact Tuvalu in quick succession within the same year. This variability is largely influenced by the ENSO cycle, with TCs being more frequent in El Ni?o years (12 per decade) and less frequent during La Ni?a years (four per decade).

While regional studies on changes in historical trends in TC frequency in the South Pacific have been inconclusive[100][99], the Intergovernmental Panel on Climate Change?s (IPCC?s) Sixth Assessment Report indicates an overall increase in the number of severe TC events (Category 3 and above) globally over the past four decades[101][100]. Similar to these historical trends, projections indicate a 20?30% decrease in the number of TCs within the South Pacific by the end of the century compared with the 2000 to 2019 values[102][101]. There is, however, medium confidence that TCs will increase in intensity by 2050, meaning that there will be a higher frequency of damaging Category 3, 4 and 5 TCs[103][102]. In addition to this, there is high confidence that precipitation near the centres of TCs will increase by the end of the century[104][103]. This suggests that the region, including Tuvalu, will have more intense rainfall events associated with TCs in the future.

Sea level rise

Rising global temperatures attributed to anthropogenic climate change are resulting in the melting of polar ice sheets and glaciers, as well as the expansion of seawater as ocean temperatures increase. These two consequences of rising temperatures contribute to sea level rise (SLR). Global average sea levels have risen approximately 100 mm since 1993[105][104] at a rate of 3 mm/year, which is nearly twice the

rate of SLR recorded between 1961 and 1993 (1.8 mm/year)[106][105]. Sea levels near Tuvalu have risen faster than this global average, increasing by ~5 mm/year since 1993[107][106].

Sea levels around Tuvalu are predicted to increase further under future climate change conditions. By 2050, sea levels are expected to increase by ~0.2 m under an RCP4.5 or RCP8.5 scenario, compared with historical values between 2008 and 2019[108][107] (Figure 5). By the end of the century, sea levels are predicted to increase further by 0.5 m under an RCP4.5 scenario and by 0.7 m under an RCP8.5 scenario. Given the notably low elevation of the country ? which averages less than 3 m above sea level ? minor changes in sea level will have substantial impacts on Tuvalu?s coastal areas. Under an RCP4.5 scenario, ~75% of the country?s area will be below the annual flood level by 2100[109][108],[110]109, largely as a result of the predicted rise in sea levels. It is predicted that the islands of Funafuti and Nukulaelae ? which have a combined population of ~6,650 ? will be completely inundated by SLR by 2100.

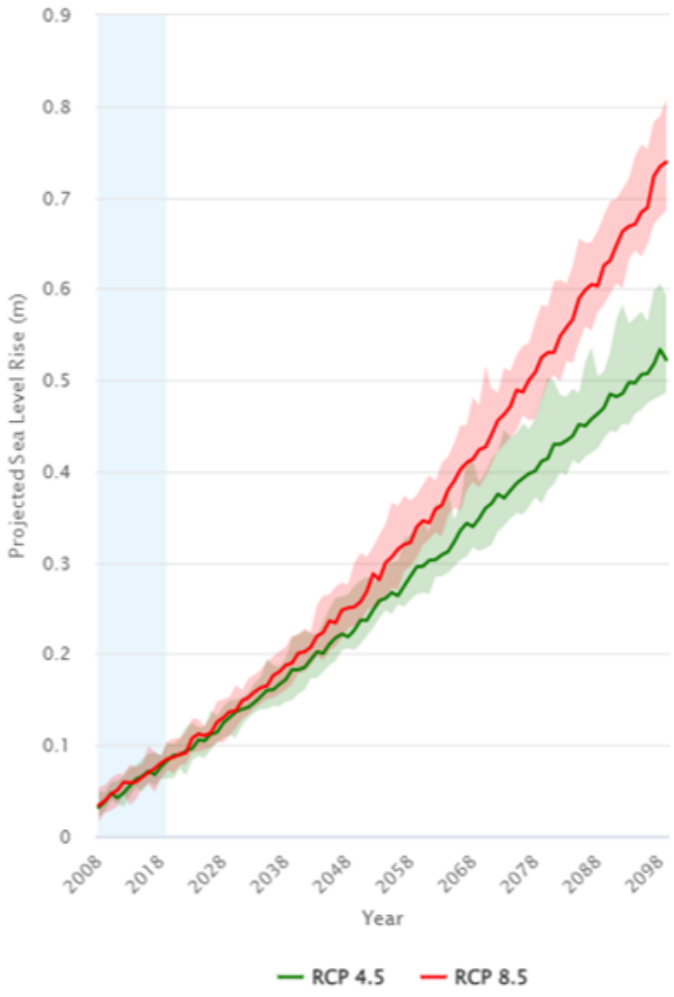

Figure 5. Projected SLR for Tuvalu from 2008?2100 for rcp4.5 (green) and rcp8.5 (red) scenarios, using a historical reference period from 2008?2019[111][110].

Impacts of climate change

Rising temperatures and sea levels, increased rainfall variability and more intense TCs as a result of climate change will have numerous and interacting impacts on Tuvalu?s inhabitants. The water and agricultural sectors, which are heavily reliant on rainfall and freshwater lenses, will be particularly affected. In addition, the coastal and terrestrial ecosystems that provide crucial ecosystem services to communities and are vital for their livelihoods will also be negatively affected. These impacts will have ramifications for the resilience of Tuvalu?s inhabitants, as a result of the reduction of protective and regulatory ecosystem services, thereby exposing agricultural systems and water resources to climate change hazards. The observed and predicted impacts of climate change on Tuvalu?s water sector, agricultural systems and ecosystems are described in more detail below.

Impacts on water resources

Climate change has exacerbated Tuvalu?s water-resource scarcity, primarily as a result of increased rainfall variability and saltwater inundation of groundwater reserves. The country depends on rainwater captured in external tanks as its primary source of drinking water. Historically, this water source has been sufficient to supply the country?s population throughout the dry season until the next wet season[112][111]. However, longer dry periods have resulted in severe water shortages. For example, in a period of two to three weeks without rainfall, stored rainwater reserves can decrease by half. Another impact is that increasing rainfall variability and intensity lead to the tanks filling quickly when there is rainfall during the wet season, resulting in much water being lost as runoff to the ocean before it can be captured and stored.

Drought periods have recently become an annual concern, particularly on the drier northern islands. Recent droughts coinciding with La Ni?a events in 1999, 2011 and 2022 have highlighted the impacts of prolonged drought periods. During these events, water shortages were severe enough that the GoT declared a state of emergency, enforcing water rations to two litres per person per day[113][112]. To alleviate the pressure on communities, the government provided additional water aid to affected islands by portable desalination plants and water trucks. However, severe droughts have a disproportionate impact on women. With water sources located further away from home, women have to spend more time travelling to collect water, reducing their availability for family responsibilities such as childcare and cooking[114][113].

Extended dry periods have a further impact on water supply. Dry soils lead to an accumulation of dust on the rooftops used for rainwater harvesting. This dust filters into water tanks, negatively affecting water quality and reducing the available volume for water storage. As a result, households? capacity for water storage is undermined.

Although the trend of increasing drought periods under future climate change in Tuvalu is uncertain, an increase in rainfall variability related to ENSO will likely lead to more frequent extreme drought years. Additionally, the increasing number of CDDs suggests that annual dry periods will become prolonged under future climate change conditions. As a result, there will be more years in which the current water-storage capacity in the country will not be sufficient to last until the next wet season, increasing the frequency of years in which communities are water insecure and dependent on government assistance for water aid. Consequently, the GoT will be required to invest an increasing budget to address water scarcity at the expense of the country?s further development.

Climate change is likely to affect water supply for Tuvalu not only through more variable rainfall and longer dry periods, but also due to higher water demand. This is related to projected increases in temperature, including substantial increases in the number of days with a heat index above 35?C. Higher temperatures will increase surface evaporation rates, accelerating the drying of soil and evapotranspiration rates, resulting in a higher water demand for hand-irrigated crops[115][114]. Evaporation rates on Pacific islands are already high, accounting 1,600?1,800 mm annually on most islands, which is more than half of Tuvalu?s annual rainfall[116][115]. Additionally, hotter temperatures will increase the demand for drinking water among Tuvalu?s inhabitants, placing further strain on the islands already limited potable water[117][116].

Another effect of increased annual and interannual rainfall variability is its impact on potential water infiltration into groundwater reserves[118][117]. Rainwater is essential for recharging the islands? freshwater lenses. During drought years and prolonged dry periods, the recharge potential is severely limited[119][118], reducing the hydrostatic pressure of the freshwater lenses and increasing intrusion of saltwater from the surrounding ocean. This leads to increased salinity of the freshwater, which reduces its quality and usability during drought periods. Although freshwater lenses can recover some of their size and quality in a few months following a drought, full recovery may take up to a year and a half[120][119].

Reduced water infiltration during dry periods and heavy rainfall events results in lost groundwater recharge potential. This occurs when the amount of rainfall in a short period exceeds the water infiltration capacity of the soil, leading to increased surface runoff. Given the small size of Tuvalu?s atoll islands and absence of natural rivers or lakes, much of this runoff is lost to the ocean. Under future climate change conditions, an increase in precipitation through heavy rainfall events will decrease the water infiltration potential during wet periods, contributing to reduced groundwater recharge ahead of dry periods.

Extreme rainfall events ? specifically TCs ? also can have substantial impacts on the integrity of freshwater lenses. One of these impacts is overtopping, which is the partial or complete inundation of an island?s land area as a result of wavewash and storm surge[121][120],[122]121. Critically, overtopping leads to saltwater seeping into the ground and contaminating the freshwater lenses[123][122]. In extreme cases, overtopping can cross the full expanse of an atoll island, as observed on Nui's island during the Category 5 Cyclone Pam in 2015 [124][123]. Numerous buildings were damaged during this cyclone, while damage to water tanks, graves and septic tanks resulted in the contamination of water and increased sanitation concerns for inhabitants[125][124]. For instance, based on a study of an island atoll in the Cook Islands following its overtopping during Cyclone Percy, freshwater lens salinity increased by as much as ten times compared with normal levels[126][125]. Most freshwater lenses returned to normal salinity levels after several months, however, the formation of a saltwater plume at the surface of one lens slowed recovery to approximately two years.

With the increase of more intense TCs in the South Pacific, the frequency of such overtopping events in Tuvalu is likely to rise, leading to longer recovery periods for freshwater lenses from the resulting salinity. Moreover, an increase in alternating extreme ENSO events has the potential to result in years where freshwater lenses recover from drought only to be impacted shortly after by TC events. The overlapping of consecutive climate change hazards could exacerbate the salinity of the lenses.

The most critical threat to Tuvalu?s freshwater lenses is SLR and its interactions with the climatic impacts mentioned above. Currently, Tuvalu?s Fongafale islet ? which forms part of Funafuti Island and houses the country?s capital ? has widespread salinisation and cannot retain freshwater lenses below the high tide level[127][126]. The remaining thin, scattered freshwater pockets are vulnerable to further salinisation from SLR, which would increase the high tide level to above the depth of these lenses. Moreover, erosion reduces the overall area of the atolls, decreasing the island?s capacity to capture rainfall and increasing the surface area of the freshwater lens exposed to the surrounding ocean, thereby increasing saltwater intrusion into the lens.

The above impacts of SLR on the freshwater lens of atoll islands like those found in Tuvalu is expected to continue as sea levels rise in the future. A rise of 40?50 cm is likely to reduce the size of Pacific island freshwater lenses by as much as half and fragment larger freshwater lenses into smaller ones as swampy depressions where the water table is higher become brackish faster than surrounding areas[128][127]. For example, the projected reduction in the width of a Kiribati atoll island because of a 50 cm SLR could reduce the thickness of the freshwater lens by 29%, and by 65% if combined with a 25% reduction in rainfall[129][128].

SLR has an important compounding effect on Tuvalu?s groundwater resources, contributing to overtopping during TC events. In a future scenario where a TC results in overtopping from wavewash without accompanying storm surge, the capacity of freshwater lenses to recover to normal conditions is considerably reduced with increased SLR[130][129]. Under this scenario and with a 20?40 cm rise in sea level, freshwater lenses may completely dissipate ? except for a shallow layer ? for more than a year after the storm event. These SLR conditions are predicted to occur by the end of the century under future climate change conditions. Given the long recovery times associated with the combination of TC overtopping and future SLR, a predicted increase in the intensity of TCs in the South Pacific could result in freshwater lenses across Tuvalu being unable to recover between TC events.

Although there are growing concerns that Tuvalu may become one of the first countries lost to SLR through complete inundation before the end of the century[131][130], there is a strong likelihood that potentially irreversible saltwater intrusion and inundation through the described climate change impacts will make the country?s islands uninhabitable before then[132][131]. The majority of Tuvalu is at risk of annual flooding by 2100, meaning that freshwater lenses will not have adequate time to recover between flooding events. Complete saltwater intrusion of the island?s freshwater lenses ? combined with reduced rainwater capture in drought periods ? will negatively impact the water and food security of the country?s inhabitants, affecting crop agriculture that many individuals depend on.

Impacts on agricultural systems

Tuvalu?s crop agriculture systems are vulnerable to the impacts of climate change hazards, including: i) reduced water availability as a result of extended drought periods; ii) increased groundwater and surface salinity due to saltwater intrusion and surface inundation; and iii) damage from strong winds and flooding related to TCs. The impacts of climate change have exacerbated these hazards, leading to more intense climate events compounded by rising temperatures and SLR.

During extended drought periods, water is rationed, leading to insufficient freshwater for many subsistence crop gardens[133][132]. Inadequate watering reduces agricultural crop productivity, even for crops that are drought resilient, such as the breadfruit tree (*Atrocarpus altillis*). In the 2011 drought, for example, fruits from the breadfruit tree and other relatively resilient crops were smaller than usual or dead. As temperatures rise and the frequency of hot days increases under future climate change conditions, the effects of drought will be compounded by increased evapotranspiration, driving up demands on water. These factors will exacerbate the effects of droughts on crop plants, leading to heat stress and further loss of productivity[134][133]. Moreover, elevated temperatures have been correlated with an increase in pest populations, such as fruit flies and coconut scale (*Aspidiotuf destructor*), resulting in damage to fruits and even the death of coconut trees, as observed on the islands of Nanumanga and Vaitupu.

Climate change hazards such as droughts, TCs and SLR all contribute to increased saltwater intrusion of groundwater resources, ultimately leading to the shrinking or disappearance of freshwater lenses. These lenses are a critically important water source for many traditional crops, most notably pulaka and other types of taro, which are grown in specific pits situated at the water table level. Although pulaka has some salt tolerance, salinity concentrations above 3000 ?S/cm result in crop decline or death. A 2006 assessment of all pulaka pits in Tuvalu indicated that three islands ? Nukulaelae, Niutao and Funafuti ? have pits that are above the salinity level for successful pulaka growth[135][134]. This is a deviation from past conditions (pre-1941) when these pulaka pits were reported to be in good health. The identified pits? change in salinity has been partially attributed to SLR and changes in land use on the islands, particularly on Funafuti.

The severe drought in 2011 had considerable impacts on the health and productivity of pulaka on many of Tuvalu?s islands, mostly attributed to the resultant increase in freshwater lens salinity[136][135]. Signs of pulaka degradation from salinity included stunted growth, drying of leaves and rotting of the root tuber. For example, 90% of pulaka on Nanumanga were affected, and 50% on Nuitao. The water salinity in the pits on these islands was, respectively, 28 and 34 times higher than values in non-drought years.

Along with saltwater intrusion from below, TCs and storms bring increasing sea spray and flooding, which also affect crop production and contribute to rising salinity. Given the small size of Tuvalu?s islands, many croplands are close to the ocean and regularly exposed to sea spray[137][136]. Although crops, such as bananas, are resistant to the spray, some crops ? particularly vegetables ? are often damaged by it, reducing productivity. Crops are also damaged by the mechanical force of TC-related flooding and strong winds, which can result in large areas of cropland being lost in a single event. Tropical Cyclone Gavin (1997), for example, damaged most of the subsistence fruit trees on Niulakita, while Tropical Cyclone Bebe (1972) destroyed 100% of food crops in the country[138][137]. More recently, Tropical Cyclone Pam (2015) was attributed with the degradation of large pulaka pit areas, some of which have not recovered. Figure 6 shows the state of three pulaka pits in Nanumanga before and after Tropical Cyclone Pam. Following the storm, the pulaka pit closest to the ocean was completely degraded and now forms part of the beach, making it unsuitable for agriculture. The increased frequency of intense TCs such as these ? combined with greater storm surge overtopping and rising sea levels ? will expose more agricultural areas to TC damages and reduce the time available for them to adequately recover.

Figure 6. Images showing the extent of damage to pulaka pits on Nanumanga from Tropical Cyclone Pam (2015). The left image shows the location of the pulaka pits in 2006 relative to the coast, while the right image from 2022 displays the loss of the pulaka pit closest to the coast as a result of the cyclone.

The above observed impacts on agriculture are expected to continue and worsen under projected climate change. Specifically, the combined effect of saltwater intrusion, rising temperatures and more intense TCs and droughts will reduce crop yields by as much as 60% for pulaka and coconut, 50% for banana and 50% for root crops and breadfruit[139][138]. Given the prevalence of subsistence agriculture in Tuvalu, the reduction in agricultural productivity will exacerbate the food insecurity of the country?s inhabitants[140][139]. The current reduction in agricultural productivity has already led to a transition away from traditional cultivation to imported alternatives, such as wheat flour and rice, in an attempt to secure access to food. This dependence on imported foods increases household food costs, leads to a rise in non-communicable diseases such as diabetes and obesity, and threatens the longevity of long-standing food traditions ? particularly through the reduced use of pulaka, a culturally important crop. In addition, a strong dependence on imported crops leaves the country vulnerable to global shocks in food availability or pricing. For instance, the ongoing war in Ukraine has caused a global reduction in wheat availability, which could result in price hikes for wheat-based products[141][140]. Moreover, TC events may lead to port closures, delaying food deliveries for several weeks and putting food availability at risk[142][141]. Disruption to food imports is a particular concern given Tuvalu?s isolation, which highlights the importance of maintaining the local production of food for continued subsistence.

Impacts on ecosystems

Tuvalu?s terrestrial and coastal ecosystems have some natural resilience but are currently impacted by climate change hazards such as droughts and TCs. These hazards impact ecosystems through: i) reduced water availability; ii) increased frequency of bushfires; iii) increased salinity of freshwater lenses; iv) direct damage from TCs; and v) loss of land as a result of flooding and erosion. The combined result of these impacts is reduced productivity or widespread death of critical natural species that provide ecosystem services to communities.

Approximately 80?90% of Tuvalu?s natural vegetation is resilient to drought conditions lasting up to six months[143][142]. However, given recent prolonged events such as the 2022 drought, there have been substantial impacts on and changes to ecosystems, partially related to limited water availability. During

the 2022 drought for example, large areas of coconut forest on the country?s northern islands either displayed reduced productivity or died. Additionally, drought conditions negatively impacted the distribution of other useful species, such as screwpine (*Pandanus*) and various medicinal plants[144][143]. An increase in the length of drought periods under future climate change conditions ? linked to more extreme La Ni?a events ? will push more indigenous plant species beyond their drought resilience and lead to widespread degradation or loss in vegetation cover.

A higher frequency of bushfires is another direct impact on vegetation related to drought periods. During the 2022 drought, for instance, half of Nuitao?s total area was burnt by bushfires[145][144]. More frequent prolonged drought periods are likely to lead to an increase in the frequency and extent of bushfire events across Tuvalu, particularly in the drier northern islands.

Many terrestrial ecosystems are dependent on groundwater resources, which are threatened by increased salinity through the combined impacts of reduced rainfall during droughts, SLR and overtopping by TC events (see impacts on water resources sub-section above). Additionally, widespread surface flooding with saltwater due to the combined effect of SLR and more intense TC events will further expose vegetation to higher salt concentrations. The potential of saltwater surface inundation and intrusion into freshwater lenses to exceed the salt tolerance of many terrestrial plant species is high, which would result in an increased reduction in plant health or vegetation die-off. For example, a 25% substitution with saltwater has been shown to reduce coconut seedling above-ground biomass by 47%[146][145].

TCs and associated storm surges and overtopping damage terrestrial and coastal ecosystems directly, uprooting vegetation and causing erosion. On some islets, vegetation has been completely washed away as a result of TC events. For example, in 2019 Tropical Cyclone Tino resulted in the noticeable loss of coastal vegetation, uprooting plants and trees in storm surges and strong winds[147][146]. Additionally, coastal erosion from TCs and SLR damages coastal vegetation and reduces the available land area on islands, further shrinking natural ecosystems on the islands. Under future climate change conditions, the occurrence of extreme TC events and their corresponding impacts are likely to worsen. A higher number of intense TCs, combined with the additive effect of SLR on storm surge and overtopping, is likely to cause greater damage on Tuvalu?s natural environment.

Projected increases in the intensity of droughts and TCs under future climate change ? combined with SLR, rising sea surface temperatures and ocean acidification ? are likely to increase the rate of ecosystem degradation and loss across Tuvalu?s islands. In addition, these compounding climate change impacts are likely to reduce the time needed for ecosystems to recover, which could result in long-term or permanent ecosystem degradation. In turn, this will reduce the capacity of these ecosystems, including mangrove forests and coral reefs, to provide protective services against the impact of erosion and flooding linked to TCs[148][147].

A reduction in ecosystem resilience will increase ecosystem vulnerability and exposure to concurrent climate change-related events[149][148], exacerbating their degradation. In turn, ecosystem degradation will result in decreased availability of ecosystem services for Tuvalu?s communities, including protection from future climate events, hydrological regulation and natural resource provision. For example, vegetation within a healthy ecosystem plays a crucial role in soil stability, slowing of surface runoff during rainfall events[150][149], and promoting the infiltration of runoff into the ground to replenish the freshwater lenses that would otherwise flow into the ocean. Increasing ecosystem degradation from climate change and anthropogenic drivers will likely result in a higher prevalence of bare soils, surface runoff and soil erosion.

Climate change is likely to compromise ecosystems' capacity to provide sustainable quantities of natural resources, including food sources and materials for traditional handicrafts. Reduced resources will negatively impact Tuvaluan communities, who have already noted a reduction in plant materials or shells linked to droughts, TCs and SLR. Fewer resources could result in their overexploitation, further contributing to ecosystem degradation. As a result, a positive feedback loop of impacts is likely to occur in the future[151][150].

Root causes, climate change, preferred solution and barriers

The prevalence of the above non-climatic threats to ecosystems and agricultural systems is influenced by several root causes. These indirect root causes are described below and include: i) a constrained economy; and ii) population growth and migration.

Root causes of vulnerability

Constrained economy and livelihood options
Tuvalu?s remoteness poses significant challenges due to limited access to information, equipment, and infrastructure, particularly for residents of the outer islands, which are between 100?460 km away from the capital, Funafuti. Public transport is mostly restricted to government ferries that visit each island once every few weeks. This constraint on national and international access, combined with the country's small land area, limits economic growth and makes it challenging for Tuvalu to compete in global markets. Costly imports and limited capacity for sustainable land management and climate change adaptation practices further exacerbate these challenges. The restricted scope for economic growth limits livelihood options for Tuvalu's inhabitants, many of whom rely on agriculture or natural resource provision, including fishing and crafting. Additionally, the remoteness of the outer islands means that opportunities for diversified economic activities are limited, primarily limiting livelihoods to subsistence activities.

Demography and migration
Tuvalu?s population is growing, leading to increased demand for land and exploitation of natural resources. The rise in population density is not uniform across the islands; extensive internal migration ? driven by people seeking better employment and lifestyle opportunities ? occurs primarily from the outer islands to Funafuti. As a result, all outer islands have experienced a decline in population between 2012 and 2017. In contrast, with limited space in Funafuti, migration is resulting in severe population pressure. In 2017, for example, the population density in Funafuti was ~2,260 people/km2, compared with the national average population density at the time of ~410 people/km2. [152]151 This intense urbanisation raises the number of Tuvaluans in the capital living in poverty, experiencing reduced living conditions or being displaced due to increased competition for scarce job opportunities. As a result, the increased density and diminished living conditions are associated with less SLM practices, including poor waste management and unsustainable resource use.

The increasing population in Tuvalu has partially contributed to a transition from traditional agricultural practices to semi-commercial agricultural systems. This transition is driven by higher agricultural demands stemming from a larger population and potential agricultural markets. The transition to a semi-commercial economy has resulted in the gradual decline of long-standing traditional practices, such as pulaka cultivation, and a rise in unsustainable methods with less focus on soil conservation or land management. The country?s soils are inherently unsuited to intensive agriculture, meaning that poor land management in this natural context quickly results in severe and potentially permanent soil quality degradation. This degradation limits future agricultural production or ecosystem expansion.

Although the outer islands are less affected by population increases than Funafuti, rising national and international migration to Australia and New Zealand also impacts agricultural production and the prevalence of SLM practices. Many migrants are skilled labourers of working age[153]152, with the result that island populations lose people who possess knowledge of SLM practices or are physically capable of cultivating labour-intensive crops.

Climate Change

Climate change has had a detrimental impact on Tuvalu's subsistence farmers over the past 30 years. The agricultural sector has been severely affected by increasing temperatures, sea-level rise (SLR), persistent droughts, and more intense tropical cyclones (TCs) (Figure 7). These extreme weather conditions have further amplified storm surges, wave energy, and surface runoff during the wet season. The abovementioned effects of climate change on Tuvalu's agricultural sector, water and livelihood security are expected to intensify, given predictions of an increase in the: i) intensity of tropical cyclones; ii) number of days with a heat index above 35?C; and iii) consecutive dry days. Within the eight target islands of Tuvalu ? namely Funafuti, Nui, Nanumaga, Nanumea, Nuitao, Nukulaelae, Niulakita and Nukufetau ? these climate change impacts have and will continue to damage crucial infrastructure and agricultural produce. In addition, the projected increase in the number of hot days is expected to cause health problems, particularly among vulnerable populations such as the elderly and young children. High temperatures will also reduce agricultural productivity and damage crops, leading to food shortages and economic losses for island residents. Moreover, an increase in the number of dry days will exacerbate freshwater scarcity, already a considerable challenge in Tuvalu. Water shortages will impact local communities? livelihoods, particularly those related to agriculture, while dry conditions will increase the risk of wildfires, damaging crucial infrastructure, ecosystems and crops. In addition, the climate threats are exacerbated by baseline drivers of degradation related to unsustainable agriculture and poor land use planning.

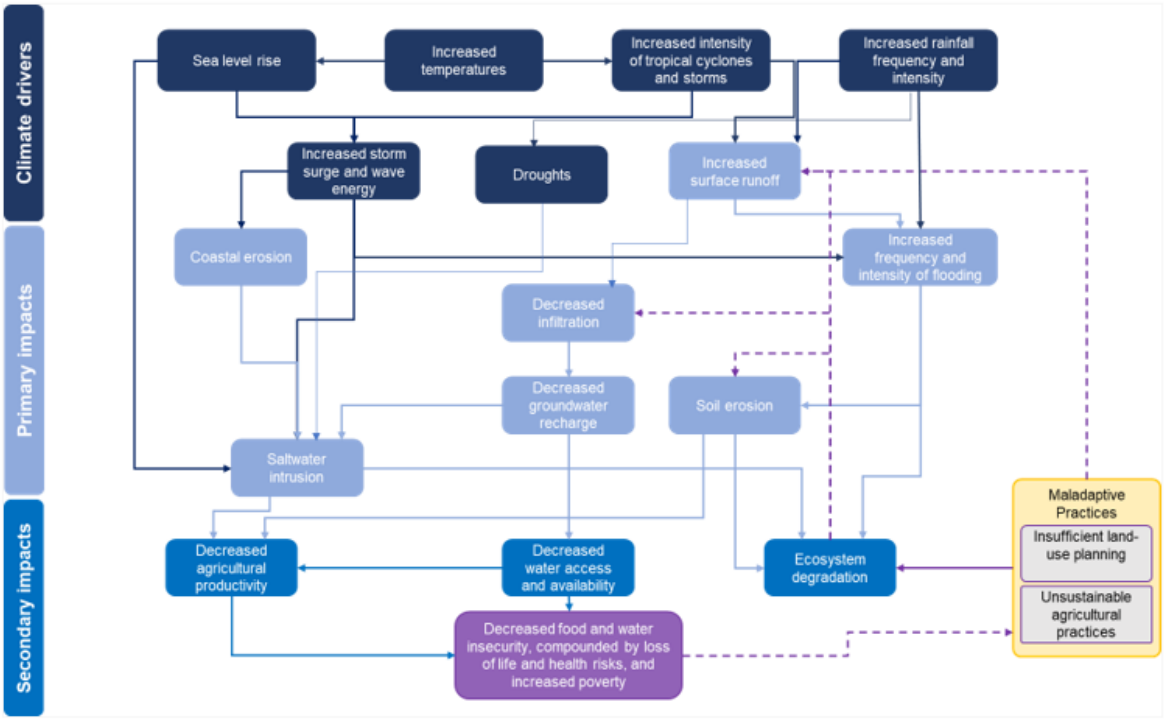

Figure 7. Problem diagram of Tuvalu's current and projected climate trends and associated impacts.

Insufficient management of water resources is another pressing environmental challenge in Tuvalu. Constraints within the country?s water and sanitation sector include: i) the absence of policies defining government and community responsibilities for the operationalisation and maintenance of rural water systems; ii) insufficient technical support services, accountability and incentives for sustaining services; iii) limited functionality of water supply schemes; and iv) insufficient district-level budgets allocated to water supply initiatives. Consequently, households with restricted access to water experience increased water shortages during the dry season. In addition, rising temperatures leading to droughts exacerbate saltwater intrusion into groundwater resources, contaminating the water supply. Contaminated water increases the likelihood of waterborne diseases, adversely affecting human health.

Preferred solution

In an ideal world, Tuvalu's food production systems would be resilient to the impacts of climate change-induced SLR, coastal storms and rainfall variability. This would be achieved through an integrated approach that includes the: i) improvement of national and sub-national adaptation planning; ii) adoption of climate-resilient SLM; iii) development and implementation of sustainable agricultural and land management systems; and iv) facilitation of groundwater recharge. By implementing appropriate land management and ecosystem restoration strategies that maintain freshwater lenses, agriculture production would be enhanced, particularly in vulnerable areas. Ultimately, this would contribute to reducing rural-to-urban migration and the associated decline of Funafuti?s resilience, while promoting sustainable and climate-resilient agricultural practices. The goal is to create a world where communities are trained on practices that reduce soil erosion, increase groundwater infiltration, and maintain the productivity of crops like pulaka.

Barriers to the preferred solution

There are several barriers to achieving the preferred solution, as well as the goals of the abovementioned policies and plans. Agriculture and ecosystem degradation, and freshwater scarcity are expected to continue unless interventions are implemented to overcome these barriers, which are described below.

Barrier 1: Limited knowledge and technology implementation regarding climate-resilient agriculture and land-management practices at national and local levels[154]153.

Although there generally some level of awareness of climate change across Tuvalu, there is limited awareness of specific climate change challenges and potential adaptation practices related to agriculture and land management across all institutional levels, from national-level policymakers to the Falekaupule and civil society. This limited awareness, insufficient knowledge and deficiency of appropriate tools and methodologies undermine the implementation of CCA actions on the ground. Without a thorough understanding of climate change impacts and coping strategies, communities in Tuvalu remain unprepared to manage the adverse effects of climate change. Consequently, there has been minimal adaptation in the country?s agricultural sector. To address this issue, it is crucial to build technical capacity and knowledge within relevant ministries ? such as the Ministries of Finance, Public Works and Agriculture ? and island councils. By recognising climate change impacts and employing appropriate tools and methodologies for identifying necessary adaptation activities, farmers and stakeholders at all levels can better promote the uptake of these measures.

Barrier 2: Limited integration of EbA and SLM-related climate change adaptation priorities into Tuvalu's national planning, policy frameworks and budgeting systems[155]154.

While previous projects have promoted EbA SLM approaches at the community level, the strategic importance of these approaches has not been sufficiently integrated into Tuvalu's national policies and regulations. Although SLM has been integrated into Tuvalu?s 2006 National Action Plan for Land Degradation and Drought (NAP-LDD), the NAP-LDD omits the relationship between SLM and CCA. Mainstreaming SLM approaches into national policies is hindered by an insufficiently enabling environment and limited technical expertise for the integration of climate change considerations in national planning, policy frameworks and budgeting systems. Combined, the abovementioned factors have inhibited Tuvalu's widespread implementation of CCA activities.

In addition to the insufficient integration in environmental policies, Tuvalu has limited financial capacity to allocate the appropriate use and conservation of ecological resources to address degradation. Although the Tuvalu Trust Fund (TTF) and the Kaupule Trust are best practice models for making financial resources available, they are not presently used for CCA activities such as EbA and SLM approaches, which exacerbates the insufficient systems for integrating CCA planning in budget processes. Moreover, the technical capacity and coordination mechanisms among national agencies and between the national, village and outer island governments are insufficient to achieve integrated decision-making for 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 resources, coastal zones and agriculture.

Barrier 3: Limited technical and professional capacity for implementing CCA strategies at the national and local scale over the long term[156]155.

Considerable regional mobility among skilled professionals in the Pacific, coupled with the absence of targeted investments in long-term capacity building for the general population, contributes to staff turnover in the GoT, which undermines Tuvalu?s capacity to respond to urgent environmental concerns. For example, coastal adaptation management practitioners have been appointed as a result of Tuvalu?s coastal vulnerability, but the country lacks a support structure for strengthening the capacity of these practitioners over the long-term. There are limited technical resources to provide the comprehensive training required for these roles. Moreover, external development projects tend to focus on building short-term capacities for existing GoT officials, rather than institutionalising knowledge and creating learning systems. To ensure that Tuvalu maintains a consistent level of technical capacity for CCA, it is imperative to complement the current capacity-building strategy with a system that focuses on building capacity in sectors of national development priority, such as climate-resilient agricultural systems.

Barrier 4: Limited opportunity for engaging landowners and tracking EbA interventions within Tuvalu?s traditionally undefined land tenure system[157]156.

Disputes over land boundaries and multiple ownership claims for the same land are prevalent in Tuvalu because of insufficient land registration processes. This systemic challenge constitutes a barrier to land leasing and the exchange of land between Indigenous Tuvaluans, which in turn limits economic growth and investments in commercial agriculture and infrastructure. In addition, it complicates engagement with landowners and reporting arrangements, particularly when tracking changes in land-use and addressing competing land claims or overlapping jurisdictions. This impedes the broad-scale implementation of EbA, climate-resilient agriculture and SLM within Tuvalu's current land tenure context.

Proposed alternative solution

The proposed Least Developed Countries Fund (LDCF) project will reduce Tuvaluan communities? vulnerability to the increasing impacts of climate change and non-climatic drivers of land degradation. To achieve these goals, the project will focus on strengthening the resilience of local agricultural systems to climate hazards, including the important pulaka pit agricultural systems on eight of Tuvalu?s islands. In so doing, the project will simultaneously promote the health of surrounding coastal and terrestrial ecosystems that provide protective and supporting ecosystem services to both the targeted agricultural systems and communities that depend on them.

The project will employ a participatory, integrated sustainable land management (SLM) approach that incorporates climate-resilient agricultural practices and Ecosystem-based Adaptation (EbA). These practices are designed to reduce the primary impacts of climate change on Tuvalu?s communities, agricultural systems and ecosystems. Specifically, these interventions will target the exacerbating effects of rising temperatures, prolonged drought periods, intensified rainfall events, increased frequency of intense tropical cyclones (TCs) and sea level rise (SLR). Combined, these threats contribute to increased saltwater intrusion of freshwater lenses, reduced overall agricultural productivity and ecosystem degradation. Degraded ecosystems have reduced capacity to provide ecosystem services such as resource provision, water regulation and coastal protection. While the project?s primary focus is addressing climate change impacts, its participatory, integrated approach will concurrently address several baseline challenges, including unsustainable land management practices and the overexploitation of natural resources.

On-the-ground approaches to be implemented include: i) enhancing agricultural practices and increasing the resilience of pulaka pits; ii) restoring coastal ecosystems to enhance protective ecosystem services and reduce saltwater inundation; iii) managing groundwater recharge by increasing water infiltration around agricultural areas; and iv) diversifying gender-responsive, sustainable livelihoods that support the healthy functioning of ecosystems. These strategies will be reinforced by knowledge generation and awareness-raising activities, ensuring the effectiveness and long-term maintenance of interventions. Moreover, the upscaling and sustainability of interventions will be facilitated by creating an enabling environment that enhances the capacity of government officials to incorporate EbA and SLM into policies, plans and budgets. The rationale for each primary on-the-ground approach is presented below.

The proposed project will use multiple synergistic and complementary approaches across Tuvalu?s islands to increase pulaka and other climate-resilient crop production. Firstly, the project will introduce climate-smart agricultural practices in and around traditional pulaka pits, increasing their usability. Secondly, in addition to supporting existing pulaka pits, the potential production of crops will be increased by upscaling existing interventions introducing climate-resilient raised concrete beds. These approaches will be supported by drought-resilient irrigation strategies to ensure crop access to sufficient and clean water. The rationale for the above approaches is explained using insights gleaned from past projects, and described in more detail below (Table 4).

Table 4. Lessons learned and application from past, GEF and non-GEF projects.

Project (including funding amounts and funder)	**Project objective**	**Lessons learned**	**Application of lessons learned in the proposed project**

Implementing a ?Ridge to Reef? Approach to Protect Biodiversity and Ecosystem Functions in Tuvalu (R2R Tuvalu)[158] 157,[159]158 US$3,912,844 (GEF) and US$15,680,591 (co-financing) Timeline: the project started in June 2015, and ended in December 2022	The main goals of the R2R project are to: i) enhance and strengthen conservation and protected areas; ii) rehabilitate degraded coastal and inland forests; iii) enhance governance and institutional capacity at all levels of government to strengthen natural resource management; and iv) improve data and information systems to enable evidence-based planning, decision-making and natural resource management.	i) In the Pacific, project designs should account for extended timeframes and unexpected delays because of regional specificities such as capacity constraints, time-consuming recruitment, remote accessibility and increased climate-related risks. ii) Projects driven by national needs yield stronger implementation and results. A design that resonates with local priorities and beneficiaries increases the likelihood of successful execution. iii) Proactive risk logs are essential for developing mitigation actions against identified risks, ensuring readiness for unexpected events like the Covid-19 pandemic. iv) Engaging communities and women's groups in project design discussions ensures their concerns are integrated, creating customised activities applicable to community-level contexts, rather than a standardised approach across islands. v) Implementation through UNDP?s National Implementation Modality (NIM) ? despite potential short-term challenges? fosters stronger country ownership, in-country capacity, and long-term project sustainability.	i) The proposed project accommodates extended time frames by dedicating the first year to recruitment and training. ii) The proposed project incorporates national needs, as evidenced by stakeholder consultations during its formation, ensuring it is tailored to local priorities. These consultations engaged a variety of participants, including government institutions, community members and leaders, Tuvalu?s National Council of Women (TNCW), and NGOs. The proposed project includes training for 100 officials, integrating EbA, climate-resilient agriculture, and SLM principles into national and community-level policies and planning (Output 2.1.2). iii) Proactive risk analyses

			and a gender action plan has been integrated into the project, addressing potential risks such as extreme weather events or the exclusion of women from participation with corresponding mitigation measures.

Building Capacity and Mainstreaming Sustainable Land Management (SLM) in Tuvalu[160] 159,[161]160 US$500,000 (GEF) and US$517,000 (co-financing) Timeline: 2008?2012	The project?s main goals were to: i) mainstream SLM into national development planning; and ii) develop integrated land-use planning systems (ILUP) that support food security nationally and locally.	i) SLM should be integrated into government policy, reflecting governmental reforms and indicators. ii) Improved SLM policy structure, linked to customary rights review and customary boundary mapping, is crucial for long-term planning. iii) 'Community engagement contracts', particularly on the outer islands, would have fostered better community ownership of SLM project ideas, enhancing long-term sustainability. A Memorandum of Understanding between local *Kaupule*, community leaders, and SLM project coordinators could facilitate this. iv) Future projects should focus on leadership commitment from government, a clear inception strategy, skilled staff recruitment, and government staff incentives. v) New staff require training on project management and quarterly report writing for UNDP. vi) Strong project and financial management is essential throughout the project lifecycle. vii) Hands-on demonstration projects, sufficiently funded, should be ongoing throughout the project. viii) Successful island management requires donors' understanding of local culture and operations.	i) The proposed project, developed in collaboration with the national government and community stakeholders (Appendix 20: Inception Workshop and Mission Report), will align with and revise *Te Kete* (Tuvalu?s National Sustainable Development Strategy), *Te Kaniva* (Climate Change Policy), and the Climate Change Resilience Act of 2019 (Output 2.1.1). Community ownership is further strengthened through the direct involvement of local stakeholders such as the *Kaupule* in project interventions, such as pulaka pit allocation. ii) The proposed project will strengthen the capacity of the Land Survey Department in Tuvalu by developing a Land-use Zoning Plan and updating the

			landowner registration system (Output 2.2.2). iii) Designed to promote EbA implementation, the proposed project will improve policy frameworks, enhance institutional capacity, and address CCA barriers (Component 2). iv) The proposed project includes training for 100 officials, integrating EbA, climate-resilient agriculture, and SLM principles into national and community-level policies and planning (Output 2.1.2).

Tuvalu's National Adaptation Programme of Action (NAPA)[162] 161,[163]162 US$3,300,000 (GEF) and US$4,500,000 (co-financing). Timeline: 2003?2012	The main objectives of the NAPA are to: i) develop a country-wide programme that encompasses the urgent and immediate needs of communities; ii) implement immediate and urgent adaptation activities to climate change and variability; iii) enhance communities' awareness and livelihoods; and iv) mainstream adaptation measures into national and sectoral planning. This will be achieved by: i) increasing subsistence pit-grown pulaka productivity by introducing a salt-tolerant species; and ii) increasing household water storage capacity, water collection accessories and conservation techniques. As part of the NAPA interventions, the GoT, in collaboration with local communities, assisted in building a sea wall. The sea wall should minimise saltwater intrusion into pulaka pits. However, it has subsequently deteriorated, undermining its effectiveness.	i) Involving stakeholders, including SPREP, SPC, and NGO representatives, along with regional agencies and tertiary institutions, is crucial for aligning projects with national priorities and enhancing capacity building. ii) Partnerships with *Kaupules,* NGOs, traditional leader forums, women's groups, youth, and parent organisations can enhance project implementation and delivery, particularly when community-based activities are the main project components. iii) Ensuring the project aligns with national development priorities and other locally supported initiatives can enhance its sustainability considerably. iv) Capacity building can be significantly improved through learning exchanges, field visits, and networking. These should be integral to similar projects. v) Continuity of key personnel and effective communication channels are essential for successful project management and coordination. vi) For complex, multi-island projects, adaptive and flexible budget management is crucial. Transparency in budget communication is necessary to counteract the potential negative impact of underperformance in any one location.	i) The proposed project engages stakeholders across institutional levels, for example, the Department of Rural Development, the Department of Fisheries *Kaupule* and local community members assess the proposed Terrestrial Conservation Areas and Locally Managed Marine Areas (Activity 1.2.1.1). In addition, local implementing agencies such as the Agriculture Department and the Climate Change Department will play pivotal roles in execution, facilitating project relevance and capacity building. ii) Developed collaboratively with the national government and community stakeholders, the proposed project ensures alignment with national policies and local priorities

			(Appendix 20: Inception Workshop and Mission Report). iii) The proposed project will align and revise the *Te Kete* (Tuvalu National Sustainable Strategy), *Te Kaniva* (Climate Change Policy), and the Climate Change Resilience Act 2019 to improve government agency coordination and funding (Output 2.1.1). iv) In response to the high staff turnover, the proposed project will introduce continuous training and knowledge generation programmes (Output 2.3.3). This includes the development of a programme for the ongoing storage and dissemination of project-generated information, as well as annual workshops for updating public sector officials on EbA implementation knowledge and upskilling new staff members.

			v) The Government of Tuvalu?s in-kind co-financing of US$944,000, alongside additional grants underscores local buy-in and financial autonomy.

Climate and Oceans Support Programme in the Pacific (COSPPAC)[164]163 GoA US$49,705,875 Timeline: 2018?2022	COSPPAC works with Pacific Island stakeholders to analyse and interpret climate, oceans and tidal data to produce valuable services for island communities. The programme aims for Pacific Island national meteorological services to understand and use climate, ocean and sea-level data and information to develop and disseminate valuable products and services to Pacific Island governments and communities, building resilience to the impact of climate change, climate variability and disasters. The programme will be delivered through three project components: i) Pacific sea-level and geodetic monitoring; ii) climate data for the environment; and iii) seasonal prediction.	i) Effective change requires recipient ownership of development activity. This was evident in the COSPPAC project, where Pacific ownership was heightened by having more national than Australian agency members in the governance structure. ii) Development program success relies on letting partners dictate their own priorities and control fund allocation. iii) Pacific partner-led innovations increase demand for climate and geodetic information from national decision-makers. iv) Constant communication among all stakeholders ensures focus on Pacific priorities. v) Consensus decision-making is preferred by Pacific partners. vi) Despite high costs, regional meetings and staff exchanges are critical for skill transfer and understanding.	i) In the new project, local implementing agencies such as the Agriculture Department and the Climate Change Department will play pivotal roles in execution, facilitating project relevance and capacity building. ii) The project aligns with national policies such as the Second National Communication, National Strategy for Sustainable Development, and Climate Change Policy, ensuring local ownership and compatibility with national goals. iii) The Government of Tuvalu?s in-kind co-financing of US$944,000, alongside additional grants underscores local buy-in and financial autonomy. iv) Continuous feedback mechanisms, including an independent

			Terminal Evaluation managed by UNEP and stakeholder consultations, are embedded in the project design to ensure responsiveness to Tuvalu's needs.

Pacific Adaptation to Climate Change[165] 164,[166]165(PACC) project Overall project funding: US$14,822,500 (SCCF) and US$39,300,000 (co-financing) Tuvalu?s national budget allocation: US$750,000 and US$1,500,000 co-financing Timeline: 2009?2014	The PACC programme comprised 14 participating countries, namely, the Cook Islands, Fiji, Federated State of Micronesia (FSM), Republic of the Marshall Islands (RMI), Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tokelua, Tuvalu and Vanuatu. This project aimed to make policy changes to water-management plans to improve water infrastructure and deliver immediate vulnerability reduction benefits in the context of climate change. This project was specifically designed for the Lofeagai community in Funafuti.	i) Ensure water harvesting is integrated into waste and household management plans, such as by incorporating existing household rainwater harvesting practices and recently introduced dry eco-sanitation and brackish wastewater use. ii) Focus on water conservation, including developing self-rationing protocols, and link these behavioral change responses to rainfall forecasting initiatives. iii) Recognize the vital role of women in sustaining communal water storage, including equitable water allocation and long-term maintenance. iv) Build awareness of water scarcity measures, such as household and community water conservation and demand reduction. This could include education on water wastage, tank leak repairs, rationing, dry eco-sanitation, and brackish groundwater use for toileting. v) Assist the development of national capacity to access and use rainfall forecasting, and develop community notification protocols to advise on climate change impacts on available freshwater resources. This enables community adaptation responses, such as water conservation and rationing, to be initiated.	i) While the PACC project was designed specifically for the Lofeagai community, there is considerable potential for Output 2.1.1 to upscale this project to other Tuvaluan islands. ii) Output 1.1.3. rainwater harvesting for crop irrigation and output 1.2.2. improving groundwater recharge zones, integrate water resource management for agriculture. The interventions also include training on water conservation, through repairing tanks and irrigation systems. iii) output 1.1.5. includes women representatives of different islands in generating knowledge of appropriate methodologies and upscaling best practices of adaptation strategies among stakeholders, including irrigation

			strategies and groundwater recharge zones.

Project goal and objective

The objective of the proposed project is to reduce the vulnerability of Tuvalu?s island communities to climate change through adaptive climate-resilient agricultural practices and EbA. This will be achieved by first introducing or upscaling on-the-ground climate-resilient agricultural and EbA strategies as part of a larger sustainable land management approach across most of Tuvalu?s islands to directly increase the climate change resilience of communities and ecosystems (Component 1). Specifically, this component is aimed at accomplishing two outcomes, namely the increased resilience of agricultural land and systems to climate change impacts ? specifically related to the growing of pulaka (Outcome 1.1) ? and flood reduction and increased groundwater infiltration by restoring and conserving supporting forest and coastal ecosystems (Outcome 1.2). The success, sustainability and replicability of outcomes under Component 1 will be supported by Component 2. This second component is aimed at creating an enabling environment for the implementation of EbA through improved national policy and planning frameworks, strengthened institutional capacity, awareness-raising and knowledge management. Component 2 will include three outcomes. Within this component, the institutional uptake of EbA will be enhanced through policy revisions and the capacity building of government staff (Outcome 2.1). This will be supported by strategic action plans aimed at streamlining the above policy and planning frameworks (Outcome 2.2). The final outcome involves the enhanced uptake of EbA and climate-resilient agricultural practices through multi-level decision-making programmes, knowledge management and awareness-raising activities (Outcome 2.3). The above components and outcomes, along with their corresponding outputs and activities, are described below.

Project components and expected results

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

Building on previous projects and initiatives, this component will facilitate the adoption of SLM, EbA, and climate-resilient agricultural approaches to enhance the resilience of Tuvalu?s agricultural and natural resource-based livelihoods. In particular, interventions will contribute to reducing the vulnerability of Tuvalu?s traditional pulaka production to saltwater intrusion or inundation, while additionally expanding the diversity and resilience of other crops to reduce the dependence on imported foods and minimise the prevalence of non-communicable diseases. EbA approaches will simultaneously be aimed at restoring and conserving the health of degraded terrestrial and coastal ecosystems, which will increase the health of these ecosystems and improve the provision of ecosystem services that benefit both agricultural systems and communities that are dependent on natural resources. Ecosystem restoration will be focussed on coastal ecosystems that reduce the risk of flooding and storm surge, as well as forest ecosystems within groundwater recharge zones in close proximity to pulaka pits. The enhancement of these groundwater recharge zones will be aimed at increasing rainwater infiltration into freshwater lenses to counteract saltwater intrusion resulting from climate change-related sea level rise (SLR), as well as more severe droughts and intense TCs. The outcomes, outputs and activities related to Component 1 are described below.

Outcome 1.1: Restoration and increased resilience of 46 ha of agricultural systems on 8 islands against the impacts of climate change and saltwater intrusion through innovative land management and agricultural practices.

Baseline

The transition to a semi-commercial economy has led to the gradual abandonment of long-standing traditional practices, such as the cultivation of pulaka, and an increase in less sustainable methods that do not prioritise soil conservation or land management. Because the country's soils are naturally unsuitable for intensive agriculture, many general techniques and best practices for soil remediation from other areas are difficult to apply in Tuvalu. This has reduced soil management and remediation, leading to further deterioration of soil quality and declining agricultural productivity.

As part of the above challenges, specific threats to pulaka production include: i) limited land suitable for pulaka production; ii) soil erosion resulting in poor soil quality; iii) naturally insufficient freshwater availability; iv) more frequent droughts; and v) increasing domestic water demand, which limits water availability for crops. In addition, saltwater intrusion and coastal flooding have impacted the production of pulaka. While salt-tolerant species of pulaka exist, there is currently not enough data on the viability of these in the Tuvaluan context, particularly in the outer islands, given their specific saltwater conditions. Other approaches taken by communities to address saltwater intrusion and coastal flooding include the construction of stone walls on the seaward side of pulaka pits and around the natural wells within pulaka pits to restrict saltwater inundation and prevent saltwater seeping up from contaminated groundwater. Some farmers and landowners have abandoned pulaka production in response to these challenges.

Low-cost alternatives to the traditional pulaka pits have been introduced because of the ongoing challenge of saltwater intrusion. The alternatives to grow pulaka successfully include ?FoodCubes?, emptied fuel drums or damaged and repurposed plastic water tanks. Foodcubes are one cubic metre sealed plastic tubs filled with compost and used to grow several crops and vegetables. They use a dry-wicking system and are very water efficient, using ~30 L of water applied every two to three months, depending on the climatic conditions. During droughts or dry periods, water needs to be applied more frequently. In Tuvalu, the Foodcubes are planted with various crops used for household subsistence or sold in markets in Funafuti. The crops include pulaka, banana, cassava, sweet potato and cabbage.

A similar approach to Foodcubes that has been implemented in Tuvalu is the installation of raised concrete beds, which are larger than Foodcubes (~5 X 6 m) and are therefore more suited to growing large varieties of pulaka, the growth of which is often restricted within Foodcubes. Concrete beds have several characteristics that make them climate resilient. First, concrete beds offer durability and protect crops from potential intrusion from salt-contaminated groundwater sources. Second, the presence of a one-metre-high wall protects crops from the impacts of overland flooding and storm surge, reducing the risk of saltwater inundation. Third, drainage pipes installed in the walls effectively drain excess water during heavy rainfall, preventing crop damage because of waterlogging. Concrete raised beds have been trialed and constructed on several islands in Tuvalu in the National Adaptation Programme of Action 2 (NAPA II) and Government of Tuvalu (GoT) Climate Proofing Project. The introduction of these beds has been well received by recipient communities on the islands of Nui, Nuitao, Nanumea and Nukulaelae, supporting the rationale for upscaling this intervention across all of Tuvalu?s islands.

Although the concrete beds display multiple potential benefits, there is still motivation to maintain the functionality and increase the resilience of existing pulaka pits through climate-resilient strategies described above instead of completely replacing these systems with concrete beds. During community consultations, multiple community members preferred growing pulaka in pulaka pits using traditional methods as part of their cultural heritage. Additionally, the costs of materials and transport of these materials for the concrete beds is comparatively high compared with maintaining existing pits. Another potential constraint is access to water for the concrete beds, as by design they are disconnected from freshwater lenses that usually provide water access for crops in pulaka pits. Through previous pilots and projects that introduced concrete beds, water was either acquired directly from rainfall during the wet season or provided by hand by community members during dry periods using stored rainwater from tanks.

Traditionally, farmers in Tuvalu have adopted several climate-resilient practices to adapt to existing environmental and climatic challenges. Mulching is a practice Tuvaluan farmers already employ successfully in pulaka pits. It involves the construction of raised beds for one or several pulaka plants ?

to provide them with nutrition and prevent waterlogging ? and the layering of leaves and other plant detritus on the surface of the pits, which helps prevent evaporation.

Intercropping is an agricultural technique that involves the simultaneous planting of two or more different crops in close proximity[167][166]. This practice offers numerous benefits, particularly related to climate change resilience. These include: i) improved resource-use efficiency; ii) enhanced soil water-holding capacity; and iii) supporting increased diversity and quality of habitat to beneficial insects such as pollinators[168][167]. Because of these benefits, intercropping has been adopted in many countries across the globe and on many Pacific islands, including Tuvalu. Examples of intercropping across Pacific islands include: i) cocoa, banana or kava (*Piper methysticum*) intercropped with ground crops under shade trees; ii) coffee grown beneath shade trees or shelter-belts; iii) citrus with shelter-belts and other multi-purpose species; iv) vanilla with host plants underneath coconut palms; and v) intercropping of various commercial agroforestry trees[169][168]. Within Tuvalu, coconut-based intercropping is traditionally practised using fruit trees and cash crops such as noni (*Morinda citrifolia*)[170][169].

Nutrient scarcity in Tuvalu?s soils, coupled with limited opportunities for composting, present major constraints for agriculture in the country. The primary sources of compost for soil remediation in the country?s agricultural systems are discarded leaves from crop trees and coconut husks. However, these materials often take several months to break down into compost using traditional methods, resulting in the process for soil enrichment being slow. Plant material shredders have been used successfully on islands in the past to increase the availability of plant compost; however, the current machines are a decade old and have exceeded their lifespan. Another source of organic compost available to farmers is manure from livestock, including pigs.

Proposed project approach

Outcome 1.1 will use a multi-option approach to increase the resilience to climate impacts of pulaka and other locally appropriate crops that both upscale proven interventions and introduce novel approaches. The options analysis will draw on and incorporate best practices from previous projects implemented within Tuvalu as well as other projects in Tuvalu and the region as a whole. This approach will increase the resilience and productivity of local food production, in turn reducing the dependency of Tuvaluans on imported food, the availability of which may be impacted by extreme weather events or global health or economic shocks similar to the Covid-19 pandemic. The first of these options will upscale the introduction of 449 raised concrete beds (benefitting ~2,400 individuals) placed separately to active pulaka pits, providing a climate-proofed additional avenue for the growth of pulaka and other crops. Second, climate-resilient crops and cropping strategies will be introduced to the raised concrete beds and existing pulaka pits to increase sustainable agricultural production. The above methods will be supported by enhanced irrigation strategies and soil remediation techniques. Additionally, these on-the-ground approaches will be iteratively improved and replicated by community training groups on each of the eight target islands. Best practices and lessons learned through the implementation of the above outputs will assist in addressing Barrier 1: Limited knowledge and technology implementation regarding climate-resilient agriculture and land-management practices at national and local levels.

Output 1.1.1: National pulaka pit health and groundwater assessment undertaken on all 8 target islands.

The European Union (EU)-funded study undertaken in 2007 to investigate the salinity and health of pulaka pits across Tuvalu[171][170] is a vital source of information for the proposed project and other initiatives involving pulaka pits (see Sections 2.1.3 and 2.5.2 which include a summary salinity information provided by this study for each island). Although comprehensive, the study was not able to investigate all pulaka pits across Tuvalu and was undertaken over 15 years ago. Based on changes to the condition of many pulaka pits noted during field missions during project development, the information

generated through the original pulaka pit salinity study is outdated. There is therefore limited information on the current health of pulaka pits across the country and the impact of climate change on groundwater salinity for pulaka pits.

Under Output 1.1.1, the pulaka pit health and salinity study undertaken in 2007 will be replicated and upscaled to include all pulaka pits in Tuvalu. This will provide valuable data to inform the implementation of interventions under the proposed project, as well as similar interventions under other future initiatives. The information will also assist in determining national priorities and actions regarding pulaka pit vulnerability to climate change and other drivers of degradation.

As the Executing Entity, the Ministry of Finance (MoF) will implement this output with assistance from international and national hydrologists and agriculturalists as well as the Agriculture Department. First, pulaka pit groundwater salinity, health, location and area measurements will be undertaken for all pulaka pits on the eight target islands. Based on these measurements, a national assessment of pulaka pit groundwater salinity and health will be developed. Finally, a framework for the regular monitoring and management of pulaka pits will be developed based on the methodologies and finding of the above measurements and national assessment. This framework will assist in ensuring the continuous monitoring of pulaka pit health, which can be used to track trends in pulaka pit health under projected climate change.

? Activity 1.1.1.1: Undertake pulaka pit groundwater salinity and health measurements for each pulaka pit on the 8 target islands.

? Activity 1.1.1.2: Based on the measurements in Activity 1.1.1.1, develop a national assessment of pulaka pit groundwater salinity and health.

? Activity 1.1.1.3: Based on the methodology and findings in Activity 1.1.1.1 and 1.1.1.2, develop a framework for regular pulaka pit salinity and health monitoring and management.

Output 1.1.2: 449 raised concrete beds introduced to 8 target islands to upscale the Climate Proofing Project.

Output 1.1.2 will directly upscale the introduction of climate-proof raised concrete beds piloted under the NAPA 2 and implemented through the Government of Tuvalu (GoT)?s Climate Proofing Project. Under these previous projects, 92 concrete beds were initially piloted on Nanumanga Island through the NAPA 2 project, while the Climate Proofing Project replicated the pilot project?s approach on the islands of Nui, Nuitao, Nanumea and Nukulaelae. The Climate Proofing Project provided 116 concrete beds in total, consisting of 50 concrete beds on Nui and 22 each on Nanumea, Nuitao and Nukulaelae. The proposed project will therefore upscale these successful initiatives by providing an additional 449 raised concrete beds ? 174 supplementary pits in the original five islands of Nanumanga, Nui, Nuitao, Nanumea and Nukulaelae, and 275 in the three new islands of Funafuti, Vaitupu and Nukufetau. The MoF has determined this number based on the previous allocation of concrete beds.

Output 1.1.2 will be implemented by the MoF because of their experience gained through the implementation of the Climate Proofing Project. To determine the number allocation of concrete beds for each island, a needs assessment will be undertaken based on the pulaka pit salinity and health study undertaken in Output 1.1.1, the climate change vulnerability of each island, interest of community members in the provision of concrete beds, and the number of beds ? or similar interventions such as food cubes ? already introduced on the islands. The needs assessment will be undertaken with inputs from the community members on each island as well as the *Kaupule* and *Falekaupule*. Once the number of concrete beds per island has been determined, the *Kaupule* will determine the specific allocation of the beds to recipient households, based on their degree of interest in the intervention, ability to continue the upkeep of the concrete beds and their vulnerability to climate change impacts. Where possible, the allocated concrete beds will be placed on the recipient?s land in close proximity to their households or

agricultural lands. This is to enable improved ease of access to the beds and to capitalize on existing structures that could be used for rainwater harvesting for the concrete beds (Output 1.1.3).

Based on the needs assessment and concrete bed allocations for each island, materials for the construction of the beds will be procured and transported to the respective islands. The materials required will replicate those used in the Climate Proofing Project to construct concrete beds, with dimensions of 6 X 5 X 1 m. The beds will be constructed of 84 concrete blocks that are 20 cm thick, with a flat cement base. Where possible, all construction material will be transported to the islands to reduce the impact of sand mining on the islands. Local labour provided through the target communities will be used in the construction of the concrete beds.

? Activity 1.1.2.1: Undertake a needs assessment to inform the allocation of concrete beds per island.

? Activity 1.1.2.2: Procurement and transport of materials for the construction of raised concrete beds on each of the 8 target islands.

? Activity 1.1.2.3. Based on the needs assessment in Activity 1.1.2.1, construct 449 raised concrete beds on the 8 target islands.

Output 1.1.3: Alternative irrigation strategies, including drip irrigation, rooftop rainwater harvesting and water tanks installed to facilitate water supply to 449 raised concrete beds introduced on each of the 8 target islands.

Alternative, water-efficient irrigation methods will be installed to support the raised concrete beds (Output 1.1.2) and ensure a sufficient water supply throughout the year. These irrigation strategies will include drip irrigation piping with flow meters to manage the daily water allowance for each concrete bed. To ensure the additional irrigation requirements of the beds do not contribute to water insecurity by taking water from existing water tanks used for domestic use, 449 water tanks will be introduced across the eight islands to supplement agricultural water demands through roof-top rainwater capture. These additional irrigation systems will be supplementary to direct rainfall that the concrete beds receive during the wet season and will therefore primarily be used during extended dry periods. They could, however, also provide additional water security to community members in addition to providing water for irrigation.

The MoF will implement Output 1.1.3 with assistance from the Public Works Department. The output will involve the installation of 449 2,000 L water tanks adjacent to the concrete beds with accompanying drip irrigation piping. Because these concrete beds will be situated close to available household structures or agricultural structures such as livestock pens, it is assumed that additional roofing structures for rainwater capture will not be necessary for most households. There are, however, potential recipients that do not currently have suitable roofing for rainwater capture. To not exclude these individuals, the project will provide roofing structures that can be used for rainwater capture for ~50 households[172][171].

The installation of the above irrigation systems will be accompanied by the development of a community-based operation and maintenance (O&M) plan. The final O&M plan will be disseminated by the community training groups established through Output 1.1.5, which will also provide detailed practical training on the use and maintenance of the introduced irrigation systems.

? Activity 1.1.3.1: Procure and distribute irrigation piping, water tanks and additional roofing to the target islands.

? Activity 1.1.3.2: Install strategically placed rainwater-harvesting (RWH) systems around constructed raised concrete beds on the 8 target islands.

? Activity 1.1.3.3: Develop operation and maintenance plans for the irrigation systems to be disseminated to recipients by community training groups under Output 1.1.5.

Output 1.1.4: Diversified cropping strategies introduced to 449 raised concrete beds and 64 pulaka pits to promote the use of climate-resilient crops.

Output 1.1.4 will build on and complement ongoing projects focusing on improved food security in Tuvalu, including the GEF?s ?Integrated agro-ecosystem approach for enhancing livelihoods and climate resilience in Tuvalu?, and the International Fund for Agricultural Development (IFAD)?s regional ?Small Islands Food and Water Project (SIFWaP)?. This will be done by drawing on best practices and upscaling diversified cropping strategies on the eight target islands, specifically within the raised concrete beds as well as in or around pulaka pits. Examples of strategies that the project will expand include community-based composting or mulching, nursery development or expansion, tree crop planting and home gardens.

With its experience in climate-resilient crop varieties and practices, the Agriculture Department as an Executing Partner will be primarily responsible for implementing Output 1.1.4. Based on the above two projects and their progress at the beginning of the LDCF project?s implementation, a site-specific options analysis will be undertaken to identify the community-specific intervention gaps on each island for climate-resilient cropping strategies. The options analysis will also assist in identifying and confirming appropriate crop varieties. This will be done in close collaboration with the Agriculture Department and the Centre for Pacific Crops and Trees (CePACT) within the South Pacific Community (SPC). CePACT has undertaken considerable work towards identifying climate-resilient crop species within the South Pacific and will be able to provide both seeds and tissues for propagating species to the project through Tuvalu?s Agriculture Department. Selected crop varieties should include those that are salt-tolerant, drought-resilient and are preferred by the recipient communities. Potential examples of vegetable or tuber varieties that could be considered include salt-tolerant pulaka, taro and papaya, potato, cassava, dwarf banana, *Pandanus,* pumpkin and breadfruit. Nitrogen-fixing fallow crops shown to be beneficial in increasing soil fertility in Pacific atolls, including Mucuna (*Mucuna pruriens*) will also be introduced[173][172].

The distribution of identified crop varieties to recipient communities will be facilitated by establishing or supporting community-managed nurseries and seed banks on each island. On most islands, this will involve upgrading existing nurseries that have been established or upscaled by the GEF agro-ecosystem project and will be aimed at supplementing nursery equipment and materials to accommodate the additional plants required for the proposed project. Although the nurseries would be primarily community-managed, extension officers from the Agriculture Department will assist in their management and operation.

Through Output 1.1.4, the proposed project will replicate and upscale climate-resilient practices undertaken by the above projects. These include home garden practices that will be implemented within the raised concrete beds, as well as intercropping to be undertaken within and around pulaka pits. Intercropping will consist of a mixture of trees and crops with multiple uses, including bananas, papaya, coconut, *Pandanus* and breadfruit. This intercropping approach around the perimeter or within pulaka pits will provide an increased diversity of food and resources for communities while additionally providing pulaka and other crops, such as taro grown in the pits, with shade protection that reduces

evapotranspiration and heat stress. In addition, these selected crops will provide plant material not used for food or other uses that are of a high enough nutritional quality to be mulched and composted to support the soil remediation of pulaka and other crops grown in the pits. This will draw on traditionally used practices for generating compost, including the use of plant leaves, coconut husks and food waste. For deep pulaka pits with steep slopes and at risk of soil erosion, intercropping will extend to these slopes through terracing. This terracing approach will slow runoff and promote water infiltration, while additionally assisting in soil retention and soil remediation. Local community members will be capacitated and employed to implement the above intercropping and terracing using hand tools and other equipment provided through the project, with guidance from Agriculture Department extension officers.

Finally, Output 1.1.4 will support improved soil remediation practices by introducing communal compost mulching equipment on each island, including vegetative shredders. Similar shredders have previously been used on the outer islands to provide compost and mulch to farmers, but this equipment has exceeded its operational lifespan. In addition, a scheme will be developed or supported for the communal collection and composting of manure from livestock to be made available to farmers. This activity will be aimed at building on community-level composting schemes that will be introduced by the SIFWaP project. The shredder and composting of shredded material and livestock manure will be managed by a waste management representative on each island from the Public Works Department. Once established, composting processes will begin months before the growing season to ensure sufficient compost is available to farmers on each island. Community members ? including women or the youth ? will be responsible for collecting and providing material for composting, which they will then have access to for crops.

? Activity 1.1.4.1: Undertake options analysis for site-specific climate-resilient cropping strategies, including terracing and identification of climate-resilient crop varieties.

? Activity 1.1.4.2: Based on the options analysis in Activity 1.1.4.1, procure appropriate climate-resilient crop varieties.

? Activity 1.1.4.3: Establish or support nurseries and seed banks on each island to supply climate-resilient crops to target communities.

? Activity 1.1.4.4: Establish cropping strategies within raised concrete beds as well as in and around pulaka pits, including through intercropping, mulching, the terracing of crops on slopes and multi-use species used for soil remediation.

? Activity 1.1.4.5: Introduce mulching equipment on each island to support the production of organic mulch for soil remediation of raised concrete beds and pulaka pits.

Output 1.1.5: Eight community training groups ? including representatives from women?s groups ? established around target sites to generate knowledge of appropriate methodologies and upscale best practices of adaptation strategies among stakeholders.

Implemented by the MoF and with assistance from the Local Government Department, Output 1.1.4 will use a training of trainers model to establish one community training group for each of the eight target islands to generate, collect and disseminate knowledge of the O&M of the on-the-ground interventions introduced in Outcome 1.1 and 1.2. Each training group will consist of at least two men and two women representatives from the corresponding island, as well as an officer from the Local Government Department. Training and upskilling of these selected representatives will be undertaken on Funafuti by national and international experts, government departments, and NGOs such as the Tuvalu National Council of Women (TNCW) on the various on-the-ground interventions. This upskilling will be enhanced by providing training for the training groups on the details of implementation or O&M plans

developed in other outputs, including: i) irrigation system O&M plan (Output 1.1.3); iii) crop strategy options analysis (Output 1.1.4); iv) ecosystem restoration plans (Output 1.2.1); v) groundwater recharge zone plan (Output 1.2.2); and vi) diversified livelihoods options analysis (Output 1.2.3). Capacity development of the training groups will also draw on best practices, lessons learned and management plans from similar previous projects and initiatives, including, *inter alia,* the Climate Proofing Project, GEF Agro-ecosystems project, SIFWaP, Tuvalu Coastal Adaptation Project (TCAP) and Ridge to Reef (R2R) project.

The community training groups will facilitate training workshops on each of their respective islands at the beginning of implementation for each on-the-ground intervention. This training will be held on each island twice a year during implementation using focus group discussions and in-person workshops. Training workshops will be recorded so that they can be uploaded to the online knowledge management platform developed under Output 2.3.3. The timing of the workshops will be planned to consider ferry transport schedules to the islands as well as the time of day to facilitate the maximum participation of community members. For example, workshops targeted towards women will be held in the evenings to accommodate their numerous daily and family obligations. Each island's *Kaupule* will also be engaged with beforehand to elicit assistance in achieving maximum participation.

Through Output 1.1.5, methodologies for continuously monitoring introduced on-the-ground interventions and collecting lessons learned will be developed in collaboration with the training groups and national and international experts. Using these methodologies, the training groups will assist in collecting and collating lessons learned from each island which will be disseminated across all islands on an annual basis and documented to inform gender-responsive best practice guidelines under Output 2.3.1. Implementing these methodologies will ensure that community capacity-building on the introduced adaptation interventions is iterative and continuous throughout project implementation and that knowledge on critical lessons learned is shared universal across all communities regularly.

? Activity 1.1.5.1: Identify community training group members and provide upskilling through training of trainer workshops.

? Activity 1.1.5.2: Develop methodologies for the monitoring of introduced interventions and collection of lessons learned on EbA, SLM and introduced agricultural practices.

? Activity 1.1.5.3. Based on the methodologies developed in Activity 1.1.5.2, collect and collate lessons learned on EbA, SLM and agricultural practices implemented by the project and share knowledge through annual workshops between the community training groups.

? Activity 1.1.5.4: Hold annual workshops facilitated by the community training groups to capacitate local communities on climate-resilient approaches undertaken through the project.

Outcome 1.2: Groundwater infiltration and flood-risk reduction services improved on 8 islands through SLM practices that include the restoration and conservation of degraded atoll ecosystems.

Baseline

Tuvalu faces several challenges to ecosystem conservation, including: i) its isolation; ii) the distances between the country?s islands; iii) limited knowledge within the Department of Environment (DoE) on the degradation of the country?s ecosystems; and iv) limited availability of land and natural resources. Despite these challenges, the country has established a comprehensive protected area (PA) network ?with support from the ?Implementing a "Ridge to Reef" approach to protect biodiversity and ecosystem

functions in Tuvalu? project[174][173] ? covering a total area of 240 km2, the bulk of which (235 km2) consists of marine PAs. These PAs include the: i) Funafuti Conservation Area (FCA); ii) Vaitupu Locally Managed Marine Area (LMMA); iii) Nukulaelae LLMA; iv) Nanumea LMMA; v) Nukufetau LMMA; vi) Nui LMMA; vii) Nuitao LMMA; viii) Niulakita LMMA; and ix) Nanumanga LMMA[175][174]. For example, the Funafuti Marine Conservation Area has been shown to yield tangible benefits through improved community awareness, higher fish biomass and the sustained health of marine ecosystems. Ecosystem conservation activities have also involved mangrove restoration projects. For example, the Tuvalu National Council of Women (TNCW), in collaboration with the Tuvalu Association of Non-Government Organizations (TANGO), has proposed an expansion project which involves the outer islands replanting mangroves and seedlings of Beauty Leaf Laurel[176][175] (*Calophyllum inophyllum*) in areas threatened by coastal erosion[177][176].

The success of EbA through the restoration and conservation of coastal ecosystems depend heavily on local community participation and buy-in. This is particularly the case in Tuvalu, where communities and associated ecosystems on the outer islands are relatively isolated compared with most countries, making external management of ecosystems logistically difficult and costly. Consequently, communities ? provided they receive sufficient capacity building ? are best placed to manage ecosystem conservation on their islands because of their proximity to the ecosystems and the direct benefits they can accrue via ecosystem services. This approach is currently being implemented within Tuvalu through community-based adaptive management. Adaptive management is the integration of design, management and monitoring to iteratively improve responses to management efforts[178][177]. Within Tuvalu, local governance structures can facilitate the conservation of targeted ecosystems through community-based adaptive management. These include the development of by-laws and locally managed conservation areas determined by island *Falekaupule* and *Kaupule*, and approved by national government. By-laws can be established on individual islands to, for example, limit the collection of natural resources to certain areas or within specific times of the year to manage resource use.

The conservation of protective coastal ecosystems can be strengthened further by introducing and promoting diversified, sustainable livelihoods on Tuvalu?s islands. Livelihood diversification is a globally recognised strategy to assist both community and ecosystem health. This is because a diversified portfolio of livelihoods allows households to spread and reduce risks associated with being dependent on one livelihood[179][178]. Through this, individuals are better able to adapt to climate change and economic stressors, thereby improving their quality of life. At the same time, by diversifying the source of natural resources used by these livelihoods, the exploitation of each individual resource is lessened. Within Tuvalu, an example of a strategy to enhance the production of an existing livelihood activity is the strengthening of crop agriculture through intercropping. This approach provides more food options to households not involved in crop growing and increases the production potential for households already involved in crop agriculture. Another livelihood option adopted in Tuvalu is the production of traditional crafts used for sale and cultural ceremonies. Craft-based livelihoods, however, are currently limited in Tuvalu because of the difficulty in transporting goods to markets.

Fishing is another primary natural resource-based livelihood in Tuvalu. Currently the most prevalent fishing practice is reef fishing, which impacts the health of coral reefs and their capacity to provide ecosystem services. To address this, sustainable fisheries livelihood priorities identified in the NAPA 2 project and National Master Plan for Fisheries Development (2008?2011) include: i) the installation of biodegradable and non-tangling fish aggregating devices (FADs) to promote the diversification of fishing to include more pelagic species; ii) training of fishers on the safe and sustainable use of FADs and canoes;

iii) provision of safety equipment and fishing gear to improve the safety of fisherfolk against ocean-based climate hazards; and iv) training on improved post-harvest of fisheries catch[180][179].

Project approach

The climate resilience of the agricultural systems targeted in Outcome 1.1 will be further enhanced through Outcome 1.2, which is aimed at maximising protective and regulatory ecosystem services surrounding and adjacent to pulaka pits on the eight islands. These ecosystem services will specifically be targeted towards reducing the vulnerability of the pulaka pits to saltwater intrusion into the freshwater lenses directly underlying the pulaka pits, as well as reducing the risk of surface inundation during TC events. Although the 2007 pulaka pit salinity study indicated that many pulaka pits samples were still in sufficient health, subsequent field visits to Nanumea, Nanumanga and Niutao have indicated that multiple pulaka pits have reduced in health as a result of saltwater intrusion. Based on climate change and hydrological analysis, there is a high likelihood that more pulaka pits will be exposed to saltwater intrusion under future climate change. The proposed project will therefore target most pulaka pits on all eight identified target islands.

Outcome 1.2 will first involve the restoration and conservation of 534 ha of degraded coastal ecosystems adjacent to pulaka pit areas, which will include the improved conservation of these ecosystems as well as active planting of indigenous species, where applicable. Second, 90 ha of groundwater recharge zones surrounding targeted pulaka pits will be enhanced through improved SLM. As with Output 1.1, the options analysis will draw on and incorporate best practices from previous projects implemented within Tuvalu as well as other projects in Tuvalu and the region as a whole. To demonstrate the potential benefits of using EbA to increase groundwater recharge, Appendix 25 uses a groundwater flow and mass transport model on Vaitupu to simulate the gradual increased infiltration of water into the groundwater lens resulting from EbA groundwater recharge buffer zones. The simulation shows that groundwater salinity concentrations by 2100 under EbA-induced freshwater infiltration are predicted to return to baseline values compared with the higher salinity concentrations resulting from projected climate change-related SLR of 1.3 m by the same time period.

The above restoration and conservation efforts will be complemented by livelihood diversification aimed at both improving the sustainable use of natural ecosystems and increasing the economic and food stability of communities that are dependent on these ecosystems for subsistence. Similar to Outcome 1.1, outputs under Outcome 1.2 will assist in addressing Barrier 1. The Environment Department will implement Output 1.2.1 as an Implementing Partner because of their experience in ecosystem restoration and conservation area establishment.

Output 1.2.1: 534 ha of coastal ecosystems restored or conserved to enhance the provision of associated ecosystem services, including flood reduction and storm surge attenuation.

Through Output 1.2.1, 534 ha of degraded or threatened terrestrial or coastal ecosystems will be restored and conserved across all target outer islands. This will include 430 ha of terrestrial or coastal ecosystems using a combination of assisted natural regeneration and active replanting of drought-resilient and resource-provisioning plant species, as well as the conservation of 104 ha of marine ecosystems. For this output, Funafuti will be excluded as a result of the location of the pulaka pits within Funafuti?s urban area, meaning that surrounding ecosystem restoration is unachievable. Assisted natural restoration will be promoted by establishing Terrestrial Conservation Areas (TCAs) and Locally Managed Marine Areas (LMMAS) for coastal ecosystems ? including littoral coastal forests, mangrove forests and coral reefs ? in areas ~200 m adjacent to pulaka pits. The incorporation of species such as mangroves into these areas can significantly ameliorate wave impact, with reductions in wave height ranging from 13% to 66% per 100 meters of mangrove coverage. Under this observation, a 200 m restoration belt of mangrove and other littoral species has the potential to reduce storm surge wave height by at least 20% compared with degraded areas.

[1] Spalding M, McIvor A, Tonneijck FH, Tol S and van Eijk P (2014) Mangroves for coastal defence. Guidelines for coastal managers & policy makers. Published by Wetlands International and The Nature Conservancy. 42 p

This approach will utilise existing community-managed land conservation models that have been used and expanded by previous projects such as the R2R Project. The proposed project will therefore draw from the training manual for implementing LMMAs developed through the R2R Project for best practices on establishing and maintaining these areas. The approach outlined in this training manual includes: i) an initial assessment ? which has begun during the PPG phase and will be completed at the beginning of the proposed project?s implementation; ii) the design and planning of the LMMA, which will take the form of the restoration implementation and maintenance plans under Activity 1.2.1.1; iii) implementation using a community-based adaptative management approach; and iv) ongoing maintenance and enforcement of the LMMAs.

First, the proposed TCAs and LMMAs will be assessed through visits to each target island and discussions with local communities, the Department of Rural Development, and the Department of Fisheries. Following these discussions and subsequent agreements, site-specific restoration implementation and maintenance plans will be developed for each island. Developing these plans will involve close engagements and participation with local community representatives to confirm the areas to be restored and gain landowners' consent. The restoration plans will also evaluate the progress and extent of other projects involved in ecosystem restoration on the target islands, including the Ridge to Reef Project and the GEF Agro-ecosystems Project. This evaluation will be done to avoid duplication of efforts and instead increase the impact of projects that have recently closed or are currently under implementation. Additionally, these complementary projects will provide best practice guidelines to inform the development of the restoration plans. The finalisation of the plans will include the confirmation of stakeholders? roles and responsibilities, as well as the presentation and validation of the plan with all community members.

TCAs and LMMAs will be established within the selected areas based on the restoration implementation and maintenance plans. Implementation will include the continued monitoring of biological and socio-economic indicators as well as continued awareness raising with communities to restrict the occurrence of activities that cause ecosystem degradation. The conservation areas will be formally declared within the communities and boundaries clearly demarcated. If a community deems it necessary, patrolling may be implemented under the authorisation of the *Kaupule*. For TCAs, the sustainable harvesting of some natural material will still be allowed, which will be determined by community by-laws and enforced through the *Kaupule* on each island.

For forest and mangrove ecosystems that are severely degraded, active restoration may be needed in addition to establishing the above conservation areas. This will involve the removal of invasive alien plant species and planting indigenous, multi-use species that are salt-tolerant. Based on the methodology used in the Ridge to Reef project, local labour will be employed for this from the target island communities. Appropriate species will be confirmed in the restoration plans described above and will draw from the inventory of native trees created under the GEF Agro-ecosystems Project. Potential examples of native species include, *inter alia,* Indian beech (*P. acidula*), *Pandanus*, mei (*A. altilis* or *A. ariannensis*) and mangrove species such as the common mangrove (*R. stylosa*) or red-flowered mangrove (*L. littorea*). Seedlings for the restoration will be provided through nurseries on each island that have been upgraded through Output 1.1.4. Local labourers will be used to prepare active restoration sites, plant seedlings, and ongoing maintenance of the plants, which will involve continuous monitoring and, where required, supplementary watering. These community members will be trained in restoration implementation and monitoring by the community training groups established in Output 1.1.5 using the restoration implementation and monitoring plans developed under Activity 1.2.1.1.

? Activity 1.2.1.1: Undertake an assessment of the proposed Terrestrial Conservation Areas and Locally Managed Marine Areas and finalise demarcation in partnership with local communities, the Department Rural Development, and Department of Fisheries.

? Activity 1.2.1.2: Develop site-specific restoration implementation and maintenance plans for each island for the restoration of 180 ha of coastal ecosystems.

? Activity 1.2.1.3: Establish Terrestrial Conservation Areas and Locally Managed Marine Areas around pulaka pit areas.

? Activity 1.2.1.4: Undertake active coastal ecosystem restoration within established or existing TPAs through planting of salt-tolerant, indigenous species.

Output 1.2.2: Groundwater recharge zones in and around ~62 active pulaka pit areas protected using EbA buffer zones to improve freshwater infiltration potential.

Under Output 1.2.2, 90 ha of groundwater recharge zones within 50 m of active pulaka pits will be strengthened and conserved to encourage increased runoff capture and groundwater infiltration. This will assist in expanding the freshwater lenses underlying the pulaka pits and reduce the impact of saltwater intrusion. First, site-specific groundwater recharge zone plans will be developed for each island, which will involve the detailed mapping of interventions for each island?s groundwater recharge zones and consultations with community representatives and landowners.

Based on the above groundwater recharge zone plans, managed aquifer recharge interventions, including vegetated infiltration ponds and drainage trenches, will be installed within the groundwater recharge zones. These will be designed to capture runoff that would otherwise be lost to the ocean and allow it to infiltrate into the ground. Measures for improved infiltration will primarily be placed inland of the pulaka pits to reduce the likelihood of saltwater inundation during storm surges related to TCs. The drainage trenches will be designed to capture and channel water to the infiltration ponds and the pulaka pits. For both the drainage trenches and infiltration ponds, naturally occurring coarse sand and coral rock will be used on the base of the structures to maximise water infiltration potential.

Once the infiltration basins and drainage trenches have been constructed, indigenous species will be planted across the infiltration zones, using drought-tolerant, multi-use species such as puka, *Pandanus*, breadfruit, seaside cordia (*C. subcordata*) and beach gardenia (*G. speciosa*). As with Output 1.2.1, seedlings for this restoration will be sourced from nurseries on each island (Output 1.1.4). To protect the groundwater recharge zones ? particularly directly following restoration ? as well as crops within the pulaka pits, fences will be installed along the perimeter of the groundwater recharge zones to prevent invasion by livestock such as cattle or pigs. Labourers will be employed from the local communities to facilitate the installation of the managed aquifer recharge structures, vegetative restoration and construction of the fencing. These community members will receive training for the implementation and monitoring of structures and vegetation under this output through community training groups established through Output 1.1.5.

? Activity 1.2.2.1: Develop site-specific groundwater recharge zone plans for each island.

? Activity 1.2.2.2: Implement managed aquifer recharge technologies such as infiltration ponds and drainage trenches to encourage the infiltration of run off around pulaka pits.

? Activity 1.2.2.3: Actively restore groundwater recharge zones by planting drought-tolerant indigenous species.

? Activity 1.2.2.4: Install fencing around established buffer areas to protect pulaka pit areas.

Output 1.2.3: Diversified livelihoods strategies introduced for ~800 people (400 women and 400 men) in local communities reliant on natural resource-based livelihoods including sustainable fisheries management to conserve coastal ecosystems and their services.

Output 1.2.3 will be synergistic with climate-resilient agricultural practices and ecosystem conservation under Outcomes 1.1 and 1.2, respectively. Specifically, other outputs under Outcomes 1.1 and 1.2 will assist in increasing the availability of natural and agricultural resources that will support the diversification of livelihoods for 800 recipients across the eight target islands. Concurrently, the design of the livelihoods to be sustainable with a focus on SLM will support the conservation of ecosystems restored through other outputs under Outcome 1.2, which will further promote the provision of ecosystem services. Moreover, livelihood enhancement and diversification will assist in improving the food self-sufficiency of Tuvalu?s isolated communities, making them more resilient to climate shocks as well as potential global health or economic shocks ? such as the Covid-19 pandemic ? which may restrict the importation of food to the country.

The first activity under Output 1.2.3 will be the development of a site-specific livelihood options analysis to identify specific livelihoods for each target island and community and finalise the number of recipients for each target island, in consultation with the corresponding *Kaupule*. This options analysis will expand on stakeholder engagements undertaken through the Project Preparation Grant (PPG) phase on Funafuti, Nanumanga, Nanumea and Nuitao to confirm specific livelihood gaps and preferences for each target community. Additionally, relevant public sector departments ? including the Agriculture Department, Fisheries Department and Environment Department ? as well as non-governmental organisations (NGOs) such as TNCW and the Tuvalu Association of Non-Government Organisations will be consulted on site-specific options and best practices for identified livelihoods. Through the options analysis and consultations, livelihoods will be prioritised that are gender-responsive and provide increased opportunities for women and the youth.

Options identified and validated through the options analysis for diversified sustainable fisheries and terrestrial resource-based livelihoods will be implemented across the eight target islands. Sustainable fisheries livelihoods will focus on reducing overfishing in reef ecosystems by increasing the accessible ocean area available to small-scale fisherfolk to include pelagic areas. This will lessen the overall fishing pressure in coastal marine areas, including protective reefs, while diversifying fisherfolk's potential catch to include other commercially valuable species such as tuna. Interventions that will be introduced by the proposed project to achieve this include the provision of FADs, safety equipment, and durable fishing gear. The FADs will be biodegradable and non-tangling to minimise potential negative impacts on marine life and will assist in increasing the viability of pelagic fishing for fisherfolk. The safety equipment and durable gear will additionally enable fisherfolk to fish farther out in more challenging ocean conditions and reduce economic losses or injury to fisherfolk. Fisheries livelihoods will also be supported by the establishment of the LMMAs under Output 1.2.1, which will assist in increasing overall fish stocks. Moreover, sustainable fish processing practices such as fish slating or drying will be promoted.

Livelihoods that depend on terrestrial natural resources will also be diversified. These livelihoods will expand potential benefits to recipients not involved in fishing and assist in promoting the sustainable management of terrestrial and coastal ecosystems. One example of a livelihood to be supported is the manufacture of cultural handicrafts that are traditionally made by women, including woven mats, headdresses, fans and necklaces. These crafts are made of natural materials such as *Pandanus* or coconut leaves, indigenous flowers, puka seeds and shells. The availability of many of these materials will be supported by intercropping and restoration interventions under Outputs 1.1.1 and 1.1.2, while the regulation of resource provision from established conservation zones will ensure resources are utilised

sustainably. Improved agricultural provision through Output 1.1.1 will also support another potential diversified livelihood, namely agro-processing. This approach will introduce equipment and practices for the manufacture of a wider variety of food products that use crops that will be promoted through Output 1.1.1. Potential products include ones that can be preserved and sold at markets in Funafuti such as coconut oil, coconut sap sugar, breadfruit flour, pandanus juice sun-dried banana and banana chips.

Recipients and the wider community will be trained in sustainable practices and the maintenance or operation of any introduced equipment for each of the livelihoods identified above. This training will include awareness raising on the benefits of using sustainable livelihood practices to support healthy ecosystems. Training will consider traditional knowledge as well as national and international experts and best practices, facilitated by the community training groups established in Output 1.1.5.

? Activity 1.2.3.1: Undertake a site-specific options analysis for sustainable small-scale fisheries and natural resource-based livelihoods.

? Activity 1.2.3.2: Establish identified gender-responsive, fisheries and natural resource-based livelihood strategies in target communities that promote the sustainable use of protective coastal ecosystems.

? Activity 1.2.3.3: Train communities on sustainable natural resource management and gender-responsive diversified livelihood strategies.

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.

Component 2 will create an enabling environment for the institutional mainstreaming of EbA, SLM and climate-resilient agricultural practices at the national and local levels. Specifically, outcomes of Component 2 include: i) enhanced institutional uptake of EbA among relevant institutions in the public sector; ii) strategic action plans to better streamline EbA into policy and planning frameworks; and iii) enhanced uptake of EbA, SLM and climate-resilient agricultural practices through improved knowledge management and awareness-raising. This enabling environment will ensure the sustainability of interventions implemented through Component 2 and will promote the future upscaling of these approaches to other areas or recipients within Tuvalu. To create this enabling environment, outputs in Component 2 will specifically be targeted towards addressing existing barriers to achieving the preferred approach (Section 2.3.5). The outcomes, outputs and activities related to Component 2 are described below.

Outcome 2.1: Institutional uptake of EbA enhanced through policy revisions and capacity building among core government staff, professionals and community representatives.

Baseline

The SLM baseline in Tuvalu includes efforts to protect and conserve natural resources ? such as soil, water, and biodiversity. Some of the specific measures that Tuvalu has implemented to promote SLM include government initiatives which have: i) implemented preventative soil erosion measures, such as reforestation and constructing terraces and contour lines to reduce surface runoff; ii) implemented measures to promote sustainable agriculture, such as the use of traditional farming methods that promote soil fertility and crop rotation; and iii) began the development of the Land Use Policy[181][180]. These measures have been supported by distributing an SLM training manual for local farmers[182][181] developed under the ?Implementing a "Ridge to Reef" approach to protect biodiversity and ecosystem

functions in Tuvalu? project[183][182]. Through the implementation of a project entitled ?Building capacity and mainstreaming sustainable land management (SLM) in Tuvalu? ? completed in 2012 ? SLM considerations were mainstreamed into national development plans[184][183].

Some capacity building for climate change adaptation, SLM and climate-resilient agriculture within the public sector has been or will be undertaken through other initiatives, including the Tuvalu Coastal Adaptation Project (TCAP) and the GEF Agro-ecosystems Project. However, specific capacity building on incorporating EbA and climate-resilient agriculture interventions as part of an overall SLM strategy to increase ecosystem services and the productivity of agricultural land ? including pulaka pits ? is currently limited. Moreover, prominent policies and plans that dictate the implementation of climate change adaptation and resilient agricultural practices, namely the Agriculture Sector Plan and Climate Change Policy, are outdated and require updating.

Project approach

Building on previous or ongoing projects, institutional uptake of SLM, EbA and climate-resilient practices will be enhanced through the revision of three national policies and one sub-national policy (Output 2.1.1). Through these revisions, the output will ultimately streamline funding for adaptation priorities and increase effective coordination between relevant government and non-government agencies. Output 2.1.1 will therefore directly address Barrier 2: Limited integration of EbA and SLM-related climate change adaptation priorities into Tuvalu's national planning, policy frameworks and budgeting systems. The revision of policies will be supported by building the capacity of government officials to integrate EbA, climate-resilient agriculture and SLM principles into policy and planning (Output 2.1.2). Through Output 2.1.2, the project will assist in addressing Barrier 2 and Barrier 3: Limited technical and professional capacity for implementing CCA strategies at the national and local scale over the long term. Outcome 2.1 will be implemented by the MoF. In doing so, best practices from previous projects implemented within Tuvalu as well as other projects in Tuvalu will be drawn, in particular in designing the training programmes under 2.1.2.

Output 2.1.1: Revisions made to 3 national policies and procedures 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.

The NAPA-I project identified a need to improve linkages between national development priorities and ongoing climate change adaptation through SLM. Towards this, Output 2.1.1 will involve the revision of three national policies and procedures to better integrate SLM, EbA and climate-resilient practices. Revisions will focus on aligning the integration of SLM and EbA with the GoT?s broader sustainability indicators, which will contribute towards the country achieving its Sustainable Development Goals for 2030 and beyond[185][184]. Examples of these indicators include: i) the prevalence of undernourishment or obesity (under Sustainable Development Goal (SDG) 2: Zero hunger); ii) the ratio of female-to-male labour force participation (under SDG 5: Gender equality); iii) marine area protected in marine sites, fish caught from overexploited stocks, and fish caught by trawling or dredging (under SDG14: Life below water); and iv) area protected in terrestrial sites and permanent deforestation (under SDG 15: Life on land). Policy revisions under the project will also be aimed at streamlining future funding for adaptation priorities within government budgets and through external funding sources. Moreover, policy revisions will be targeted towards improving coordination between relevant government agencies regarding climate change adaptation.

The three national policies and plans that Output 2.1.1 will target include the: i) Agriculture Sector Plan; ii) *Te Kaniva* (Climate Change Policy); and iii) Land-use Policy. Revisions to the Agriculture Sector Plan through the project will focus on promoting the resilience of the agricultural sector to climate change impacts, as well as limiting the impacts of agriculture on protective ecosystems. Updates to the *Te Kaniva* through the proposed project will include diversifying the potential actions for climate change adaptation

using an SLM approach. Lastly, Output 2.1.1 will support the Land Survey Department in improving coordination between the public sector and landowners, as well as promoting the use of SLM practices across Tuvalu. Specific climate change and non-climatic challenges that revisions of each of the above plans and policies will focus on are provided in Table 5. The above policy and plan revisions will additionally have a focus on developing strategies that promote the incorporation of SLM, EbA and climate-resilient agriculture into government budgets and the Tuvalu Trust Fund. In addition to the above national policies and plans, this output will review and build on the Public Works Department?s sub-national section plan developed for pulaka pit protection by making recommendations for improved resilience of pulaka pits to climate change based on other interventions within the project.

Table 5. Summary of strategies to be proposed through policy or plan revisions under the proposed project aimed at addressing climate change and non-climatic challenges.

Policy or plan to be revised	Strategies to be proposed that addressed climate change and non-climatic challenges
Climate Change Policy	**Climate change impacts, including from SLR, tropical cyclones and droughts** ? Mainstream information dissemination and awareness-raising of climate change impacts and mitigation strategies. ? Promote the uptake of climate-resilient agricultural practices, water resources management and EbA to increase the resilience of communities to climate change impacts. **Unsustainable land use practices** ? Provide recommendations for the informed implementation of green and grey adaptation infrastructure to reduce the impact of these interventions on threatened protective coastal ecosystems. ? Promote SLM through EbA interventions that support ecosystem services that reduce vulnerability to climate change impacts. ? Integrate SLM practices within customary land tenure arrangements, informed by land ownership boundary mapping. **Overexploitation of natural resources** ? Promote climate-resilient agricultural practice and diversified, sustainable livelihoods to improve the functioning of ecosystems and promote ecosystem services, while reducing the vulnerability of agricultural systems to climate change impacts.

Agriculture Sector Plan	**Climate change impacts, including from SLR, tropical cyclones and droughts** ? Increase knowledge base of climate change impacts on the agricultural sector at a national level. ? Promote the use of climate-smart agricultural practices, particularly those that reduce the impact of saltwater intrusion and inundation on pulaka pits. ? Improve food security by promoting the sustainable growth of local agricultural crops to reduce the dependency of the population on imported foods. **Unsustainable land use practices** ? Promote the increased productivity of existing agricultural land to reduce unsustainable agricultural land expansion. ? Determine agricultural practices that do not degrade ecosystems and ecosystem services ? Activities aimed at controlling and reducing invasive species and pests ? Promote agricultural practices that minimise agricultural effluent into groundwater reserves of surrounding coastal ecosystems.
Land-use Policy	**Climate change impacts, including from SLR, tropical cyclones and droughts** ? Present strategies that promote collaboration between the public sector and land owners, which will encourage the successful implementation of climate adaptation initiatives and projects. ? Encourage the use of EbA within land use practices, which are aimed at increasing the health of ecosystems that provide protective ecosystem services. **Unsustainable land use practices** ? Promote strategies that minimise activities resulting in ecosystem degradation ? such as sand mining or urban expansion ? specifically around identified protective ecosystems. **Overexploitation of natural resources** ? Promote the formalisation of LMMAs and TCAs to assist in the regulation of natural resource use, while supporting cultural practices.

To support the implementation of Output 2.1.1, a detailed gap assessment of the identified policies and plans will be undertaken to determine appropriate entry points for policy revisions. The gap assessment will inform coordination workshops between relevant government policymakers to develop and propose multi-sectoral and participative policy and procedure revisions. These workshops will also include representation by local community leaders to ensure recommendations appropriately address climate change challenges at a local level and will result in tangible benefits for communities. Recommendations will also focus on being gender-responsive and ensure that revisions account for the unique challenges women and other vulnerable groups face. Based on these recommendations, national and sub-national policy and plan briefs will be developed and validated with relevant stakeholders.

? Activity 2.1.1.1: Undertake a detailed gap assessment of relevant policies to identify entry points.

? Activity 2.1.1.2: Undertake coordination workshops between government policymakers to develop and proposed agreed upon policy and procedure revisions.

? Activity 2.1.1.3: Draft revised national policy briefs and procedures based on the gap assessment in Activity 2.1.1.1 and coordination workshops in Activity 2.1.1.2.

? Activity 2.1.1.4: Validate draft changes to the national policies and procedures with relevant stakeholders.

Output 2.1.2: Training conducted for 100 government officials, with a focus on technical officers, coastal adaptation management professionals, gender experts, 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.

Under Output 2.1.2, the technical capacity of selected government officials will be strengthened to integrate EbA, SLM and climate-resilient agriculture into national and local policies or plans. This capacity building will target technical officers, coastal adaptation management professionals, public representatives from island communities, and women?s groups within the environmental, agricultural and water sectors. Capacity building will include, *inter alia*: i) the identification of climate change impacts and challenges specific to Tuvalu; ii) principles for EbA, climate-resilient agriculture and SLM; iii) cross-sectoral best practice national and international guidelines for incorporating them into policies, plans and projects; iv) monitoring and evaluation of these interventions; and v) budgeting for the upscaling of EbA, climate-resilient agricultural practices and SLM and linking strategies to the Tuvalu Trust Fund. This training will assist government officials in contributing to the revision of policies, plans and budget formulation under Output 2.1.1. Output 2.1.2 will also inform continuous training and knowledge generation programmes under Output 2.3.3.

Output 2.1.2 will first include a capacity needs assessment of the current capacity of target government officials regarding EbA, climate-resilient agriculture and SLM, which will also account for capacity building already implemented under complementary projects such as Tuvalu Coastal Adaptation Project (TCAP) and the GEF Agro-ecosystems Project. Based on this needs assessment, a training programme will be developed, followed by a series of training workshops for government officials. These training workshops will be recorded and ? along with the training programme also developed under this output ? uploaded to the online knowledge management platform (Output 2.3.3).

? Activity 2.1.2.1: Undertake capacity needs assessment of government officials current technical and human capacity regarding integrating EbA, climate-resilient agriculture and SLM principles into policies and planning.

? Activity 2.1.2.2: Develop a training programme based on the capacity needs assessment in Activity 2.1.2.1 for government officials on integrating EbA, climate-resilient agriculture and SLM principles into policies and planning.

? Activity 2.1.2.3: Hold training workshops for government officials based on the training programme in Activity 2.1.2.2.

Outcome 2.2: Develop and implement strategic action plans for streamlining EbA national policy and planning frameworks.

Baseline

Although current policies and plans such as the three to be revised under Output 2.1.1 show the GoT?s commitment to addressing climate change impacts and promoting climate change adaptation, the enforcement of these policies is often insufficient to effectively streamline action on the ground. Moreover, the limited integration of Tuvalu?s complex land tenure system into policies and planning results in complications and delays the implementation of these policies or other initiatives. This limited integration is partly a result of an insufficient database and up to date understanding of land ownership across the country. Because all land on Tuvalu is owned by communities or families, the insufficient documentation of land ownership and limited coordination with landowners limits the success of adaptation or sustainable development projects that involve land use. To address this, the Land Survey Department has begun work on updating the land use database and Land Use Policy; however, these initiatives have not been completed as a result of insufficient financial and technical capacity within the department.

Project approach

Through Outcome 2.2, the implementation of EbA policy and plan revisions under Outcome 2.1 will be streamlined through the development of sectoral strategic action plans. These will include the preparation of a Guidance Note to guide the effective compliance and monitoring of revised policies (Output 2.2.1). In addition, a Land-Use Zoning Plan will be developed to better incorporate EbA, SLM and climate-resilient agriculture practices under the country?s existing land tenure system (Output 2.2.2). Outcome 2.2 will therefore address Barrier 2: Limited integration of climate change adaptation priorities into Tuvalu's policy frameworks and budgeting systems, as well as Barrier 4: Limited opportunity for engaging landowners and tracking EbA interventions within Tuvalu?s traditionally undefined land tenure system. The lessons learned and best practices from previous project in Tuvalu and in the region will be reflected in developing the guidance notes (Output 2.2.1).

Output 2.2.1: Guidance Note for compliance monitoring and implementation of EbA policy recommendations prepared under Output 2.1.1.

Under Output 2.2.1, a Guidance Note will be developed to inform the compliance monitoring and implementation of the policy revisions under Output 2.1.1. The Guidance Note will focus on establishing methods and protocols for monitoring policy compliance indicators and implementing the policy revisions. This will assist in tracking progress related to the updated policies as well as their effective enforcement. The Guidance Note will clearly outline roles and responsibilities for compliance monitoring and implementation, as well as follow-up procedures for non-compliance of the policies.

Output 2.2.1 will be implemented by the MoF and will first include an assessment of international best practices for policy compliance and enforcement, with recommendations on how to implement these in the Tuvaluan context. Based on these recommendations, the Guidance Note will be drafted and validated with relevant national- and local-level stakeholders. Once the final Guidance Note has been validated, training workshops will be held with government officials on the procedures and protocols presented in the Guidance Note. The training workshops will be recorded and uploaded to the online knowledge management portal (Output 2.3.3) along with the Guidance Note.

? Activity 2.2.1.1: Undertake an assessment of policy compliance monitoring and enforcement best practice recommendations for the Tuvaluan context.

? Activity 2.2.1.2: Draft a Guidance Note for policy compliance monitoring and enforcement.

? Activity 2.2.1.3: Validate the Guidance Note with relevant stakeholders and complete the final draft based on feedback.

? Activity 2.2.1.4: Hold training workshops with government officials on policy compliance and enforcement, based on the Guidance Note finalised in Activity 2.2.1.3.

Output 2.2.2: National Land-use Zoning Plan developed to enable EbA, SLM and climate-resilient agriculture under existing land tenure systems.

Under Output 2.2.2, the capacity of the Land Survey Department to map and monitor land ownership in Tuvalu will be strengthened through technical capacity building and the development of a Land-use Zoning Plan. This will first include the identification and procurement of, *inter alia,* modern mapping and database software, as well as Global Positioning System (GPS) equipment, based on a needs assessment of current capacity gaps within the Land Survey Department. The acquisition of this software and equipment will allow for the effective digitisation of maps and land registers, as well as digital application processes that are easy for landowners to access and use. To facilitate the use and maintenance of this software and equipment, personnel within the Land Survey Department will be given training on their operation which will be recorded and uploaded to the online knowledge management platform (Output 2.3.3).

The Land Survey Department will implement Output 2.2.2. Through the above activities, detailed assessments of land ownership across Tuvalu will be undertaken. This will include engagements with landowners, on-the-ground surveying utilising GPS technology, and digital mapping. The assessments will be used to develop a comprehensive and revised database of land boundaries and land use categories across Tuvalu, aimed at formalizing and documenting the country?s dynamic land ownership. The will build on efforts undertaken by the Land Survey Department to update this database and assist in completing this initiative. Additionally, the software and technical capacity introduced through Output 2.2.2 will develop an updated landowner registration system to continuously maintain the landownership database under Tuvalu?s dynamic traditional land tenure system. The database and improved registration system will assist the proposed project and future land development projects to identify potentially affected landowners and ensure effective engagement and participation with landowners. A National Land-use Zoning Plan will be developed based on the updated landownership database. This plan will build on and support the Land Use Policy currently being developed by the Land Survey Department and provide guidance for the consideration of Tuvalu?s land tenure system within future policy and planning frameworks. Specifically, the plan will be aimed at enhancing the engagement process between landowners and relevant stakeholders and providing guidelines for land use to support an EbA approach and promote the health of agricultural lands. This could include restricting engineering works or urban development in close proximity to pulaka pits to ensure this development does not increase the salinity of groundwater reserves in the area.

? Activity 2.2.2.1: Identify and procure modern software or equipment to facilitate the improved mapping and assessment of land zoning, based on a capacity needs assessment of the Land Survey Department.

? Activity 2.2.2.2: Improve technical capacity within the Department of Lands of software or equipment introduced in Activity 2.2.2.1.

? Activity 2.2.2.3: Undertake detailed national assessments of land ownership to develop an updated land ownership database.

? Activity 2.2.2.4: Develop a national Land-use Zoning Plan based on the land ownership database supported in Activity 2.2.2.1.

Outcome 2.3: Uptake of EbA and climate-resilient agricultural practices enhanced through multi-level stakeholder decision-making programmes, knowledge management and awareness-raising regarding CCA.

Staff turnover within the GoT related to increasing migration out of the country results in a loss of institutional knowledge within relevant public institutions. Therefore, a robust knowledge collection and management system is required to retain information at the national and local levels. Additionally, the remoteness of many of Tuvalu?s local communities means that the sustainability of climate change adaptation projects will be enhanced by empowering communities to implement, monitor and maintain these interventions through awareness-raising and capacity building. To address these challenges, Outcome 2.3 will be targeted towards knowledge management and sharing information and lessons learned from the proposed project, targeting both the public sector and communities. The uptake of EbA, climate-resilient agricultural practices and SLM amongst public sector officials, NGO representatives and community members will be enhanced through the development and dissemination of gender-responsive best practice guidelines (Output 2.3.1). A knowledge management and communication strategy will also be developed to inform the incorporation of EbA, SLM and climate-resilient practices into future policies and plans (Output 2.3.2). This will be complemented by training and knowledge generation programmes for the continuous capacity building of public sector officials will be established to promote the further incorporation of EbA, SLM and climate-resilient practices into policies and plans (Output 2.3.3). Through these outputs, Outcome 2.3 will address Barrier 1: Limited knowledge and technology implementation regarding climate-resilient agriculture and land-management practices at national and local levels and Barrier 3: Limited technical and professional capacity for implementing CCA strategies at the national and local scale over the long term. Outcome 2.3 will be implemented by the MoF. The lessons learned and best practices from previous and ongoing projects in Tuvalu and in the region will be reflected in the guidance notes (Output 2.3.1) and training programmes (Output 2.3.3).

Output 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.

Under Output 2.3.1, gender-responsive guidelines on EbA, SLM and climate-resilient agriculture best practices will be developed and disseminated across Tuvalu. Best practices will be based on: i) project lessons learned collected by the Community Training Groups established under Output 1.1.5; ii) best practices from other recent or ongoing synergistic projects; and iii) regional best practices. Once the best practice guidelines are collated and developed, they will be incorporated into locally-appropriate media forms, including pamphlets, booklets, websites, videos and radio broadcasts. Developed media will be translated into English and Tuvaluan to be accessible to a wide range of stakeholders. The best practice guidelines will be made available to a multi-level range of stakeholders, including government officials, NGO representatives, community leaders and community members. Moreover, guidelines will be accessible to stakeholders in other countries in the region, thereby encouraging multi-national knowledge sharing on EbA for climate change adaptation.

? Activity 2.3.1.1: Develop gender-responsive best practice guidelines on EbA, climate-resilient agriculture and SLM.

? Activity 2.3.1.3: Develop best practice guideline pamphlets and other visual or audio media on EbA, climate-resilient agriculture and SLM.

? Activity 2.3.1.3: Disseminate best practice guideline pamphlets and other visual media on EbA, climate-resilient agriculture and SLM to communities and community leaders.

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

A gender-responsive knowledge management and communication strategy will be developed under Output 2.3.2, aimed at integrating EbA, climate-resilient agriculture and SLM best practices and lessons learned into future planning and policy frameworks. An assessment of guidelines and principles for

incorporating EbA, climate-resilient agricultural practices and SLM into policies and plans will be undertaken, drawing from lessons learned through the project from Outputs 2.1.1 and 2.1.2 as well as other national and international best practices. This assessment will be used to develop a strategy for gender-responsive knowledge management and communication of incorporating EbA best practices into policies and plans, specific to the context of Tuvalu. This strategy will focus on developing procedures for collecting and storing best practices collated under Activity 2.3.2.1 and those developed in the future, as well as effective ways of communicating these timeously with policy- and decision-makers across multiple sectors related to climate change, agriculture and water.

? Activity 2.3.2.1: Undertake an assessment on national and regional best practices and lessons learned on incorporating EbA into policies and planning.

? Activity 2.3.2.2: Develop a knowledge management and communication strategy based on the assessment in Activity 2.3.2.1.

Output 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.

Under Output 2.3.3, a programme for the storage and ongoing dissemination of information generated through the project will be developed. This programme will additionally be designed to store information generated through similar projects in the future within an online knowledge management platform and will be linked to and be informed by the Knowledge Management and Communication Strategy developed in Output 2.3.2. Examples of information to be stored and disseminated include: i) training and lessons on incorporating EbA and climate-resilient agriculture provided through Output 2.1.2; ii) measurable outcomes of the project activities, based on monitoring activities undertaken with assistance from the Community Training Groups (Output 1.1.5); iii) costs or benefits of EbA, and climate-smart agriculture in Tuvalu, using the project?s initiatives as case studies; and iv) lessons learned on gender-responsive approaches taken through the project. The knowledge management platform will be available within Tuvalu as well as neighbouring Pacific island countries, thereby promoting South-South Cooperation through the sharing of best practices and lessons learned on climate change adaptation.

? Activity 2.3.3.1: Develop an online knowledge management platform for the storage and collaborative dissemination of information generated through the project and future initiative, including through the capacity building activities undertaken under Output 2.1.2

? Activity 2.3.3.2: Develop a continuous training programme for public sector officials using government officials trained under Output 2.1.2.

Intervention logic and theory of change

The proposed project will provide tangible on-the-ground climate change adaptation benefits that improve food security and the overall resilience of communities and ecosystems to climate change impacts (Component 1). These project interventions have been selected to directly target the most urgent climate change threats while accounting for existing baseline drivers of landscape degradation. This will be supported by an improved enabling environment for the identification, design, implementation and monitoring of EbA, SLM and climate-resilient agriculture practices across Tuvalu (Component 2). The aim of the enabling environment approach, which includes policy revisions, technical capacity development and continuous training and knowledge management, will support the upscaling, replicability and sustainability of EbA, SLM and climate-resilient practices throughout Tuvalu. Each of

the project?s two components are additionally aimed at addressing existing barriers to the large-scale implementation of climate change adaptation interventions (Section 2.3.5).

Project interventions were designed in consultation with both the national government and community stakeholders (Appendix 20: Inception Workshop and Mission Report). These consultations ensured that the proposed project activities align with national priorities as well as local plans and strategies (Section 3.6). Ensuring local community engagement in the design, implementation and maintenance of project interventions will promote local ownership, which will in turn support the replication and upscaling of project interventions beyond the project's lifespan.

Project activities will follow a complementary approach, with each outcome creating a foundation for the following one to build on or otherwise strengthening the effectiveness of other outcomes. Outcome 1.2 will directly support resilient agricultural practices in Outcome 1.1 by restoring and conserving ecosystems that provide ecosystem services, specifically flood reduction and increased groundwater recharge. Outcome 2.1 will support the upscaling and replication of outcomes in Component 1 by creating an enabling environment through policy revisions and public sector capacity building for the national mainstreaming of EbA, SLM and climate-resilient agricultural practices. Outcome 2.2 will build on Outcome 2.1 by developing strategic plans that support the compliance and implementation of policy revisions, as well as the integration of land-use ownership considerations into policies and planning. Outcome 2.3 will support the overall storage and dissemination of knowledge generated through the project and ensure ongoing awareness-raising and capacity-building to maintain the sustainability and replication of project interventions regarding EbA, SLM and climate-resilient agriculture.

All project activities are either considered ?low regret? or ?no regret? options because they have been designed to provide benefits to the target communities regardless of the impacts of climate change. For example, improved climate-resilient agricultural practices and diversified livelihoods under Component 1 will improve food security and market opportunities that incentivise SLM and natural resource management, which will assist in reducing baseline drivers of degradation. The restoration and conservation of ecosystems under the same component is additionally a no-regrets option as healthy ecosystems provide numerous ecosystem services and benefits besides protection from climate change impacts, including the improved provision of resources such as food, timber or crafting materials, and cultural or tourism services.

The overall Theory of Change for the project is shown in Figure 8. This outlines the main problem statement the project aims to address, the outputs and expected outcomes, barriers that these outputs aim to address and the overall project objective that will be achieved through successful project implementation.

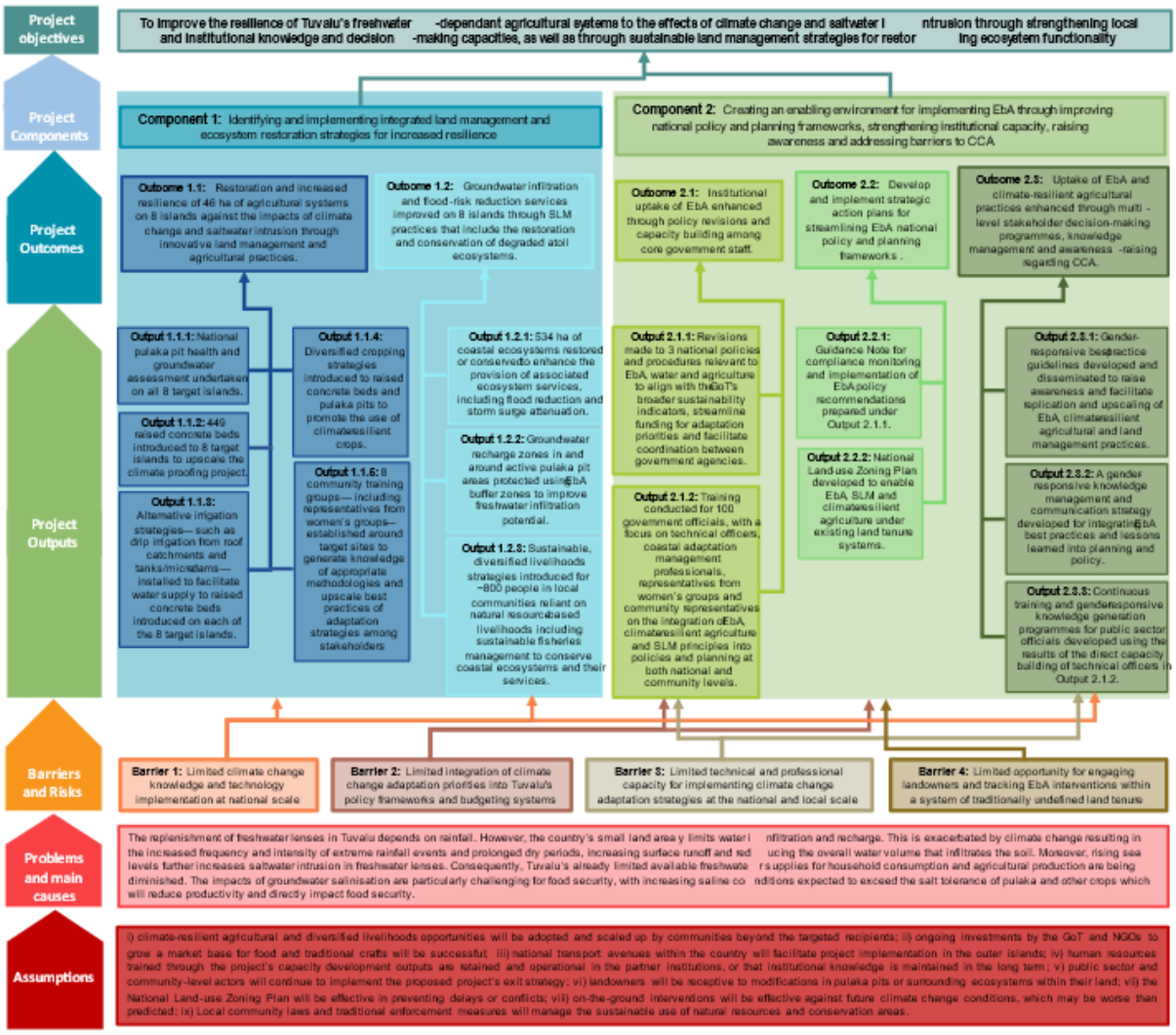

Figure 8. Theory of change diagram.

Several assumptions will need to be met for the proposed project?s objectives and outcomes to be sustainable and successful in the long term. These assumptions have been determined through consultations with major stakeholders as well as experience from previous project, including the TCAP and the R2R Project. The project?s main assumptions are listed below.

? Climate-resilient agricultural and diversified livelihood opportunities introduced through the proposed project will be adopted and scaled up by communities beyond the targeted recipients.

? Ongoing investments by the GoT and NGOs to grow a market base for food and traditional crafts will be successful and will provide logistically feasible market access for communities on the outer islands.

? National transport avenues within the country ? including the government ferry and the airline which is planned to be ready in late 2023 ? will facilitate project implementation in the outer islands and not result in delays or excessive costs.

? Human resources trained through the project?s capacity development outputs are retained and operational in the partner institutions, or that institutional knowledge is maintained in the long term through the continuous training and knowledge generation programme under Output 2.3.3.

? Public sector and community-level actors will have sufficient technical capacity and financial resources to continue to implement the proposed project?s exit strategy.

? Landowners will be receptive to modifications in pulaka pits or surrounding ecosystems within their land.

? The National Land-use Zoning Plan (Output 2.2.2) will be effective in preventing delays or conflicts regarding the implementation of on-the-ground interventions.

? On-the-ground interventions implemented through Outcomes 1.1 and 1.2 will be effective against projected climate change conditions, which may be worse than predicted, and other potential natural hazards such as tsunamis.

? Local community laws and traditional enforcement measures will effectively be able to manage the sustainable use of natural resources and conservation areas established through Outcome 1.2.

As shown in Figure 8, several barriers exist that may hinder the implementation of climate change adaptation. Through its outputs, the proposed project has been designed to address these barriers and increase the potential success of climate change adaptation initiatives. The barrier removal strategy of the proposed project is presented in Table 6.

Table 6. Barrier removal strategy for the proposed project.

Barriers	**Removal strategy**
Barrier 1: Limited knowledge of climate-resilient agriculture and land-management practices at national and local levels.	The first barrier will be addressed by Output 2.3.2 which will develop a gender-responsive knowledge management and communication strategy for integrating EbA best practices and lessons learned. The knowledge management platform will be used to ensure that national and local level stakeholders have access to the most recent information for EbA, SLM and climate-resilient agriculture.

Barrier 2: Limited integration of Ecosystem-based Adaptation (EbA) and SLM-related climate change adaptation priorities into Tuvalu's national planning, policy frameworks and budgeting systems.	Output 2.1.1 will contribute to addressing this barrier by undertaking a gap assessment of relevant policies to identify entry points for EbA, SLM and CCA priorities (Activity 2.1.1.1). This will be followed by drafting revised national policy briefs and procedures based on the gap assessment (Activity 2.1.1.3). These changes will be validated by relevant stakeholders.
Barrier 3: Limited technical and professional capacity for implementing CCA strategies at the national and local scale over the long term.	The third barrier will be addressed by Output 2.1.2 by training 100 government officials on the integration of EbA, climate-resilient agriculture and SLM principles into policies and planning at both national and community levels. The training workshops will be recorded to ensure newer staff are kept up to-date (Activity 2.1.2.3). The technical and professional capacity of government officials will further be strengthened by the dissemination of best practice guidelines to raise awareness and facilitate replication and upscaling of EbA, climate-resilient agricultural and SLM practices (Output 2.3.1).
Barrier 4: Limited opportunity for engaging landowners and tracking EbA interventions within Tuvalu?s traditionally undefined land tenure system.	Output 2.2.2 will contribute to addressing this barrier by developing a land-use zoning plan to enable EbA, climate-resilient agriculture and SLM under existing land tenure systems. This will involve improving: i) mapping and assessment of land zoning, based on a capacity needs assessment of the Land Survey Department; and ii) the technical capacity of the Land Survey Department.

Incremental cost reasoning

Several recent and ongoing initiatives within Tuvalu have been designed to address baseline developmental challenges, climate hazards and barriers (see Section 2.4.1. Institutional arrangements in the Project Document). 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 7 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 7. Additional cost reasoning for the three components of the proposed project.

Component and additional cost	Baseline	Alternative scenario	Co-financing Initiatives

Component and additional cost	Baseline	Alternative scenario	Co-financing Initiatives
Component 1: Identifying and implementing integrated land management and ecosystem restoration strategies for increased resilience	The salinisation of Tuvalu's freshwater lenses as a result of increasing sea level rise (SLR) has significantly impacted freshwater supply, livelihoods, and agricultural productivity. This is particularly true for pulaka production, which cannot withstand saline groundwater conditions. Additionally, atoll soils in Tuvalu are structurally unsuitable for intensive agriculture due to factors such as rapid drainage, low moisture retention capacity, minimal cation-exchange capacity, and high susceptibility to nutrient deficiency. These factors make it challenging to implement general soil remediation techniques and best practices from other regions in the context of Tuvalu. To protect pulaka production from saltwater intrusion, ongoing efforts have successfully piloted providing concrete beds as an alternative to pulaka pits. However, these raised beds have not been introduced to all of Tuvalu?s households or communities. Climate change and anthropogenic impacts on ecosystems currently result in a high degree of terrestrial and coastal degradation. This reduces ecosystem services that provide protection from climate hazards and SLR to communities and agricultural services. Although there have been efforts within Tuvalu to restore and protect ecosystems ? such as the use of Locally Managed Marine Areas (LMMAs) ? there are still large areas of Tuvalu?s natural ecosystems not protected. These conservation measures have also not focussed on ecosystems surrounding pulaka pits and other agricultural areas to increase ecosystem services to these areas.	The aim of this component is to enhance the resilience of agricultural systems in pulaka pits on eight islands in Tuvalu against the impacts of climate change and increasing saltwater intrusion. This will be achieved through a comprehensive approach to innovative land management practices, including the rehabilitation of degraded pulaka pits, the adoption of soil remediation and diversified cropping strategies, and the upscaling of raised concrete beds to encompass all islands of Tuvalu that grow pulaka (Outcome 1.1). Specifically, the project will build on previous initiatives by promoting the use of identified climate-resilient crops that can tolerate atoll conditions and	A total of USD4,244,410 in co-financing from two initiatives, the ?Enhancing climate information and knowledge services for resilience in 5 island countries of the Pacific Ocean (2021?2026)? (USD3,709,410) and the ?Small Islands Food and Water Project (SIFWaP) (USD535,000).

Component and additional cost	Baseline	Alternative scenario	Co-financing Initiatives
		improve soil quality, as well as traditional and scientific climate resilient practices such as drip irrigation and intercropping. The support the above agricultural interventions, sustainable land management practices will be employed to improve groundwater infiltration and reduce flood risks on the eight islands (Outcome 1.2). These practices will include restoration and conservation activities such as mangrove planting and replanting of coastal vegetation to improve protection against flooding and storm surge. This approach will include the expansion of Terrestrial Protected Areas and LMMAs in areas surrounding pulaka pits in areas that have	

Component and additional cost	Baseline	Alternative scenario	Co-financing Initiatives
		yet to be conserved using this approach by other projects. Closer to pulaka pits, groundwater recharge zones will be established, including conservation activities and restoration of indigenous, drought-tolerant species. Moreover, vulnerable farmers and community members will be supported through the adoption of diversified livelihood strategies, including sustainable fisheries management that complements the LMMA methodology. These livelihoods will draw from and build on sustainable livelihoods introduced through other projects.	

Component and additional cost	Baseline	Alternative scenario	Co-financing Initiatives
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	The country?s national policies and regulations currently do not fully integrate ecosystem-based adaptation (EbA) and sustainable land management (SLM) because of a limited enabling environment for mainstreaming, insufficient of technical expertise and coordination for SLM, as well as a mismatch between budget estimations and information in existing climate change adaptation (CCA) plans. Insufficient appropriate tools, knowledge and methodologies at all levels further limit CCA actions at the local level. Where policies do exist, they are outdated and do not adequately reflect CCA priorities (Section 2.4). Nevertheless, the Australian government has provided funding for the Climate and Ocean Support Program in the Pacific (COSPPac) which aims to develop useful products and services for governments and communities to enhance resilience to climate change, climate variability and disasters.	The project will prioritize GEF resources to foster institutional adoption of EbA interventions through revising three national policies and one sub-national revisions and capacity building programs for government officials in relevant institutions (Outcome 2.1). This will build on the current capacity building for EbA implementation as well as its integration into policies that has been undertaken. To support this, resources will be allocated towards developing and executing strategic action plans to better incorporate EbA into national policy and planning frameworks and sub-national plans (Outcome 2.2). These outcomes will	Three ongoing projects will contribute a total of USD3,567,607 in co-finance to Outcome 2.1. These include the: i) ?Tuvalu Coastal Adaptation Project (TCAP)?, USD2,933,000; ii) the ?Enhancing climate information and knowledge services for resilience in 5 island countries of the Pacific ocean (2021 ? 2026), USD234,607; and iii) SIFWaP project, USD400,000. One initiative will contribute a total of USD5,056,000 in co-finance to Outcome 2.2, the ?TCAP? project. Finally, co-finance under Outcome 2.3 amounts to USD498,657 from three initiatives: i) TCAP, (USD212,000); ii) Enhancing climate information and knowledge services for resilience in 5 island nations in the Pacific Ocean (2021 ? 2026), (USD238,657); and iii) SIFWaP (USD48,000).

Component and additional cost	Baseline	Alternative scenario	Co-financing Initiatives
		improve the enabling environment and facilitate the expansion of the project interventions, which has not been previously attempted in adaptation projects in Tuvalu. Knowledge management and awareness raising on climate change impacts and adaptation through EbA and SLM will also be strengthened through knowledge management and generation programmes, as well as community awareness-raising programmes (Outcome 2.3).	

Innovativeness, sustainability and potential for scaling up

The proposed project aims to address Tuvalu?s environmental challenges by adopting an innovative approach that utilises integrated, multi-focal area interventions. The project focuses on EbA strategies, policy revisions, sustainable land management, water security and diversified livelihoods to increase local communities? resilience to climate change impacts. To ensure the sustainability, replicability and scalability of the project, local community-level landscape planning is necessary and forms an integral part of the project design.

A number of innovative approaches for the country will be implemented by the proposed project. These approaches are summarized below.

? Salt-tolerant and climate-resilient crop varieties utilized in other countries will be introduced by the project as part of climate-resilient agricultural practices under Output 1.1.4. This includes salt-tolerant varieties of pulaka, taro, papaya, potato, cassava, dwarf banana, *pandanus*, pumpkin and breadfruit.

? The use of terracing to cultivate crops around steep-sided pulaka pits through Output 1.1.4 is additionally a relatively new approach for Tuvalu.

? Although mulching has been utilized traditionally within Tuvalu, the proposed project will further promote this approach across the islands for the purpose of reducing salinity levels within pulaka pits. This mulching will include the introduction of shredders to promote the recycling of green waste across the islands. Employing mulch, such as palm leaves, at the top and bottom of soil pits has shown the potential to reduce soil salinity from ~9 to 5 ds/m[1]. Utilising mulch in pulaka pits is expected to lower salinity levels. Green waste, predominantly consisting of pandanus, breadfruit, and other trees, constitutes up to 50% of Tuvalu's total municipal solid waste. In Funafuti alone, this amounts to 2,265 m^3 per year.

? Another agricultural innovation to be introduced by the project is a water-efficient irrigation system to support cultivation within the introduced raised concrete beds. Although the concrete beds themselves have been used previously in Tuvalu, the proposed project will further build on this by concurrently introducing drip irrigation systems for each concrete bed to ensure they have sufficient water supply despite not being connected to the freshwater lens.

? Ecosystem restoration and conservation have been implemented in Tuvalu, but not specifically for the purpose of increasing ecosystem services to project agricultural lands. The incorporation of species such as mangroves in ecosystem restoration zones can considerably ameliorate wave impact, with reductions in wave height ranging from 13% to 66% per 100 meters of mangrove coverage.

? Protective ridges/walls around pulaka pits have been used successfully by communities to prevent surface flooding from storm surge. As this has been undertaken by community members, specific lessons learned have not been documented.

? The introduction of groundwater recharge zones, which is a novel intervention for Tuvalu, though they have been tried in other island countries. These recharge zones will include infiltration basins and drainage trenches to capture run-off and encourage water infiltration which ? although being a recognized method for groundwater recharge globally ? has not been trialed in Tuvalu. The drainage trenches will use naturally occurring coarse sand and coral rock for optimal water infiltration. After construction, indigenous species like puka, Pandanus, breadfruit, seaside cordia (*C. subcordata*), and beach gardenia (*G. speciosa*) will be planted in the recharge zones to restore vegetation.

As a result of the remoteness of the majority of the target sites, the sustainability of the above project interventions is dependent on the continued input and participation of the target communities and Kaupule. Through stakeholder engagements communities indicated a commitment to assist in the

implementation and continued maintenance of the proposed interventions. Diversified livelihood options and improved agricultural productivity through the project are expected to increase the income for community recipients which will support their ability to maintain infrastructure in the long-term. This will be further supported by Kaupule annual budgets, which are provided through the Local Government Department. The sustainability of established natural infrastructure ? namely conserved and restored groundwater recharge zones, TPAs and LMMAs ? will be managed by landowning community members and enforced through island by-laws managed through the Kaupule. Training and awareness-raising through the project, including through the community raining groups, will have an important role in ensuring project intervention sustainability by: i) demonstrating the benefits of the interventions and their maintenance to community members, and ii) providing guidance and training on the appropriate way to implement and maintain the interventions in the long-term.

The proposed project will directly benefit ~4,200 people in eight of Tuvalu?s nine islands, including Nanumea, Nanumanga, Nuitao, Nui, Vaitupu, Nukufetau, Funafuti and Nukulaelae. This represents roughly one third of the country?s inhabitants, with the remaining population expected to benefit indirectly. While there is scope to replicate a range of project interventions across the remaining indirect beneficiaries, the project additionally has considerable potential to be replicated in other neighbouring Pacific small island states.

The project team therefore recognizes that ensuring the replicability of project activities is crucial to achieving long-term sustainable impact ? not only within Tuvalu, but in neighbouring countries facing similar climate change and development challenges. To that end, on-the-ground interventions under Outcomes 1.1 and 1.2 will be designed to make them easily implementable and replicable for community members and local authorities. This will be assisted by the development of implementation and maintenance plans which will be disseminated broadly by community training groups (Output 1.1.5). It is envisioned that the activities convened under Output 1.1.5 will contribute to overcoming Barrier 1: Limited knowledge of climate-resilient agriculture and land-management practices at national and local levels, through supporting the development of a knowledge base on these practices by community members. The deliverables of this output will be integrated throughout other elements of the proposed project, including Output 2.3.3, to ensure that this local-level knowledge can be upscaled to the national level.

Several mechanisms will also be put in place to facilitate the replication and upscaling of project activities. One of the first mechanisms is Output 2.1.1, which will revise three national policies and procedures relevant to EbA, water, and agriculture. The revisions will be made to align with the government's broader sustainability indicators, streamline funding for adaptation priorities, and facilitate coordination between government agencies. This will ensure that the policies and procedures are better suited to support the implementation of EbA and other climate-resilient agricultural practices in the future. Another mechanism to facilitate replicability is Outcome 2.2, which will develop and implement strategic action plans for streamlining EbA national policy and planning frameworks. This will ensure that the necessary frameworks are in place to support the long-term compliance and monitoring of the above policies. Combined, these outputs will contribute to overcoming Barrier 2: Limited integration of EbA and SLM-related climate change adaptation priorities into Tuvalu?s national planning, policy frameworks and budgeting systems.

Output 2.3.1 is another critical mechanism that will develop gender-responsive best-practice guidelines to raise awareness and facilitate replication of climate-resilient agricultural practices. These guidelines will be disseminated to stakeholders and relevant national ministries to support the country-wide replication and upscaling of EbA practices. Moreover, the project will capture lessons learned throughout its implementation and disseminate them to other stakeholders and relevant national ministries (Outcome 2.3). This will ensure that the successes and challenges of the project are well-documented and can be used to support the replication and upscaling of similar projects in across the country and in similar Pacific small island states. Outcome 2.3 will contribute to addressing Barrier 1: Limited knowledge of climate-resilient agriculture and land-management practices at national and local levels. The knowledge management platform will be made available within Tuvalu as well as neighbouring Pacific island

countries, thereby promoting South-South Cooperation through the sharing of best practices and lessons learned on climate change adaptation.

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[16] Ibid.

[17] Tuvalu Meteorological Service. 2022. Raw data for temperature and rainfall for Nanumea, Nui, Funafuti and Niulakita.

[18] Based on established national weather stations, the northern islands of Nanumea and Nui receive the least rainfall at 2,195 mm and 2,730 mm per year on average, respectively.

[19] The southernmost island of Niulakita receives an average of 2,970 mm of rainfall annually.

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1b. Project Map and Coordinates

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

Please refer to Annex D (Annex E of the ER file.).

1c. Child Project?

If this is a child project under a program, describe how the components contribute to the overall program impact.

N/A

2. Stakeholders

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

Civil Society Organizations Yes

Indigenous Peoples and Local Communities Yes

Private Sector Entities Yes

If none of the above, please explain why:

Please provide the Stakeholder Engagement Plan or equivalent assessment.

Table 7. Stakeholder Engagement Plan.

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
Government Department at the central level				
Ministry of Finance	? Planning, coordinating, managing, M&E and reporting. ? Risks management, procurement of goods and services, financial management, approving and signing the multiyear workplan, the combined delivery reports and signing the financial report ? Supervise the work of PMU in day to day operation of the project	1.1.1	Technical expertise and implementation of pulaka pit health and salinity assessment	Email, meetings, telephone
		1.1.2	Implementation of raised concrete beds	Email, meetings, telephone

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
	including administration, management and technical support to Project Manager. ? Execution of project activities	1.1.3	Implementation of irrigation systems	Email, meetings, telephone
		1.1.4	Implementation and coordination of community training groups	Email, meeting, telephone, workshops
		1.2.3	Technical input and implementation of diversified livelihoods	Email, meetings, telephone
		2.1.1	Provide input into and coordinate the revision of identified policies and plans	Email, meeting, telephone, workshops
		2.1.2	Facilitate and receive capacity building of government officials	Email, meeting, telephone, workshops
		2.2.1	Provide input to, and receive training on, guidance note for compliance monitoring and implementation relating to policies revised under Output 2.1.1.	Email, meeting, telephone, workshops
		2.3.1	Facilitate development and dissemination of best practice guidelines	Email, meetings, telephone

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
		2.3.2	Implement knowledge management and communication strategy	Email, meetings, telephone
		2.3.3	Develop and house gender-responsive knowledge generation programme	Email, meeting, telephone, workshops
Environment Department	Technical input into ecosystem restoration and conservation activities	1.1.4	Provide input into the upskilling of community training groups	Email, meeting, telephone, workshops
		1.2.1	Provide input to the proposed Terrestrial Conservation Areas (TCAs) and Locally Managed Marine Areas (LMMAs) and provide expertise for restoration of ecosystems.	Email, meetings, telephone, workshops
		1.2.2	Provide input in restoration of groundwater recharge buffer zones.	Email, meetings, telephone, workshops
		1.2.3	Participate in collaborative development of diversified livelihood strategies.	Email, meetings, telephone, workshops

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
		2.1.1	Provide input to the development of revisions to the *Te Kaniva* (Climate Change Policy)	Email, meetings, telephone
		2.1.2	Receive capacity development for integrating EbA, SLM and climate-resilient agriculture into their operations.	Workshops
		2.2.1	Provide input to, and receive training on, guidance note for compliance monitoring and implementation relating to policies revised under Output 2.1.1.	Email, meeting, telephone, workshops
Land Survey Department	Development of Land Use Policy, Land use zoning plan and Land Use Database to improve coordination with landowners during adaptation project implementation	2.1.1	Contribute to the development of the Land-Use Policy	Email, meeting, telephone, workshops
		2.1.2	Receive capacity development for integrating EbA, SLM and climate-resilient agriculture into their operations.	Workshops

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
		2.2.2	Receive technical capacity building and collaboratively design and implement a National Land-use Zoning Plan and land-use database	Email, meeting, telephone, workshops
Agriculture Department	Introduction of improved agricultural and fisheries practices, technical input into implementation of climate-resilient agricultural practices	1.1.1	Support in undertaking national pulaka pit health and groundwater assessment	Email, meetings, telephone
		1.1.2	Support the design and implementation of climate-resilient agricultural practices	Email, meetings, telephone
		1.1.3	Provide technical input into the implementation of irrigation systems	Email, meetings, telephone
		1.1.4	Assist in upskilling community training groups	Email, meeting, telephone, workshops
		1.2.1	Provide input to the proposed Terrestrial Conservation Areas (TCAs) and Locally Managed Marine Areas (LMMAs)	Email, meetings, telephone

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
		1.2.3	Participate in collaborative development of diversified livelihood strategies.	Workshops
		2.1.2	Receive capacity development for integrating EbA, SLM and climate-resilient agriculture into their operations.	Workshops
Local Government Department	Facilitate coordination with local communities and Kaupule	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.2.1, 1.2.2, 1.2.3	Assist in arranging communication and travel to outer islands as well as coordination with Kaupule	Email, meetings, telephone
		2.1.1	Provide input into the revision of policies and plans	Email, meetings, telephone
		2.1.2	Receive capacity development for integrating EbA, SLM and climate-resilient agriculture into their operations.	Workshops

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
		2.2.2.	Provide insight into land ownership of outer islands and facilitate coordination with Kaupule and community members	Email, meetings, telephone
Gender Department	The Gender Department is an essential resource for the project, providing invaluable information and expertise on gender-related matters. Collaboration with the Gender Department can ensure the project takes gender considerations into account and is sensitive to gender issues. Objective is to enhance gender responsiveness throughout project implementation.	1.2.3	Contribute to design of diversified livelihood strategies to ensure options are gender responsive and contribute to empowerment of women and girls.	Email, meetings, telephone
		2.2.1	Ensure that gender is appropriately considered during the revision of national and subnational policies.	Email, meetings, telephone
		2.3.1	Provide input to the development of gender-responsive best practice guidelines on EbA, climate-resilient agricultural and land use management practices	Email, meetings, telephone
Community level				

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
Male island community members and leaders	Primary recipients of project interventions and critical to engage with them often to ensure environmental and social safeguard risks are determined and mitigated. Community members will also play a major role in the implementation and sustainability of interventions.	1.1.2	Provide input to the implementation of 449 raised concrete beds in target islands	Email, meetings, telephone
		1.1.3	Participate in design and implementation of Operation and Maintenance (O&M) plans for the irrigation systems	Workshops
		1.1.4	Participate in site-specific options analysis to inform climate-resilient cropping strategies	Workshops
			Receive capacity building to implement intercropping and terracing using hand tools and equipment provided through the project	Training workshops
		1.1.5	Receive training-of-trainer programme for 8 community groups on monitoring the on-the-ground interventions.	Training workshop

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
		1.2.1	Support in designing and implementing TCA and LMMA management plans.	Workshops
		1.2.3	Participate in collaborative development of diversified livelihood strategies.	Workshops
		2.1.1	Contribute to the development of revisions to national and subnational policies to ensure revisions are aligned with community needs.	Workshops
		2.3.1	Provide input to the development of gender-responsive best practice guidelines on EbA, climate-resilient agricultural and land use management practices	Email, meetings, telephone
		2.3.3	Provide input to and benefit from the development of knowledge generation programme	Email, meetings, telephone

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
Female island community members and leaders	Primary recipients of project interventions and critical to engage with them often to ensure environmental and social safeguard risks are determined and mitigated. Community members will also play a major role in the implementation and sustainability of interventions.	1.1.2	Provide input to the implementation of 449 raised concrete beds in target islands	Email, meetings, telephone
		1.1.3	Participate in design and implementation of Operation and Maintenance (O&M) plans for the irrigation systems	Workshops
		1.1.4	Participate in site-specific options analysis to inform climate-resilient cropping strategies	Workshops
			Receive capacity building to implement intercropping and terracing using hand tools and equipment provided through the project	Training workshops
		1.1.5	Receive training-of-trainer programme for 8 community groups on monitoring the on-the-ground interventions.	Training workshop

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
		1.2.1	Support in designing and implementing TCA and LMMA management plans.	Workshops
		1.2.3	Participate in collaborative development of diversified livelihood strategies.	Workshops
		2.1.1	Contribute to the development of revisions to national and subnational policies to ensure revisions are aligned with community needs.	Workshops
		2.3.1	Provide input to the development of gender-responsive best practice guidelines on EbA, climate-resilient agricultural and land use management practices	Email, meetings, telephone
		2.3.3	Provide input to the development of knowledge generation programme	Email, meetings, telephone
NGOs/CSOs				

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
Live and Learn	? Live and Learn is involved in similar food-security projects that this project can complement and build on. ? Supporting implementation of agriculture components.	1.1.2, 1.1.3, 1.1.4, 1.2.3	Provide technical input and advice based on similar initiatives	Email, meetings, telephone
		1.1.5, 2.3.1, 2.3.3	Assist in developing training guidelines and best practices for gender-responsive agricultural and livelihood practices	Email, meetings, telephone
Centre for Pacific Crops and Trees	Work in identifying climate-resilient crop species within the South Pacific	1.1.4	Support in completing the options analysis for identifying appropriate crop varieties.	Email, meetings, telephone, workshops
Tuvalu National Council of Women	Represents a diverse collection of female stakeholder voices and has a high degree of experience in empowering women and gender-responsive livelihoods.	1.1.5	Support in introducing and implementing training-of-trainer groups	Email, meetings, telephone, workshops
		1.2.3	Contribute to design of diversified livelihood strategies to ensure options are gender responsive and contribute to empowerment of women and girls.	Email, meetings, telephone, workshops

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
		2.3.1	Contribute to the development of gender-responsive best practice guidelines	Workshops
Tuvalu Association of Non-Governmental Organisations	Livelihood diversification and sustainable private sector development	1.2.3	Contribute to development of diversified livelihood strategies	Email, meetings, telephone, workshops
International organisations				
Centre for Pacific Crops and Trees	Work in identifying climate-resilient crop species within the South Pacific	1.1.4	Support in completing the options analysis for identifying appropriate crop varieties.	Email, meetings, telephone, workshops
United Nations Development Programme (UNDP)	Accredited Entity for the co-financing Tuvalu Coastal Adaptation Project (TCAP)	2.1.2, 2.2.2, 2.3.1, 2.3.3	Contribute to the achievement of Outputs that will receive grant co-financing through the TCAP project.	Email, meetings, telephone
Food and Agriculture Organisation (FAO)	Supervising Entity for the co-financing Small Islands Food and Water Project (SIFWaP)	1.1.3, 1.1.4, 2.1.1, 2.3.1, 2.3.3	Contribute to the achievement of Outputs that will receive grant co-financing through SIFWaP.	Email, meetings, telephone

Stakeholder Group	Why included (interests)	Output	Purpose of engagement	Participation methods
International Fund for Agricultural Development (IFAD)	Supervising Entity for the co-financing Small Islands Food and Water Project (SIFWaP)	1.1.3, 1.1.4, 2.1.1, 2.3.1, 2.3.3	Contribute to the achievement of Outputs that will receive grant co-financing through SIFWaP.	Email, meetings, telephone

?

? Select what role civil society will play in the project:

? Consulted only;

? Member of Advisory Body; contractor;

? Co-financier;

? Member of project steering committee or equivalent decision-making body;

? Executor or co-executor;

? Other (Please explain)

In addition, provide a summary on how stakeholders will be consulted in project execution, the means and timing of engagement, how information will be disseminated, and an explanation of any resource requirements throughout the project/program cycle to ensure proper and meaningful stakeholder engagement

Please refer to the stakeholder engagement plan for details.
Select what role civil society will play in the project:

Consulted only;

Member of Advisory Body; Contractor; Yes

Co-financier;

Member of project steering committee or equivalent decision-making body; Yes

Executor or co-executor; Yes

Other (Please explain)

3. Gender Equality and Women's Empowerment

Provide the gender analysis or equivalent socio-economic assesment.

Traditionally, Tuvalu has been a patriarchal society. Decisions were made by men older than 50 years of age ? they were the only ones allowed to speak in the Falekaupule (traditional meeting hall). Most island decisions were made within the following hierarchical structures: a group of chiefs, comprising four or five men, including the island?s primary chief; the Falekaupule, which was made up of chiefs

representing village sides or family clans, as well as men over 50 years old. The primary chief acted as the Falekaupule?s chairman.

In terms of livelihoods on the islands, men younger than 50, women and youth constitute the main labour force for implementing the island community?s commitments, projects and church activities. Despite this, in the past these three groups have been prohibited from speaking at the Falekaupule. However, although women make up about 50% of Tuvalu?s population, they have had no say in decision-making processes, as it was only men who had the right to speak and vote in the Falekaupule. In addition, women have had limited employment opportunities. While there have been some changes for the positive for women and other vulnerable groups, this analysis focuses on identifying gaps that can be address in this project.

International and Regional Frameworks and Commitments

Tuvalu, as part of its commitment to promoting gender equality, equity and women's empowerment, has ratified various international and regional conventions. One of these is the United Nations (UN) Beijing Declaration and Platform of Action, which emphasizes gender equality and women's empowerment. Additionally, Tuvalu became a party to the Convention on Eliminating All Forms of Discrimination Against Women (CEDAW) in October 1999. The island state, along with other Pacific Island countries, is also subject to the 2012 Pacific Leaders Gender Equality Declaration, a significant proclamation announced at the Island Forum in the Cook Islands. The country has implemented a range of national legislation and policies dedicated to promoting women's equality, equity, empowerment and protection. See Table 2 in Appendix 17 for a comprehensive overview of each policy.

Gender equality and empowerment

In 2007, the gender gap in the labour force participation rate was 33%; in 2017, this had decreased to 19%. This indicates improved competitiveness for women in the job market. Additionally, the women's unemployment rate declined from 49% in 2007 to 31% in 2017, reflecting progress in reducing the employment gap between men and women over the decade.

Women in decision-making

The representation of women in senior positions within the public service, including ministry secretaries, deputy secretaries, assistant secretaries and directors (department heads), was notably low in 2013. At that time, only nine out of 41 positions (22%) were held by women, while men dominated at 78%[1]. By 2022, the number of senior positions increased to 71%, with women accounting for 41% of these roles, while men still held the majority at 59%. This represents a decrease from the 78% observed in 2013[2].

In other sectors, such as the health department, women have made remarkable strides. In 2022, they occupied 86% (18 positions out of 21) of qualified medical doctor roles, whereas men held only 14% (three positions). Similarly, in the education sector across Tuvalu?s islands, women were dominant, holding 57% of graduate and diploma teacher positions, while men accounted for 43%. These figures indicate an improvement for women in these sectors, suggesting that this trend is likely to continue.

The representation of women in local government has also seen progress over the last decade. Previously, only one or two islands had women councillors in their Kaupule (Island Council), but now, every island has at least one female councillor, and Vaitupu has two. This shift demonstrates growing confidence and trust within island communities regarding women's capabilities. It is anticipated that this trend may extend to seats within the parliament in the near future.

Notably, in 2014, the Falekaupule Act was amended, allowing both women and men over 18 years old to participate and vote on matters related to the Kaupule annual budget in the Falekaupule meeting. This change represented a considerable departure from the traditional decision-making process, which restricted speaking and voting rights to older men only. While this amendment does not encompass all matters, it successfully broke the long-standing taboo that prevented women from participating in decisions taken for the islands.

In 2022, the Tuvalu Christian Church (EKT) ? Tuvalu?s predominant religion ? achieved a breakthrough in gender representation when two women were appointed as pastors. This is particularly noteworthy considering the esteemed status of pastors within the island communities, where they hold influential roles and serve as advisors to the Falekaupule on various matters. With designated seats in the Falekaupule, the presence of women pastors in these positions represents a substantial milestone for gender representation.

Women?s access to and control over resources

Tuvalu is a patriarchal society that adheres to a system where extended families, known as Kaitasi, reside together and share land and resources, including pulaka pits and gardens. Typically, the head of the Kaitasi is an older man who assumes responsibility for managing family affairs and resources. He holds authority over Kaitasi land, deciding whether to grant permission for activities like building houses. In rare cases where no older male remains in the family, women may receive the matai[3] title. However, this does not automatically grant them a place in the Falekaupule, the traditional decision-making body. Women traditionally hold lower status within the family and are often expected to reside with their husband's family after marriage.

These cultural dynamics are also reflected in the Tuvalu Lands Code and Native Lands Act. For instance, under Section 14 of the Tuvalu Lands Code includes provisions for a wife, stating that a husband must provide for his wife during her lifetime if they have lived together continuously for at least three years without having children. However, upon the wife's death or remarriage, the land and pulaka pit provided for her support revert to the husband's family[4]. These provisions demonstrate discriminatory practices against women. For instance, if a husband passes away just before the third year of marriage, the wife would not be entitled to her husband's land and pulaka pit. Furthermore, if she remarries, any property she acquired would be returned to her deceased husband's family. These laws contain several provisions that favour men, further reinforcing the patriarchal nature of Tuvaluan society.

Women?s access to education

In Tuvalu, access to education is generally equitable for both girls and boys, with equal opportunity to schooling provided. The government passed an Education (Compulsory) Order in 1984 under section 35 of the Education Act, making schooling compulsory for children aged seven to 15. It explicitly stated that this did not prohibit education before the age of seven or after the age of 15. The order aimed to ensure that everyone receives a minimum of eight years of education. Additionally, the government offered subsidies to primary and secondary schools within the country, and scholarships for tertiary education outside of Tuvalu were made available with assistance from various donor countries such as New Zealand, Australia, Taiwan, Japan and the United Kingdom, among others. Some of these donor countries emphasised the importance of gender balance in their scholarship awards.

Data from the 2017 Census Report revealed a consistent trend in previous censuses, which showed that school attendance reached its peak between the ages of 6 and 13, corresponding to primary education. However, attendance began to decline from the age of 14 onwards, with an increasing number of secondary school dropouts, particularly among boys, between the ages of 14 and 18[5]. In terms of career preferences, males tend to lean towards vocational or technical training, maritime, engineering and civil work, while females show a preference for teaching careers and nursing. However, when it comes to academic achievements, diploma attainment, degrees and master's qualifications, both genders have a similar proportion of accomplishments.

In the past, the number of girls pursuing tertiary education overseas was relatively low, primarily due to parental concerns regarding safety and potential social consequences, such as pregnancy. These concerns stemmed from prevailing perceptions and stereotypes against women at that time, partly influenced by religious and cultural factors. However, attitudes have evolved, and parents now recognise the significance of education, utilising all available opportunities for their children. Furthermore, the Pacific Access Category Scheme Resident Visa has opened doors for employment opportunities in New Zealand and Australia, providing equal opportunities for women as well[6].

Other challenges facing women

According to the 2007 Tuvalu Demographic and Health Survey report 'Violence Against Women', approximately 4 in 10 women in Tuvalu have experienced some form of physical abuse, with their current husbands or partners being the primary perpetrators (85%). Approximately half of all reported incidents of physical violence were reported by women aged 25?29. The report further reveals that wives whose husbands consume excessive amounts of alcohol are significantly more likely (72%) to suffer from physical, emotional or sexual violence compared to those whose partners do not drink (27%)[7].

Climate change and women

There are several reasons climate change has a greater impact on women in Tuvalu. Firstly, women on the islands bear the primary responsibility of caring for children and ensuring there is food for the family. This includes activities such as food production, water collection and household chores, which are directly impacted by changes in weather patterns and natural resources. Additionally, women?s economic activities in Tuvalu are often tied to natural resources that are vulnerable to climate change. For example, even a category 1 strong wind (the lowest category) can damage pandanus tree leaves (Laukie), which are used to weave handicrafts, mats, baskets, fans and local dancing skirts. In the event of strong winds, it takes two to three months for new leaves to mature, thereby impacting the production of handicrafts

that Tuvaluan women sell for income to support their families. This reliance on natural resources amplifies women?s vulnerability to changing environmental conditions.

Gender Action Plan (GAP): Strategic framework

The proposed project will contribute to securing and enhancing gender equality and women?s empowerment through the project design and implementation strategy.

The project design has focussed on prioritising gender equality and empowerment wherever possible. Women?s groups ? such as the Tuvalu National Council of Women (TNCW) ? will be engaged during stakeholder consultations to ensure that deliverables sufficiently integrate gender considerations, such as under Outputs 1.1.5 and 2.1.2. Fisheries and natural resource-based livelihood strategies introduced under Output 1.2.3 will be developed in a gender-responsive manner to ensure that women can equitably access and benefit from these livelihoods. Gender has been mainstreamed throughout Outcome 2.3 to ensure that all knowledge products generated, stored and disseminated under this outcome are gender-disaggregated as far as possible and consider the differential impacts of gender on project interventions. The knowledge management and communication strategy (Output 2.3.2) will be developed in a gender-responsive manner to ensure that the best practices and lessons learned to be communicated under this output can reach beneficiaries of all genders. Finally, the online knowledge management platform (Output 2.3.3) will be designed to ensure equitable access to, and use of, the platform among women and men.

To ensure that the gender-related activities and outputs will achieve their envisioned impacts, gender equality has also been mainstreamed throughout the implementation strategy. The Project Management Unit (PMU) will include a dedicated Safeguards and Gender Specialist, who will ensure that project outputs are implemented in alignment with the Gender Action Plan (Appendix I). Gender specialists will also be recruited to support the implementation of relevant activities wherever possible, to ensure that gender considerations can be adequately considered during implementation and that data collection is gender-disaggregated wherever possible. It is envisioned that these inclusions will contribute to ensuring that project interventions are implemented in a gender-responsive manner.

Component	Outcome	Output	Gender action	Indicators and targets	Responsible stakeholder

Component 1: Identifying and implementing integrated land management and ecosystem restoration strategies for increased resilience.	Outcome 1.1. Restoration and increased resilience of 46 ha of agricultural systems on 8 islands against the impacts of climate change and salt-water intrusion through innovative land management and agricultural practices.	Output 1.1.1. National pulaka pit health and groundwater assessment undertaken on all 8 target islands.	Undertake an assessment to understand how groundwater availability, access, and use impact women in Tuvalu. Ensure the active and meaningful participation of women in the groundwater assessment process. This could include community meetings, surveys and mapping exercises.	Target: A gender-responsive groundwater assessment published and shared with key stakeholders. Indicator: Gender considerations are mainstreamed in the groundwater assessment.	Project manager, Monitoring, Safeguard and Gender Specialist, representatives from the Kaupule
		Output 1.1.2: 449 raised concrete beds introduced to 8 target islands to upscale the climate proofing project.	Ensure that the concrete beds are close to women?s homes to allow access that does not compromise their caretaking roles and responsibilities.	Target: At least 150 of the concrete beds are close to women?s homes. Indicator: Number and percentage of concrete beds located within 500 metres from women's homes.	Project manager, Monitoring, Safeguard and Gender Specialist, representatives from the Kaupule
		Output 1.1.3. Alternative irrigation strategies ? such as drip irrigation from roof catchments and tanks/micro-dams ? installed to facilitate water supply to rehabilitated pulaka pits and raised concrete beds introduced on each of the 8 target islands.	Involve women farmers in the planning and decision-making for identifying the alternative irrigation strategies. This can be achieved through using measures such as quotas, preferential admissions and scholarships where appropriate	Target: At least 40% of farmers are women. Indicator: Number or percentage of women farmers participating in the planning and decision-making meetings.	Project manager, Monitoring, Safeguard and Gender Specialist, representatives from the Kaupule

		Output 1.1.4. Diversified cropping strategies introduced to raised concrete beds and pulaka pits to promote the use of climate-resilient crops.	Offer a woman-led training session and education to build women?s knowledge and skills in diversified cropping techniques. Make sure that training materials are sensitive to gender-specific challenges.	Target: Increased percentage of women demonstrating an understanding or proficiency in diversified cropping techniques post-training, compared to pre-training. Indicator: Number of women attending the woman-led training sessions on diversified cropping techniques.	Project manager and Monitoring, Safeguard and Gender Specialist
		Output 1.1.5. 8 community training groups ? including representatives from women?s groups ? established around target sites to generate knowledge of appropriate methodologies and upscale best practices of adaptation strategies among stakeholders.	Ensure any and all training workshops have content on products tailored to women/girl-led MSMEs.	Target: At least 40% of training programme beneficiaries are women, disaggregated by age and disability. Indicator: Percentage of community training groups that have capacity to mainstream gender.	Project manager and Monitoring, Safeguard and Gender Specialist

	Outcome 1.2. Groundwater infiltration and flood-risk reduction services improved on 8 islands through SLM practices that include the restoration and conservation of degraded atoll ecosystems.	Output 1.2.1. 180 ha of coastal ecosystems restored to enhance the provision of associated ecosystem services, including flood reduction and storm surge attenuation.	Ensure that the assessment of the proposed Terrestrial Conservation Areas and Locally Managed Marine Areas includes the input of women and other vulnerable groups.	Target: The Conservation Areas and Locally Managed Marine Areas have been developed in consideration of women and vulnerable group?s interests. Indicator: Number or percentage of women and representatives of vulnerable groups participating in the assessment meetings or consultations for the proposed Conservation Areas and Marine Areas.	Project manager, Monitoring, Safeguard and Gender Specialist, representatives from the Falekaupule and Kaupule
		Output 1.2.2. Groundwater recharge zones in and around active pulaka pit areas protected using EbA buffer zones to improve freshwater infiltration potential.	Develop gender assessment methodology and tools for identification of vulnerabilities and ecosystem degradation hotspots.	Target: A gender-responsive and transformative groundwater recharge zone plan. Indicator: Gender considerations have been mainstreamed throughout the groundwater recharge zone plan.	Project manager and Monitoring, Safeguard and Gender Specialist

		Output 1.2.3. Sustainable, diversified livelihoods strategies introduced for ~800 people (400 women and 400 men) in local communities reliant on natural resource-based livelihoods based on sustainable fisheries management to conserve coastal ecosystems and their services.	Ensure the options analysis under Activity 1.2.3.1 includes gender-disaggregated information. Training workshops should include women as participants by using instruments such as quotas, preferential admissions and scholarships where appropriate. Ensure that women?s multiple roles are not prohibiting them from participating in any training (i.e. the timing of workshops; location and venue of the training).	Target: At least 40% of participants are women disaggregated by age and disability. Indicator: ? Training workshop reports include chapters on gender issues discussed at the workshops. ? Number or percentage of women who have benefited from quotas, preferential admissions, and scholarships related to this initiative.	Project manager and Monitoring, Safeguard and Gender Specialist
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.	Outcome 2.1. Institutional uptake of EbA enhanced through policy revisions and capacity building among core government staff, professionals and community groups.	Output 2.1.1. Revisions made to 3 national policies and procedures 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.	Ensure consultations to revise the national policies include input from the Tuvalu National Council of Women (TNCW). In addition, include gender-related information, targets and data in the revised policies.	Target: At least 40% of participants are women disaggregated by age and disability. Indicator: Consultation workshop report includes a chapter on gender issues discussed at the workshops.	Project manager and Monitoring, Safeguard and Gender Specialist

		Output 2.1.2. Training conducted for 100 government officials, with a focus on technical officers, gender experts, 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.	Training workshops should include women as participants using instruments such as quotas, preferential admissions and scholarships where appropriate. Ensure that women?s multiple roles are not prohibiting them from participating in any training (i.e., the timing of workshops; location and venue of the training).	Target: At least 40% of participants are women, disaggregated by age and disability. Indicator: Training workshop reports include a chapter on gender challenges discussed at the workshops.	Project manager and Monitoring, Safeguard and Gender Specialist

	Outcome 2.2. Develop and implement strategic action plans for streamlining EbA national policy and planning frameworks.	Output 2.2.1. Guidance Note for compliance monitoring and implementation of EbA policy recommendations prepared under Output 2.1.1.	The training workshop under Activity 2.2.1.4 should include women as participants using instruments such as quotas, preferential admissions and scholarships where appropriate. Ensure that women?s multiple roles are not prohibiting them from participating in any training (i.e., the timing of workshops; location and venue of the training). The TNCW can assist in facilitating this process.	Target: At least 40% of participants are women, disaggregated by age and disability. Indicator: Training workshop reports include a chapter on gender challenges discussed at the workshops.	Project manager and Monitoring, Safeguard and Gender Specialist
		Output 2.2.2. Land-use zoning plan developed to enable EbA, climate-resilient agriculture and SLM under existing land tenure systems.	Ensure that the land-use zoning plan includes gender-responsive indicators and considerations, such as how the current land tenure system affects women.	Target: A gender-responsive and transformative land-use zoning plan. Indicator: Gender considerations have been mainstreamed throughout the land-use zoning plan.	Project manager, Monitoring, Safeguard and Gender Specialist, representatives from the Falekaupule and Kaupule

	Outcome 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.	Output 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.	Establish a network including women?s associations from all islands to facilitate sharing information, best practices and challenges for integrating EbA. This network will be consulted to develop the knowledge management and communication strategy.	Target: ? An active network comprising representatives from Women's Associations across all islands to facilitate the exchange of information. ? At least 80% of the women's associations actively participate in the network within the first year of its establishment. Indicator: ? Number or percentage of women?s associations from all islands that are active network members. ? Number or percentage of network recommendations incorporated into developing the knowledge management and communication strategy.	Project manager and Monitoring, Safeguard and Gender Specialist
		Output 2.3.2. A gender-responsive knowledge-management and communication strategy developed for integrating EbA best practices and lessons learned into planning and policy.			
		Output 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.	Awareness raising on the importance of having a gender database. This will be through training workshops that will cover how the database can be accessed and utilised.	Target: At least 40% of participants are women disaggregated by age and disability. Indicator: Training workshop reports include a chapter on gender challenges discussed at the workshops.	Project manager and Monitoring, Safeguard and Gender Specialist

[1] Government of Tuvalu. Tuvalu National Gender Policy. Available at: https://prdrse4all.spc.int/sites/default/files/tuvalu_national_gender_policy.pdf

[2] Tuvalu Government: 2022 Civil Service List.

[3] "Kaitasi" refers to an extended family that live separately but still share the family's resources (land and pulaka pits). A "matai' is the head of the kaitasi and it is usually an elderly male within the family.

[4] Tuvalu Government: Tuvalu Land Code. Available at: http://tuvalu-legislation.tv/cms/images/LEGISLATION/SUBORDINATE/1962/1962-0027/TuvaluLandsCode_1.pdf

[5] Government of Tuvalu. 2017. Census Report. Available at: https://sdd.spc.int/digital_library/tuvalu-population-housing-mini-census-2017-report

[6] PAC Scheme: https://www.immigration.govt.nz/new-zealand-visas/visas/visa/pacific-access-category-resident-visa

[7] Government of Tuvalu. Tuvalu National Gender Policy. Available at: https://prdrse4all.spc.int/sites/default/files/tuvalu_national_gender_policy.pdf

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; Yes

Improving women's participation and decision making Yes

Generating socio-economic benefits or services or women Yes

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

Yes
4. Private sector engagement

Elaborate on the private sector's engagement in the project, if any.

As a result of the small size of Tuvalu and its economy, there is not a prominent formal private sector presence. In the context of the proposed project, the private sector consists of subsistence or small-scale agricultural, fisheries or handicraft production by men and women. These individuals consist of the project?s direct and indirect beneficiaries and are expected to benefit from project interventions.

5. Risks to Achieving Project Objectives

Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, the proposed measures that address these risks at the time of project implementation.(table format acceptable):

All relevant stakeholders were included to ensure potential challenges that could impede, or delay project activities were identified. A participatory approach was taken during the Project Preparation Grant (PPG) phase to recognise these challenges, and national workshops were conducted. This collaborative approach will continue throughout the project's implementation to ensure its success. Additionally, the implementation of project activities will be closely monitored to guarantee that all project milestones are evaluated, updated, and made accessible to all relevant stakeholders. This monitoring will also be critical in identifying challenges early on and iteratively addressing them to minimise project delays. To identify potential risks involved in implementing the proposed project, a risk assessment table has been created (Table 9). Each risk has been analysed in terms of its: i) potential consequences; ii) mitigation measures; iii) probability and impact; and iv) risk category and overall risk rating, based on its probability and impact score.

Table 9. Risks and mitigation measures for the proposed project.

	Risk	**Potential consequence**	**Mitigation measure**	**Probability (P) (1?5) & Impact (I) (1?5)**	**Risk Category (C) & Rating (R)**
1	Extreme weather events (such as droughts, TCs and floods) at project sites may damage or destroy EbA activities implemented through the project[1].	Communities may experience increased vulnerability to climate change and food insecurity.	Project implementation activities will be timed to avoid periods when extreme weather events are more prevalent. Additionally, provision will be made in work plans and budgets to allow for weather-related interruptions, ensuring the project remains on schedule. Project interventions have been designed to address the impacts of projected climate change and be resilient to climate change hazards.	P = 2 I = 3	C = Environmental R = Moderate

2	Women may be restricted from participating in community consultations and decision-making processes during project implementation, leading to project maladaptation[2].	Women may not benefit equally from project activities, such as the use and management of pulaka pits.	A Gender Assessment and Gender Action Plan (GAP) developed during the PPG phase in consultation with relevant stakeholders, including women and vulnerable groups, will identify gender challenges and priorities. The GAP will ensure that project interventions are gender-inclusive and responsive during implementation. Moreover, a gender specialist will oversee the proposed project?s gender-relevant activities to ensure gender equity is maintained throughout the project period.	P = 3 I = 3	C = Social R = Moderate
3	National or regional restrictions due to a national or global disease outbreaks may cause project delays[3].	Restrictions on gatherings and travel may hinder stakeholder engagement and delay project implementation, particularly capacity development and adaptation interventions.	Limited travel to and from Tuvalu ? which reduces the chance of exposure ? and the high vaccination status of the country make it unlikely that Covid-19 will negatively influence project implementation. However, in the event of an outbreak of either Covid-19 or an alternative virus during project implementation, provisions will be made in the workplan to ensure the project remains on schedule. Moreover, should a pandemic event occur, government recommendations on safety and travel protocols will be strictly followed to ensure the safety of project implementers and stakeholders.	P = 1 I = 1	C = Social R = Low

4	High staff turnover in the government departments and implementing agencies[4].	High staff turnover may result in the loss of institutional knowledge and experience, leading to reduced effectiveness, project delays, increased costs, and a breakdown in communication with stakeholders.	To ensure continuity of institutional knowledge and experience, the proposed project will appoint deputies and alternative representatives during its inception. Additionally, it will recruit staff independent of government departments to form its core team. Comprehensive manuals in English and local languages will be developed to guide new staff unfamiliar with the project. To ensure the continuity of technical capacity and EbA-related knowledge, the project will also train core government staff (Outputs 2.1.2 and 2.3.3). These individuals will transfer their technical knowledge to new staff within government departments and implementing agencies, consolidating the technical expertise within institutions.	P = 2 I = 3	C = Social R = Low

5	Land-tenure arrangements proposed by the project for the conservation of ecological buffer zones may restrict access to resources, affect customary land rights and create some level of economic displacement[5].	Restricted resources may cause conflicts, economic displacement, reduced income, social and economic inequalities, and a breakdown in social cohesion.	An Environmental and Social Impact Assessment (ESIA) will be developed before any on-the-ground interventions are undertaken to ensure that the project minimises its impact on the environment and local communities. Traditional authorities, as well as local communities, will be consulted during the development of land-use plans to ensure adherence to local laws governing land tenure, and agreements will be made concerning the impacts on land-tenure arrangements.	P = 3 I = 3	C = Environmental R = Modest
6	Limited community ownership of project activities and interventions post-project implementation[6].	Limited community ownership may undermine project sustainability and success, resulting in the inefficient use of resources and reduced effectiveness in achieving project objectives.	The project will regularly conduct stakeholder consultations and workshops, encouraging community participation and gathering their feedback. To emphasise the value and significance of project activities, the project will conduct awareness-raising programmes in the months leading up to project initiation and throughout its implementation (Output 2.3.1). Project interventions have been designed to yield tangible benefits for the communities. Coupled with capacity building, this approach will incentivize the communities to maintain these interventions over the long term.	P = 2 I = 3	C = Social R = Moderate

7	Limited technical, on-the-ground expertise for implementing project interventions[7].	Limited technical expertise may compromise the quality and effectiveness of project outcomes, resulting in delays, inefficiencies and increased costs.	The project will focus on enhancing the capacity of district and local officials to effectively implement and monitor project activities (Outputs 2.1.2 and 2.3.3). This will be achieved through regular technical oversight missions conducted by United Nations Environment Programme (UNEP) staff and/or technical advisors. Additionally, on-the-ground training will be provided to project implementers to enhance their technical skills and knowledge. Through these capacity-building measures, the project will ensure the successful implementation and monitoring of project activities.	P = 3 I = 2	C = Social R = Low
8	High cost of transportation[8].	High transportation costs can put a strain on the budget allocated	Seek collaborations with local organizations, government agencies, or other stakeholders involved in the restoration project. Pooling resources and sharing transportation costs can help reduce expenses and enhance efficiency.	P= 3 I =3	C = Social R = Moderate

[1] Based on lessons learned form R2R Project and stakeholder engagements.

[2] Based on stakeholder engagements, particularly with the TNCW.

[3] Based on global experience of project delays resulting from travel restrictions and quarantine.

[4] Based on risks and lessons learned from the R2R Project and NAPA.

[5] Based on stakeholder engagements and risks identified under the R2R Project.

[6] Based on risks and lessons learned from the R2R Project, Building Capacity and Mainstreaming Sustainable Land Management in Tuvalu, NAPA and COSPPAC.

[7] Based on risks and lessons learned from the R2R Project, Building Capacity and Mainstreaming Sustainable Land Management in Tuvalu and Pacific Adaptation to Climate Change.

[8] Based on stakeholder engagements.

6. Institutional Arrangement and Coordination

Describe the institutional arrangement for project implementation. Elaborate on the planned coordination with other relevant GEF-financed projects and other initiatives.

The proposed project will be implemented over a five-year (2024?2028) and will be executed by Tuvalu?s Ministry of Finance ? specifically the Climate Change Department ? in collaboration with the Department of Agriculture, Department of Environment, Land and Survey Department and Local Government Department. National ministries, additional to those directly involved in project implementation, will be consulted regularly to ensure that the project is executed in line with national priorities and to identify areas of complementarity. Non-government organisations such as the Tuvalu Association of Non-Government Organisation (TANGO) and Tuvalu National Council of Women will also be engaged with regularly to assist with a range of stakeholder?s concerns and priorities are addressed. Regular, community-level consultations with local stakeholders, including island *Kaupule* and *Falekaupule*, will also ensure that local needs and priorities are addressed throughout project implementation. During the project's inception phase, an inception workshop will be convened to inform stakeholders about the project work plan, project activities and interventions, and the different roles stakeholders will fulfil during project implementation. Community consultations will ensure that intervention activities are validated and enable communities to provide input into the design and implementation of interventions.

Implementing Agency:

UNEP will be the GEF Implementing Agency (IA) for the proposed project, and provide project oversight to ensure that UNEP and GEF policies and criteria are adhered to and that the Project meets its objectives and achieves expected outcomes in an efficient and effective manner. As IA, UNEP will implement the project through its Ecosystems Division, with delegated authority for day-to-day supervision by a Task Manager (TM) based at UNEP?s Asia and the Pacific Office in Bangkok, Thailand. UNEP communicate and collaborate with other UN agencies within the UN Multi-Country Office (MCO) located in Fiji through its office in Samoa. UNEP will also ensure reporting project contributions to the UN Pacific Multi-Country Programme 2023-2027. UNEP will be responsible for project supervision to ensure consistency with GEF and UNEP policies and procedures and follow-up and evaluation, including the supervision of a Mid-Term Review and Terminal Evaluation and the review and approval of regular reports ? both financial and technical. The agency will also provide guidance, analysis and technical support in relevant areas and other liaison and coordination actions necessary to ensure the effective implementation of the project. As mentioned above, a TM will be assigned to the project, providing project supervision to ensure compliance with GEF and UNEP policies and procedures. The TM will formally participate in the following: i) annual Project Steering Committee (PSC) meetings; ii) the mid-term and terminal evaluations; iii) the clearance of

bi-annual progress reports and project implementation reviews; and iv) the technical review of project outputs.

UNEP will provide guidance on linkages with relevant UNEP and GEF-funded activities and provide a platform for collaborative partnerships between national and international organisations that will bring the best available expertise in science and knowledge from the scientific community to partners working in project development at a national level. UNEP will also monitor the implementation of activities undertaken during the execution of the project by providing the overall coordination and ensure that the project is in line with the UNEP Medium-Term Strategy and its Program of Work (PoW). More specifically, UNEP will:

? Provide project oversight and guidance to ensure that national, UNEP and GEF policies and criteria are adhered to and that the project meets its objectives efficiently and effectively. Project supervision is entrusted to the UNEP/GEF Task Manager and Fund Management Officer. Project supervision missions by the Task Manager or Fund Management Officer will be stipulated in the project supervision plan;

? Enter into an Execution Agreement with the lead Executing Agency (Ministry of Finance) for the provision of services to the project;

? Have a representative on the Project Steering Committee;

? Report to the GEF Secretariat on the progress against milestones outlined in the CEO approval letter;

? Inform the GEF Secretariat whenever there is a potentially substantive co-financing change (i.e. one affecting the project objectives, the underlying concept, scale, scope, strategic priority, conformity with GEF criteria, the likelihood of project success, or outcome of the project);

? Be responsible for submitting the overall annual Project Implementation Review report to the GEF Secretariat and Evaluation Office and rate the project on an annual basis in terms of: i) progress in meeting project objectives; ii) project implementation progress; iii) risk to project implementation; and iv) quality of project monitoring and evaluation. In addition, UNEP will report to the GEF Secretariat through the Project Implementation Review (PIR) report;

? Review and clear manuscripts prepared by the Executing Agency before publication, and review and agree to any publishing contracts;

? Undertake a mid-term review of the project or request the Evaluation Office (EO) to perform an independent mid-term evaluation;

? Ensure that the EO of UNEP arranges an independent terminal evaluation and submits its report to the GEF Evaluation Office;

? As deemed appropriate, facilitate access to information, advisory services, technical and professional support available to UNEP and assist the Executing Agency to access the advisory services of other United Nations agencies, whenever necessary; and

? Manage and disburse funds from GEF in accordance with the rules and procedures of UNEP.

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Project assurance: UNEP?s GEF Climate Change Adaptation and Land Degradation Units will monitor the implementation of the proposed project, specifically the achievement of project outcomes and outputs. In addition, these units will ensure the adequate use of UNEP GEF funds. UNEP will be responsible for recruiting mid-term and terminal evaluators through the independent UNEP Evaluation Office.

UNEP's Comparative advantage

UN Environment has experience in implementing approximately 80 projects on adaptation at global, regional and national levels worldwide, through which it has accumulated a considerable knowledge base and experience on climate change adaptation and resilience building. These projects develop innovative solutions for national governments and local communities to adapt to the predicted effects of climate change in an environmentally sound manner. This is achieved by: i) providing methods and tools to support decision-making; ii) addressing barriers to implementation; iii) testing and demonstrating proposed solutions; and iv) enhancing climate resilience by restoring valuable ecosystems that are vulnerable to climate change.

The GEF Council paper (C.31/15) outlines the comparative advantages of UN Environment. These include providing GEF with the best available science and knowledge upon which to base investments, and provision of expertise on environmental and climate change matters. UN Environment also has considerable experience in the piloting of successful innovative approaches to adaptation and the implementation of adaptive learning. The proposed LDCF project builds upon this comparative advantage.

Management Structure

Role of Executing Agency

Ministry of Finance (MoF) will serve as the proposed project's national Executing Agency (EA). MoF will provide overall leadership for the project in close collaboration with: i) the Agriculture Department; ii) Department of Environment; iii) Lands and Survey Department; iv) Local Government Department; v) members of the Project Steering Committee; and vi) local communities.

MoF will be accountable to UNEP, as IA, for project execution at the national level and using resources for project implementation effectively. In addition, the MoF will be responsible for achieving the overall project objectives and will, therefore, designate a senior official to serve as the National Project Director (NPD). The NPD?s primary responsibility will be to ensure that the project produces the results specified in the Project Document to the required quality standard within the specified time and cost constraints[1]. They will work closely with all partner institutions to link the project with complementary national programmes and initiatives. MoF will also designate an alternate to act as NPD in their absence to ensure continuity.

UNEP will enter into a Project Cooperation Agreement (PCA) with MoF to execute the project. The PCA will establish clear roles and responsibilities for: i) delivering the proposed activities, schedule and conditions for instalments, and ii) determining the prevailing fiduciary standards, terms and conditions for arbitrations and termination of contracts. The PCA will include specific obligations for the national EA on project execution, financial management, personnel administration and reporting, as well as arbitration and liability terms. The national EA will be responsible for establishing national project implementation in a

relevant department of the government administration to provide guidance and support to national service providers and Technical Partners. Accordingly, the national EA will provide technical and implementation guidance and facilitate cooperation and coordination among national service providers. The EA will be accountable and submit regular progress reports to the Project Management Unit (PMU).

Implementation Arrangements

The implementation of the project will be undertaken through a defined organisational structure that outlines the flow of funds and reporting lines. This structure includes the Implementing Agency (UNEP), the Executing Agency, Executing Partners, Project Steering Committee, Project Management Unit, Beneficiaries and technical supporting groups. This structure and the responsibilities of each party member are provided in Figure 09 and described below.

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[1] Within the conditions laid down by the Project Steering Committee and in line with UNEP Policies and Procedures

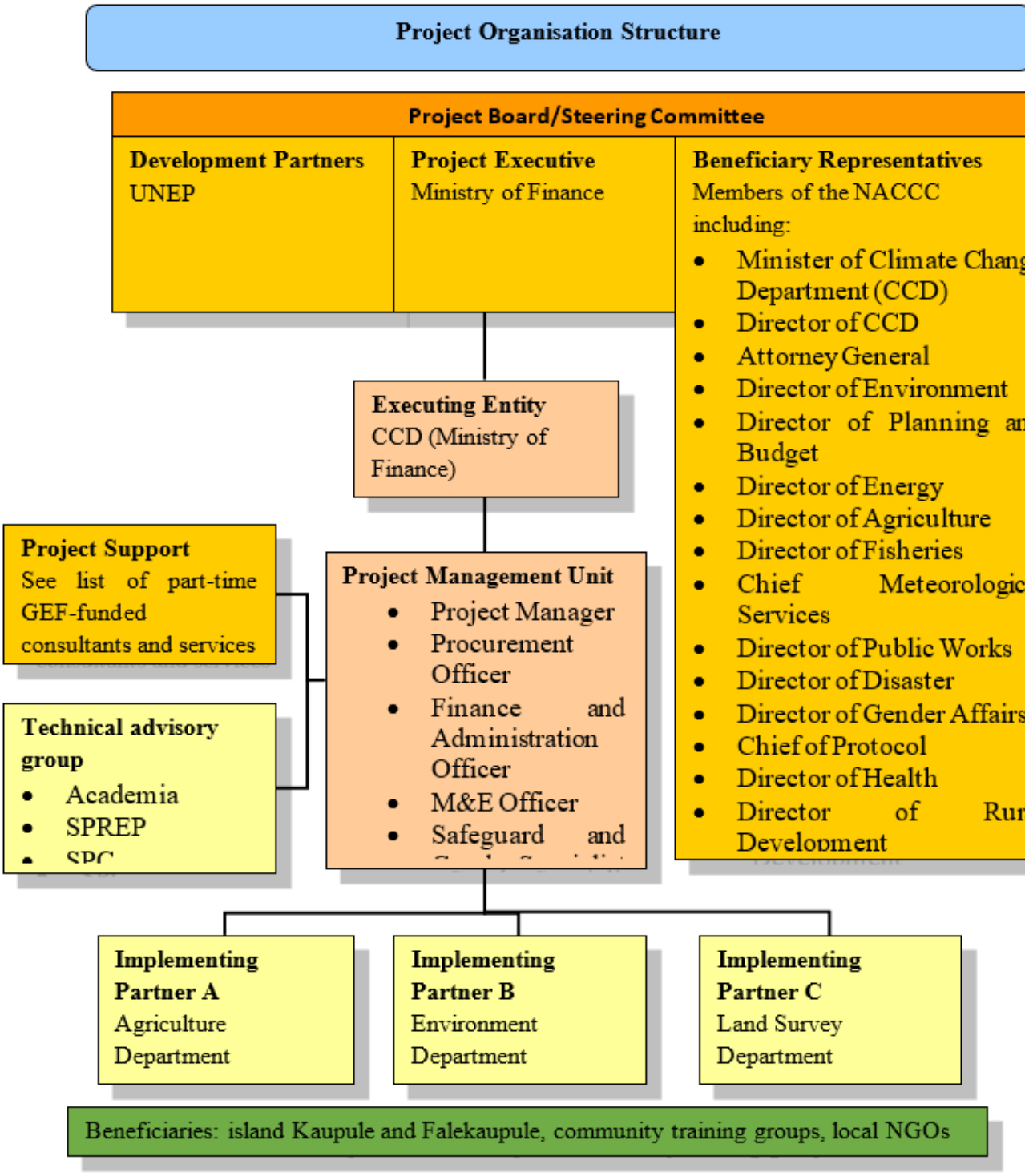

Figure 09. Project organisational structure.

As the EA, the MoF will have full responsibility to support accountability, transparency, effective management, and timely project results. The day-to-day management of the proposed project will be the responsibility of the PMU, under the direct supervision of the NPD. The PMU will be based in Funafuti and comprise the following staff: i) Project Manager; ii) Procurement Officer; iii) Finance and Administration Officer; iv) Monitoring and Evaluation (M&E) Officer; v) Safeguard and Gender Specialist; and vi) Agriculture Specialist. A Chief Technical Advisor (CTA) will additionally be recruited part time to provide technical guidance to the PMU.

A Project Manager (PM) will be recruited[1] on a full-time basis to lead the PMU and coordinate the execution of the proposed project under the guidance of the NPD. The individual responsible for the role will be answerable to the Project Steering Committee (PSC) for, *inter alia*, the: i) quality, timeliness and effectiveness of the interventions implemented; and ii) transparent disbursement and use of project funds[2]. The PM will produce annual work plans (AWPs) ? with associated cash advance requests/annual budget plans[3] ? that will be approved by the PSC at the beginning of each financial year and provide the basis for allocating resources to planned activities. Once an AWP is approved, it will be sent to the UNEP TM[4] for clearance of GEF funds, which will be released once UNEP clears the AWP and its associated cash advance requests.

The PM will manage the project in line with the AWPs and in accordance with the guidelines stipulated by the GEF and UNEP. In addition, the PM will deliver quarterly progress reports to the PSC and UNEP TM. These reports will include the status of activities and any challenges encountered on the ground during project implementation. In particular, the PM will:

? provide on-the-ground information for UNEP progress reports;

? engage with stakeholders;

? organise PSC meetings;

? provide technical support to the project, including measures to address challenges to project implementation; and

? participate in training activities, report writing and facilitating expert activities relevant to the PM?s area of expertise.

In addition to the responsibilities discussed above, the PM will produce[5]: i) UNEP annual financial reports, with support from an MoF appointed Finance and Administration Officer; ii) bi-annual progress reports and Project Implementation Reviews (PIRs); iii) budget revisions; and iv) any other project-related reports requested by the PSC. These reports will enable the comparison between the project?s progress and the expected results, providing the primary reporting mechanism for monitoring project activities. Moreover, the reports will highlight any substantial delays or changes during implementation and detail the necessary adjustments made or recommended.

An Agriculture Specialist will be recruited to ensure the effective implementation of all agricultural activities under the project, specifically those relating to Outcome 1.1. The Agricultural Specialist will provide guidance on the procurement of agricultural equipment and goods, as well as oversight for the implementation of raised concrete beds, seedling nursery maintenance, irrigation systems and other climate-resilient practices introduced through the project.

A Monitoring and Evaluation (M&E) Officer will be recruited to support the implementation of all project activities. The M&E Officer will support the PMU with M&E-related tasks including: i) monitoring; ii) reporting; iii) knowledge sharing; and iv) adaptive management. Moreover, the M&E specialist will support independent evaluators conducting the Mid-Term Review and Terminal Evaluation.

A Safeguards and Gender Specialist will be responsible for tracking project risks identified in the UNEP Safeguard Risk Identification Form (SRIF) and ensuring that project implementation adheres to social and environmental safeguards as outlined in the project?s Environmental and Social Management Framework (ESMP). Additionally, the Safeguards and Gender Specialist will ensure project implementation is done in a gender-responsive manner and follows the recommendations outlined in the project?s Gender Action Plan (GAP).

MoF will recruit a Chief Technical Advisor (CTA), with involvement and approval by UNEP, responsible for providing overall technical backstopping and operational support to the project. The CTA will provide technical support and expertise to the implementation of project activities and specifically guiding sustainable land management through and agribusiness approach. The CTA will also provide support to MoF on related matters.

MoF will have the ability to contract other entities ? defined as Implementing Partners ? to undertake specific project tasks through a competitive bidding process according to procurement rules and regulations of the GoT. However, if an identified Implementing Partners is another government institution, Inter-governmental Organisation or a United Nations agency, the competitive bidding will not be necessary and direct contracting will be applied. Confirmation of direct contracting will need to comply with comparative advantage, timing, budgeting and quality criteria. If direct contracting criteria cannot be met, the position will be opened to competitive bidding.

All procurement will be non-discriminatory, inclusive and gender-sensitive, with at least 50% of roles filled by women. Contractors that will be procured will be required to demonstrate their commitment to inclusivity and all labour conditions will be in line with Tuvalu?s labour laws.

Individuals and organizations within the project management structure described above will also coordinate closely with the implementers of other current GEF or non-GEF initiatives within Tuvalu that are utilizing similar interventions or have objectives that align. Project management will in particular coordinate closely with projects that are providing grant co-financing to ensure project outputs identified for co-financing are meeting targets that contribute to the proposed project?s objectives. The project management team will additionally draw from lessons learned and best practices from similar projects that have been completed. A list of completed and ongoing GEF and non-GEF projects that the proposed project will coordinate with or draw lessons learned from are summarized in Table 14 and Table 15 below. These tables include specific linkage points for the proposed project and the presented complementary projects.

Table 14. The relevant GEF projects in Tuvalu and their linkages to the proposed project.

Project (including funding amounts and timelines)	**Project objective**	**Linkage with the proposed project**

Managing Coastal Aquifers Project (MCAP)[6] US$5,261,356 (GEF) and US$19,604,797 (co-financing) Timeline: approved in 2020 with a duration of 48 months for implementation	The project?s main objective is to improve the understanding, use, management and protection of coastal aquifers towards enhanced water security, particularly in the context of climate change. This will be achieved by: i) identifying the extent, threats and development potential of groundwater resources; ii) increasing awareness of groundwater as a water security supply source; and iii) improving aquifer protection and management. The project is currently being implemented.	Output 1.2.2 (Groundwater recharge zones in and around ~62 active pulaka pit areas protected using EbA buffer zones to improve freshwater infiltration potential) will draw from the lessons and reports generated by the MCAP to inform the development of groundwater recharge zones.

Increasing Resilience of Coastal Areas and Community Settlements to Climate Change[7] US$3,366,000 (LDCF) and US$3,140,000 Timeline: 2009?2018	This project?s primary objective was to protect livelihoods in coastal areas from dynamic risks related to climate change and climate variability. To achieve this, the project: i) implemented effective community-based adaptation measures, including technical assessments to propose feasible, diversified livelihood strategies; ii) increased institutional capacity at all levels of administration and communities to support policy planning and responses to climate change impacts; and iii) implemented a knowledge-management and dissemination strategy, which applied lessons learned from policy processes, technical assessments,	Output 1.2.3 (Sustainable, diversified livelihoods strategies introduced for ~800 people (400 women and 400 men) in local communities reliant on natural resource-based livelihoods based on sustainable fisheries management to conserve coastal ecosystems and their services) of the proposed project will draw from the technical assessments of the ?Increasing Resilience of Coastal Areas and Community Settlements to Climate Change? GEF LDCF project to propose feasible and sustainable diversified livelihood strategies that support the sustainable management of Tuvalu?s natural resources and ecosystems. Output 2.1.2 (Training conducted for 100 government officials, with a focus on technical officers, gender experts, 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) will incorporate EbA and SLM considerations into policies and plans and build on this project?s capacity-building activities, focusing on the relevant stakeholders. Outcome 2.3 will build on and update the knowledge-capturing, management and dissemination strategy developed by the GEF LDCF project.

	community engagement and adaptation plans.	

Table 15. The relevant non-GEF projects in Tuvalu and their linkages to the proposed project.

Project (including funding amounts and funder)	**Project objective**	**Linkage with the proposed project**
Improving Agroforestry Systems to Enhance Food Security and Build Resilience to Climate Change in Tuvalu[8] The European Union ?500,000 (or US$526,990) Timeline: 2015?2015	This project aimed to improve food security and build climate change resilience by utilizing climate-resistant crop varieties to diversify crops. Climate-ready crop varieties are researched and made available by the Secretariat of the Pacific Community?s (SPC) Centre for Pacific Crops and Trees.	Output 1.1.4 (diversified cropping strategies introduced to raised concrete beds and pulaka pits to promote the use of climate-resilient crops) will use the SPC?s Centre for Pacific Crops as an entry point for the diversification of crops, and to build on the European Union funded project?s activities.
The Climate Proofing Project[9] Government of Tuvalu US$332,166 Timeline: 2020?2023	The project focused on four of Tuvalu?s islands ? namely Nui, Nukufetau, Nanumea and Nukulaelae ? with the aim of: i) enhancing the resilience and adaptive capacity of pulaka; ii) reducing the vulnerability and increasing the food security of the most vulnerable people, including women, the elderly and people with disabilities; and iii) strengthening community members? and farmers? awareness of climate change. The project primarily comprised of the introduction of concrete beds for the planting of pulaka and other crops. These beds are 5 x 6 x 1 m in size and include drainage pipes that assist in maintaining a consistent water level. Water is usually added to the beds manually, using buckets.	Output 1.1.2 (449 raised concrete beds introduced to 8 target islands to upscale the climate proofing project) has specifically been designed to upscale the Climate-Proofing project?s interventions pertaining to the concrete beds for pulaka and other crops.

The Tuvalu Coastal Adaptation Project (TCAP)[10] GCF US$36,010,000 (GCF) and US$2,860,000 (co-financing). Timeline: 2016?2024	The project aims to build institutional capacity and coastal resilience in three of Tuvalu?s inhabited islands ? Funafuti, Nanumea and Nanumaga ? using grey infrastructure coastal protection measures such as geotextiles to manage coastal inundation risks. The project is currently being implemented.	Output 1.2.1 (180 ha of coastal ecosystems restored to enhance the provision of associated ecosystem services, including flood reduction and storm surge attenuation) will complement the TCAP?s coastal protection interventions to increase the resilience of communities and agricultural systems through EbA interventions on the proposed project?s target islands.
Atoll Food Futures (AFF) Project[11] Government of Australia (GoA) US$689,512 Timeline: 2020?2023	Live and Learn is currently implementing the third phase of the AFF Programme in Tuvalu. The Australian Department of Foreign Affairs and Trade (DFAT) funds the project. The AFF project aims to improve vulnerable households? resilience and food security through increased production and consumption of locally grown food using Foodcube and dry-wicking bed technologies. The Foodcubes provided through Live and Learn are free for interested community members, who then maintain ownership of the cube for as long as they utilize it. Costs for growing crops in the Foodcube incurred by the recipients include an initial investment of ~US$6.72 for the application of compost. After this, compost is often acquired from the Public Works Department, which processes waste-plant material into ground compost.	Output 1.1.4 (diversified cropping strategies introduced to raised concrete beds and pulaka pits to promote the use of climate-resilient crops) of the proposed project will complement the AFF project?s by building on diversified cropping strategies used within Foodcubes. This will, in turn, promote sustainable, diversified livelihoods under Output 1.2.3 of the proposed project.

Project Steering Committee

A Project Steering Committee (PSC) will be established as the group responsible for making management decisions ? by consensus ? when the PMU, and especially the PM, requires high level guidance. For example, the PSC will be responsible for the approval of project work plans and budgets and any revisions by UNEP and MoF. In addition, the PSC will provide high-level oversight and guidance in achieving project objectives and participate in discussing general strategies and opportunities for project planning and implementation. Committee members will meet a minimum of twice a year (more often if necessary), be co-chaired by MoF and UNEP. The PM will act as a secretary to the PSC. In addition to the UNEP Task Manager, the PSC will consist of members of Tuvalu?s National Advisory Council on Climate Change (NACCC), which includes: i) Minister of Climate Change Department (CCD); ii) Director of CCD; iii) Attorney General; iv) Director of Environment; v) Director of Planning and Budget; vi) Director of Energy; vii) Director of Agriculture; viii) Director of Fisheries; ix) Chief Meteorological Services; x) Director of Public Works; xi) Director of Disaster; xii) Director of Gender Affairs; xiii) Chief of Protocol; xiv) Director of Health; xv) Director of Rural Development; xvi) Director of Land Survey; xvii) Coordinator of TNCW; xviii) Coordinator of TANGO; and xiv) Secretary EKT[12][185]. This approach has been taken to avoid the replication of already

existing committee structure within Tuvalu, as the NACCC consists of representatives of stakeholder groups that would already be consisted for the project?s PSC.

PSC decisions will be held to a standard of cost-effectiveness, fairness, integrity, transparency and effective international competition to ensure UNEP?s ultimate accountability. Project reviews by this group will be made at designated decision points over the course of the project?s implementation ? with additional reviews where necessary.

The functions of the PSC will include, *inter alia*:

? providing guidance for project execution to the PMU, specifically on cross-cutting issues that require consensus from a variety of project stakeholders and the agreement of management actions to address specific risks;

? approving the AWPs that are prepared by the PM prior to approval by UNEP;

? hosting regular meetings to review the project?s progress and provide recommendations to ensure the agreed deliverables are of a satisfactory standard;

? determining a strategic direction, reinforcing country ownership and government involvement in the leadership of the programme and coordinating all interventions;

? reviewing and approving all activities that are supported by the project based on the project objectives, work plan and availability of funding; and

? monitoring and evaluating programme activities through periodic meetings and occasional site visits.

Technical Advisory Group

Project implementation will be supported by a Technical Advisory Group that will provide additional technical expertise and guidance to the PSC. The Technical Advisory Group will consist of representatives from Academia as well as regional organisations with expertise in agricultural and environmental practices such as the South Pacific Community (SPC) and Pacific Regional Environment Programme (SPREP). Members of the Technical Advisory Group will be confirmed at the beginning of project implementation.

Financial procedures

UNEP will provide oversight to the financial arrangements and procedures under the project?s components as per UNEP financial rules and regulations. The proposed project will be audited in accordance with UNEP Financial Regulations and Rules and all applicable audit policies.

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[1] By MoF using national rules and regulations and ensuring international standards on recruitment processes

[2] The Executing Agency (EA) is also accountable for the use of project funds.

[3] Under the supervision of the National Project Director and with support from the rest of the PMU

[4] At the GEF Regional Coordinating Unit (RCU)

[5] Under the supervision of the National Project Director and with support from the rest of the PMU

[6] GEF project. 2020. Managing Coastal Aquifers in Selected Pacific SIDS. Available at: https://www.thegef.org/projects-operations/projects/10041

[7] GEF project. 2009. Increasing resilience of coastal areas and community settlements to climate change. Available at: https://www.thegef.org/projects-operations/projects/3694

[8] European Union. 2012. Improving agroforestry systems to enhance food security and build resilience to climate change in Tuvalu. Available at: https://europa.eu/capacity4dev/file/19503/download?token=Vx3IOw92

[9] Government of Tuvalu. 2020. Climate Proofing Project.

[10] GCF. 2016. Tuvalu Coastal Adaptation Project (TCAP). Available at: https://www.greenclimate.fund/document/tuvalu-coastal-adaptation-project

[11] Live and Learn. 2020. Atoll Food Futures Programme. Available at: https://livelearn.org/projects/atoll-food-futures-program/

[12] CCD. N.d. Tuvalu Climate Change Portal. NACCC ? National Advisory Council on Climate Change. Available at: https://www.tuvaluclimatechange.gov.tv/naccc-national-advisory-council-climate-change

7. Consistency with National Priorities

Describe the consistency of the project with national strategies and plans or reports and assesments under relevant conventions from below:

NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.

Table 16. Alignment with national strategies, policies or plans.

National strategy, policy or plan	Alignment
Intended Nationally Determined Contributions[1] (INDC) 2015	Tuvalu?s INDC aims to increase resilience to climate change impacts ? such as sea level rise (SLR) and ocean acidification ? through adaptation measures including sustainable agriculture, coastal protection and rainwater harvesting. The proposed project will contribute to these goals by increasing the resilience of agricultural systems (Outcome 1.1) and improving flood-risk reduction services (Outcome 1.2).
Second National Communication[2] (SNC) 2015	The SNC identifies several challenges to achieving Tuvalu's climate change goals, including limited financial resources and technical capacity. The proposed project will help address these challenges by: i) mobilising climate finance to address unsustainable practices in the country; ii) building local communities? technical capacity by training eight community groups to generate knowledge of appropriate methodologies and upscale best practices of adaptation strategies (Output 1.1.5); and iii) developing the technical skills of 100 government officials through training (Output 2.1.2).
Climate Change Policy[3] (2011?2020)	In line with the Climate Change Policy, the proposed project will also support and contribute towards building Tuvalu's resilience and adaptive capacity to climate change impacts by, *inter alia*, enhancing national policy and planning frameworks, strengthening institutional capacity, raising awareness and addressing barriers to CCA.
National Strategy for Sustainable Development[4] (NSSD) 2021?2030	To implement the NSSD?s framework, the government of Tuvalu (GoT) has planned to revise priority sectoral plans and policies relevant to the agriculture, water and infrastructure sectors. The proposed project will contribute to achieving this objective by revising three national policies and procedures relevant to ecosystem-based adaptation (EbA), water and agriculture (Output 2.1.1).
National Environment Management Strategy[5] (NEMS) 2015?2020	The NEMS aims to promote the: i) development of climate-resilient infrastructure; ii) sustainable management of Tuvalu's freshwater resources; and iii) sustainable agriculture and forestry practices. This project will contribute to these goals by enhancing the resilience of agricultural systems (Outcome 1.1), restoring coastal ecosystems (Output 1.2.1), and creating groundwater recharge zones to improve freshwater infiltration potential (Output 1.2.2).

National Adaptation Programme of Action[6] (NAPA) 2007	The NAPA outlines the following priorities for each sector: i) water resources ? promote the development of rainwater harvesting systems and the construction of freshwater-storage facilities; ii) coastal management ? construct sea walls, breakwaters and other protective structures to reduce the impacts of coastal flooding; and iii) agriculture and food security ?develop drought-resistant crops and improve soil-conservation practices. The proposed project will contribute to the NAPA objectives by developing alternative irrigation strategies (Output 1.1.3), diversifying cropping strategies to promote the use of climate-resilient crops (Output 1.1.4) and restoring coastal ecosystems (Output 1.2.1).
Department of Agriculture Sector Plan[7] (2016?2023)	The objectives of the Agriculture Sector Plan include, *inter alia*: i) updating the policy, legislative and regulatory framework for the agricultural sector; ii) improving access to financing for agricultural production and projects; and iii) strengthening government agencies and production and marketing organisations. The proposed project will contribute to fulfilling these objectives by revising three national policies and procedures relevant to water, agriculture (Output 2.1.1) and ecosystem-based adaptation (EbA). The project will also train government officials on the integration of EbA, climate-resilient agriculture and SLM principles into policies and planning (Output 2.1.2).
National Action Plan to Combat Land Degradation and Drought[8] (NAP-LDD) 2006	The NAP-LDD identifies the main drivers of land degradation and drought in Tuvalu, including climate change, unsustainable land use practices and water scarcity. The document outlines several priority actions to address these challenges, including: i) introducing sustainable land management (SLM) practices, including soil conservation, agroforestry and reforestation; ii) developing rainwater harvesting systems, improving groundwater management and promoting water-conservation practices; iii) building institutional capacity and stakeholder engagement to strengthen the management and coordination of land and water resource; and iv) ensuring community participation, ownership and empowerment in the planning and implementation of water and land management strategies. The proposed project will build on these priority actions by: i) developing groundwater recharge zones (Output 1.2.2); ii) training community groups (Output 1.1.5); iii) building the capacity of government officials, technical officers, coastal adaptation management professionals, community representatives and representatives from women?s groups through training (Output 2.1.2); and iv) developing land-use zoning plans to enable EbA, climate-resilient agriculture and SLM (Output 2.2.2).

National Gender Policy[9] (NGP) 2014	Tuvalu?s NGP comprises five objectives and priority actions, including: i) gender mainstreaming; ii) women?s economic empowerment; iii) women?s political empowerment; iv) ending violence against women and girls; and v) the health and well-being of women. While the proposed project is not primarily focussed on the last two actions, the project will contribute to gender equality and women?s empowerment by ensuring women?s participation in the project interventions. These activities will specifically be included in the gender action plan (GAP) for the proposed project.

Table 17. Alignment with relevant international conventions and other frameworks.

International multilateral environmental agreement (MEA) or other frameworks	**Alignment**
United Nations Framework Convention on Climate Change (UNFCCC)	The UNFCCC outlines an overall framework for intergovernmental efforts to address the global challenge of climate change, recognizing that the climate system is a shared resource affected by industrial and other sources of greenhouse gases. Party members of the convention are divided into industrialized country parties which have obligations to reduce their greenhouse gas emissions, and developing country parties which are particularly vulnerable to the impacts of climate change. Tuvalu falls within the latter group of parties and is recognized as being a recipient Party of activities and investments to address climate change impacts. The proposed project aligns with the UNFCCC as a source of climate finance to assist the country in enhancing adaptation to climate change for its most vulnerable inhabitants.
United Nations Sustainable Development Cooperation Framework (UNSDCF) and Sustainable Development Goals	Tuvalu?s country development goals and their linkages to the United Nations Sustainable Development Goals (SDGs) are reflected in the National Strategy for Sustainable Development and are supported by the proposed project. Specifically, the project will contribute to: i) SDG 1 ? No poverty; ii) SDG 2 ? Zero Hunger; iii) SDG 5 ? Gender equality; iv) SDG 6 ? Clean water and Sanitation; v) SDG 12 ? Responsible consumption and production; vi) SDG 13 ? Climate action; vii) SDG 14 ? Life below water; and viii) SDG 15 ? Life on land.

UN Pacific Multi-Country Programme Document 2023-2027	The proposed project specifically contributes to the UN Cooperation Framework of 14 Pacific countries, namely National Priority: Planet and Outputs: ? 1.1 Enhanced gender-responsive actions on climate change adaptation, mitigation, and climate security across sectors implemented ? 1.3. Institutions and communities have improved capacities to protect and manage ocean and land ecosystems.

[1] InforMEA. 2023. United Nations Framework Convention on Climate Change. Available at: https://www.informea.org/en/treaties/united-nations-framework-convention-climate-change

[2] United Nations Sustainable Development Group. 2019. United Nations Sustainable Development Cooperation Framework Guidance. Available at: https://unsdg.un.org/resources/united-nations-sustainable-development-cooperation-framework-guidance

[1] Government of Tuvalu. 2015. Intended Nationally Determined Contributions. Available at: https://unfccc.int/sites/default/files/NDC/2022-06/TUVALU%20INDC.pdf

[2] Government of Tuvalu. Second National Communications of Tuvalu. Available at: https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7190452_Tuvalu-NC2-1-Tuvalu%20%20SNC%20Final%20Report.pdf

[3] Government of Tuvalu. Te Kaniva: Tuvalu Climate Change Policy 2012. Available at: https://reliefweb.int/sites/reliefweb.int/files/resources/TUV_2012_Te_Kaniva_CCpolicy.pdf

[4] Government of Tuvalu. 2015. Te Kakeega III: National Strategy for Sustainable Development 2016?2020. Available at: https://www.adb.org/sites/default/files/linked-documents/cobp-tuv-2017-2019-ld-02.pdf

[5] Government of Tuvalu. 2015. National Environment Management strategy (2015?2020). Available at: https://www.sprep.org/sites/default/files/documents/publications/nems-tuvalu.pdf

[6] Government of Tuvalu. 2007. Tuvalu?s National Adaptation Programme of Action. Available at: https://www.adaptation-undp.org/sites/default/files/downloads/tuvalu_napa.pdf

[7] Government of Tuvalu. 2015. Department of Agriculture Section Plan. Available at: https://faolex.fao.org/docs/pdf/tuv170765.pdf

[8] Government of Tuvalu. 2006. National Action Plan to Combat Land Degradation and Drought. Available at: https://www.unccd.int/sites/default/files/naps/tuvalu-eng2006.pdf

[9] Government of Tuvalu. 2014. Tuvalu National Gender Policy. Available at: https://prdrse4all.spc.int/sites/default/files/tuvalu_national_gender_policy.pdf

8. Knowledge Management

Elaborate the "Knowledge Management Approach" for the project, including a budget, key deliverables and a timeline, and explain how it will contribute to the project's overall impact.

Knowledge management will be an essential element of the proposed project to enable the adoption and upscaling of sustainable land management (SLM), Ecosystem-based Adaptation (EbA) and climate-resilient agricultural practices to collectively improve the climate resilience of Tuvaluans. This will first include the project collating and incorporating lessons learned from previous or existing climate adaptation in Tuvalu and surrounding countries, a process which has been initiated during the PPG stage with details of lessons learned described in the Project Document. To further this, the Executing Entity and Implementing Partners will draw on and incorporate best practices from previous projects they have been involved in implementing within Tuvalu as well as other projects in Tuvalu and the region as a whole. These lessons learned and best practices will be reflected in the multiple options analyses (Output 1.1.4 and 1.2.3), guidance notes (Output 2.2.1 and 2.3.1) and training programmes (Output 2.1.2 and 2.3.3) implemented by the project. The knowledge management approach will include also have a strong emphasis on maximising knowledge management and communication of lessons learned through the proposed project, and will include: i) building the capacity of public sector officials at the national and local levels; ii) awareness raising and capacity building of community members; and iii) generating best practices and lessons learned. These elements of the knowledge management approach have been elaborated in more detail in the following paragraphs.

Public sector stakeholders will receive capacity building and awareness raising under a range of outputs. Officials will also receive a range of training under Outcomes 2.1 and 2.2, including: i) integrating EbA into policies and planning processes (Output 2.1.2); ii) monitoring and enforcement of compliance with EbA-related policies at the local level (Output 2.2.1); and iii) using relevant software to map land ownership and tenure arrangements (Output 2.2.2). A dedicated knowledge management and communication strategy will be produced under Output 2.3.2, detailing best practices for integrating EbA into policies and planning processes.

Gender-responsive awareness raising and capacity building on EbA, SLM and climate-resilient agricultural techniques will be directed to community members under Outcomes 1.1, 1.2 and 2.3. Beneficiary communities will be empowered by the delivery of training on the monitoring and generation of best practices and lessons learned from implementing SLM and climate-resilient agricultural interventions under the proposed project (Output 1.1.5). A targeted awareness raising campaign will also be developed under this output, to disseminate best practices. Communities will also receive training on sustainable, natural resource-based livelihoods under Output 1.2.3. Finally, guidelines on best practices for EbA, SLM and climate-resilient agriculture will be developed and disseminated to communities under Output 2.3.1, to facilitate the sustainability of project interventions as well as to enable the upscaling and replication of project interventions beyond the target areas.

Outcome 2.3 will further prioritise knowledge generation and management by the production of a gender-responsive knowledge management and communication strategy (Output 2.3.2) to monitor and document best practices and lessons learned generated during the proposed project. The training of community groups on the generation of best practices and lessons learned (Output 1.1.5) will further support on-the-ground collection and analysis of data. Dedicated monitoring of specific interventions will also be included in the proposed project, for example, the monitoring of pulaka pit salinity and health under Output 1.1.1. An online knowledge management platform will be created under Output 2.3.3 to store best practices and lessons learned generated under Output 2.3.2, as well as other knowledge products generated by the proposed project. The recordings made of various trainings conducted under Outputs 1.1.5, 1.2.3, 2.1.2, 2.2.1 and 2.2.2 will be uploaded to this portal and to enable the continuous training of public sector officials after the close of the project. This platform will be essential to ensuring the upscaling and replication of project interventions following the project lifespan, both within the country and in neighbouring Pacific island countries, where generated best practices and lesson learned will contribute to South-South Cooperation regarding climate change adaptation.

An adaptive management approach will also be employed throughout project implementation to enable the use of best practices and lessons learned generated under the proposed project to revise the implementation strategy, as required. Collectively, these interventions will enhance the impact of the proposed project, as well as contribute to the knowledge base underpinning global, regional and national policy dialogues on climate change adaptation. These outcomes closely align with the objectives for knowledge management outlined in the GEF Knowledge Management Approach (2015). Table 18 presents the costed knowledge management plan for the proposed project, in line with the approach described above.

Table 18. Costed knowledge management plan.

Output	**Expected deliverables**	**Expected timeline**	**Budget**
Output 1.1.5. 8 community training groups ? including representatives from women?s groups ? established around target sites to generate knowledge of appropriate methodologies and upscale best practices of adaptation strategies among stakeholders.	64 Community training workshops on climate-resilient crop agriculture, sustainable resource management and climate change awareness-raising.	Completion by end of year 5	USD73,600
	Manual of lessons learned and best practices.	Completion by end of year 5	USD203,200

Output 2.1.1: Revisions made to 3 national policies and procedures 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.	3 Coordination workshop between government policymakers.	Completion by end of year 2	USD120,575
Output 2.1.2: Training conducted for 100 government officials, with a focus on technical officers, coastal adaptation management professionals, gender experts, 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.	Government training programme developed for integration of EbA, climate-resilient agriculture and sustainable land management into policies, strategies and plans.	Completion by end of year 2	USD80,500
	2 Training workshops for government officials.	Completion by end of year 3	USD98,000
Output 2.2.1: Guidance Note for compliance	Validation workshop to validate Guidance Note.	Completion by end of year 3	USD9,440

monitoring and implementation of EbA policy recommendations prepared under Output 2.1.1.	2 training workshops with government officials on policy compliance and enforcement.	Completion by end of year 3	USD10,050
Output 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.	Gender-responsive best-practice guidelines for replication and upscaling of EbA, climate-resilient agriculture and sustainable land management practices.	Completion by end of year 5	USD68,820
Output 2.3.2: A gender-responsive knowledge management and communication strategy developed for integrating EbA best practices and lessons learned into planning and policy.	Gender-responsive knowledge management and communication strategy.	Completion by end of year 3	USD27,000
Output 2.3.3: Continuous training and	Knowledge-management platform.	Completion by end of year 5	USD30,000

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.	Training programme for public sector officials.	Completion by end of year 5	USD34,900
Total			**USD756,085**

9. Monitoring and Evaluation

Describe the budgeted M and E plan

The proposed project will adhere to UNEP's standard monitoring, reporting, and evaluation processes and procedures, which are designed to ensure effective implementation and accountability. The substantive and financial project reporting requirements are outlined in Appendix 8: Summary of reporting requirements and responsibilities and will be an integral part of the UNEP legal instrument to be signed by the Executing Agency (EA) and UNEP.

The reporting requirements and templates will be designed to capture relevant information on project progress, achievements, challenges, and lessons learned. They will also be used to track financial expenditures and ensure compliance with the project budget. These reporting requirements will be monitored and evaluated by UNEP to ensure that the project is meeting its objectives and achieving its intended impacts. By following UNEP's standard monitoring, reporting, and evaluation processes and procedures, the proposed project will ensure that it is accountable, transparent, and effective in achieving its objectives. The reporting requirements will provide a mechanism for the EA and UNEP to communicate regularly on project progress, identify areas for improvement, and ensure that the project remains on track to achieve its intended outcomes.

The M&E plan aligns with the GEF Monitoring and Evaluation policy, which sets out best practices for monitoring and evaluating GEF-funded projects. The Project Results Framework included in Appendix 4: Results Framework provides Specific, Measurable, Attainable, Relevant, and Time-bound (SMART) indicators for each expected outcome, along with mid-term and end-of-project targets. These indicators, combined with the main deliverables and benchmarks presented in Appendix 6: Key deliverables and benchmarks, will serve as the primary tools for assessing project implementation progress and whether the

expected project results are being achieved. Other M&E-related costs are presented in Appendix 7: Costed M&E Budget and Workplan, and these costs are fully integrated into the overall project budget.

The M&E Plan will undergo a review and revision during the project inception workshop to ensure that all project stakeholders have a clear understanding of their roles and responsibilities regarding project monitoring and evaluation. At the workshop, project partners will discuss and agree upon specific indicators and means of verification that will be used to track project progress. Day-to-day project monitoring will be the responsibility of the project management team, who will be tasked with regularly collecting and analysing data related to project activities and outcomes. Other project partners will also have specific responsibilities for collecting information relevant to tracking the indicators. The Project Management Unit (PMU) will work closely with these partners to ensure that the required data is collected and recorded accurately.

The Project Manager (PM) will have the overall responsibility for ensuring that the project is on track to achieve its objectives. As such, it will be the PM's responsibility to inform UNEP of any delays or difficulties faced during implementation. This will enable UNEP to provide appropriate support or corrective measures in a timely manner, ensuring that the project remains on track to achieve its objectives. The M&E Officer will be responsible for implementing the project?s M&E Plan and will be involved in project monitoring, reporting, knowledge management and adaptive management. Regular reporting and review of project progress will be carried out at different stages of the project and falls within the responsibility of the PMU members, most notably the M&E Officer. Reporting and review of project progress will involve the project management team presenting updates on project progress and discussing any challenges faced and how they are being addressed. This process will help to ensure that all stakeholders are kept informed and involved in project implementation and that corrective measures are taken promptly if needed.

The Project Steering Committee (PSC) will receive regular progress reports and provide recommendations to UNEP on necessary revisions to the Results Framework or M&E Plan. The Task Manager (TM) in UNEP/GEF is responsible for project oversight, ensuring compliance with UNEP and GEF policies and procedures, reviewing draft project outputs, and establishing peer review procedures for technical and scientific outputs. In the first year of project implementation, baseline data gaps will be addressed in line with the M&E Plan (Appendix 7).

The TM will take an adaptive management approach and develop a project supervision plan at the inception of the project, emphasizing outcome monitoring while ensuring financial management and implementation monitoring. Progress towards achieving global environmental benefits will be assessed at agreed intervals with the PSC. Risk assessment and rating, as well as the quality of project M&E, will be regularly monitored by project partners and UNEP. Main financial parameters will be monitored quarterly to ensure the cost-effective use of financial resources.

In line with the GEF Evaluation requirements and UNEP?s Evaluation Policy, any project with a duration of 4 years or more will be subject to an independent Mid-Term Evaluation or management-led Mid-Term Review at mid-point. All GEF funded projects are subject to a performance assessment when they reach operational completion. This performance assessment will be either an independent Terminal Evaluation or a management-led Terminal Review.

In case a Review is required, the UNEP Evaluation Office will provide tools, templates, and guidelines to support the Review consultant. For all Terminal Reviews, the UNEP Evaluation Office will perform a quality assessment of the Terminal Review report and validate the Review?s performance ratings. This quality assessment will be attached as an Annex to the Terminal Review report, validated performance ratings will be captured in the main report. However, if an independent Terminal Evaluation (TE) of the project is required, the Evaluation Office will be responsible for the entire evaluation process and will liaise with the Task Manager and the project implementing partners at key points during the evaluation. The TE will provide an independent assessment of project performance (in terms of relevance, effectiveness and efficiency), and determine the likelihood of impact and sustainability. It will have two primary purposes: (i) to provide evidence of results to meet accountability requirements, and (ii) to promote learning, feedback, and knowledge sharing through results and lessons learned among UNEP staff and implementing partners. The direct costs of the evaluation (or the management-led review) will be charged against the project evaluation

budget. The TE will typically be initiated after the project?s operational completion. If a follow-on phase of the project is envisaged, the timing of the evaluation will be discussed with the Evaluation Office in relation to the submission of the follow-on proposal.

The draft TE report will be sent by the Evaluation Office to project stakeholders for comment. Formal comments on the report will be shared by the Evaluation Office in an open and transparent manner. The project performance will be assessed against standard evaluation criteria using a six-point rating scheme. The final determination of project ratings will be made by the Evaluation Office when the report is finalised. The evaluation report will be publicly disclosed and will be followed by a recommendation compliance process.

The evaluation recommendations will be entered into a Recommendations Implementation Plan template by the Evaluation Office. Formal submission of the completed Recommendations Implementation Plan by the Project Manager is required within one month of its delivery to the project team. The Evaluation Office will monitor compliance with this plan every six months for a total period of 12 months from the finalisation of the Recommendations Implementation Plan. The compliance performance against the recommendations is then reported to senior management on a six-monthly basis and to member States in the Biennial Evaluation Synthesis Report.

The PSC will participate in the mid-term review and develop a management response to the evaluation recommendations along with an implementation plan. The UNEP TM will monitor whether the agreed recommendations are being implemented.

At the end of project implementation, an independent TE will take place, managed by the UNEP Evaluation Office. The TE will assess project performance in terms of relevance, effectiveness, and efficiency and determine the extent of impact and sustainability. The TE will serve to provide evidence of accountability and promote learning, feedback, and knowledge sharing among UNEP and executing partners. The evaluation report will be publicly disclosed and followed by a recommendation compliance process, with the Evaluation Office determining the final project ratings using a six-point rating system. Direct costs of the evaluation will be charged against the project evaluation budget, with the Evaluation Office sharing the draft TE report with project stakeholders for comments, and formal comments shared transparently. See Table 13 for the Costed M&E Plan.

Table 13. Costed M&E Plan.

Type of M&E activity	Responsible Parties	Budget US$ (Excluding project team staff time)	Time frame
Project Steering Committee (PSC) Meetings	? PSC ? Project Manager (PM) ? UNEP Task Manager (TM)	Indicative cost: $ 7,500 ($ 1,500 per meeting)	Annually over five years
Measurement of means of verification of project results	? Chief Technical Advisor (CTA) ? PM ? M&E Officer ? UNEP TM	Indicative cost: US$ 25,000	To be conducted at the mid-term point of the project.
Measurement of means of verification for project progress on output and implementation	? CTA ? PM ? M&E Officer ? UNEP TM	Indicative cost: US$ 25,000	To be conducted at end of term.

Type of M&E activity	Responsible Parties	Budget US$ (Excluding project team staff time)	Time frame
Project Implementation Review (PIR)	? PM ? CTA ? M&E Officer ? UNEP TM	None.	Annually
Periodic Progress Reports for GEF	? PM ? CTA ? M&E Officer ? UNEP TM	None	Bi-annual reports
Independent Mid-Term Evaluation (MTE)	? External consultant ? UNEP TM ? UNEP Evaluation Office, as per the UNEP Evaluation Policy. ? M&E Officer	Indicative cost: US$ 40,000	At the mid-point of project implementation (Year 3)
Independent Terminal Evaluation (TE)	? External consultant ? UNEP Evaluation Office. ? M&E Officer	Indicative cost: US$ 40,000	Within six months of the project completion date (Year 5)
Consultants	? M&E Officer	Indicative cost: $ 48,000 ($9,600 per annum)	Over the lifetime of the project (five years)
TOTAL indicative cost			Estimated to cost US$ 185,500

10. Benefits

Describe the socioeconomic benefits to be delivered by the project at the national and local levels, as appropriate. How do these benefits translate in supporting the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCF/SCCF)?

The proposed project will contribute to a range of socioeconomic benefits at both the national and local levels. A total of 4,200 Tuvaluans will benefit from the proposed project, ~81% of which are engaged in the agricultural sector. The project design also includes several activities that explicitly contribute to enhancing gender equality and women?s empowerment (elaborated in the ?Gender equality and women?s empowerment? section).

At the national level, the mainstreaming of EbA into appropriate policies and procedures under Outcomes 2.1 and 2.2 will create a framework for continued investment in EbA beyond the project lifespan, enabling the upscaling and replication of project interventions beyond the target area. This will contribute to the achievement of *LDCF Core Indicator 3: Number of policies, plans or development frameworks that mainstream climate resilience* through the revision of three policies, including the: i) Te Kete (Tuvalu National Sustainable Strategy); ii) Vakafenua (Climate Change Policy); and iii) the Climate Change Resilience Act 2019, as well as the updating of the Public Works Department sub-national plan on pulaka pit protection (Output 2.1.1, see Section F for more details).

. Outcomes 2.1 and 2.2 will be supported by the rigorous documentation of best practices and lessons learned under Outcome 2.3, which will contribute to an evidence-base for EbA, SLM and climate-resilient agricultural practices that can guide the development of future adaptation interventions. Communities will

be empowered to replicate and upscale project interventions through a training-of-trainers approach under Output 1.1.5, which will enable community training groups to raise awareness on climate-resilient agricultural methods across the country.

At the local level, investments in climate-resilient agriculture and sustainable land management (SLM) practices under Outcomes 1.1 and 1.2 will result in the sustainable intensification of agricultural activity, creating benefits for direct beneficiaries in the form of greater income generation, as well as for the country as a whole through enhancing food security and reducing the dependence on food imports. Moreover, this will contribute to job creation and reduce unemployment rates. Alternative irrigation technologies to be introduced as part of this strategy will additionally result in greater water security, a key challenge facing the Small Island Development State (SIDS). Collectively, these outcomes will contribute to the achievement of *LDCF Core Indicator 2: Area of land under climate-resilient management* by increasing the resilience of 47 ha of agricultural land through climate-resilient agriculture (Output 1.1.4) and conserving or restoring 624 ha of terrestrial and coastal ecosystems (see Section F for more details). Specifically, the 624 ha of ecosystems made more resilient to climate hazards through the project will include the conservation and restoration of 430 ha of terrestrial ecosystems (Output 1.2.1), 104 ha of marine coastal areas designated as LMMAs, and an additional 90 ha of terrestrial ecosystems designated as groundwater recharge zones using EbA practices.

The restoration and conservation of priority coastal ecosystems under Outcome 1.2 will secure the ongoing provision of flood reduction and wave attenuation. Given the high exposure of Tuvalu to high-intensity storms and hurricanes, these ecosystem services are essential to enhancing resilience of all citizens to this climate hazard. Greater rates of freshwater infiltration, to be achieved under Output 1.2.2, will contribute to reducing water insecurity, and the introduction of sustainable and diversified livelihood strategies to ~800 people under Output 1.2.3 will reduce unemployment and poverty rates.

In conclusion, the proposed project in Tuvalu will deliver a range of socioeconomic benefits at both the national and local levels. At the national level, it will create a framework for continued investment in EbA through policy integration, best practice documentation, and training-of-trainers approaches. At the local level, it will contribute to increased income generation, food security, water security, and reduced unemployment and poverty rates through investments in climate-resilient agriculture, SLM practices, and coastal ecosystem restoration. Overall, the project will enhance the resilience of Tuvalu's communities to climate hazards and contribute to the achievement of key indicators related to climate resilience and sustainable land management.

11. 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	Medium/Moderate		

Measures to address identified risks and impacts

Elaborate on the types and risk classifications/ratings of any identified environmental and social risks and impacts (considering the GEF ESS Minimum Standards) and any measures undertaken as well as planned management measures to address these risks during implementation.

Table 1. Summary of the potential project risks associated with the ESSF safeguard standards. .

Safeguard Standard	Related Project Risk	Probability (P) (1?5) & Impact (I) (1?5)	Mitigation measures	Indicative Cost (USD)
Safeguard Standard 2: Climate Change and Disaster Risks	The proposed project may involve outputs and outcomes sensitive or vulnerable to potential impacts of climate change (**SS2.3**). Extreme weather events (such as droughts, tropical cyclones and floods) at project sites may damage or destroy EbA activities implemented under Outcome 1.2.	P = 2 I = 3	Provision will be made in work plans and budgets to allow for weather-related interruptions to ensure that the project remains on schedule. Project implementation activities will be timed to not coincide with periods of the year when extreme weather events are more prevalent. The site selection process to determine suitable sites to introduce EbA interventions under Outcome 1.2 will consider, among other factors, exposure to and vulnerability of sites to climate hazards such as tropical cyclones and focus on selecting sites that have the lowest exposure and vulnerability to these hazards. The project implementation team will ensure they are readily informed on potential approaching extreme weather scenarios such as tropical cyclones using established national early warning systems and protocols. Where sufficient warning has been provided, any on-the-ground interventions currently being implemented will be halted and secured until conditions are safe.	**USD33,750** (Assessment of Terrestrial Conservation Areas and Locally Managed Marine Areas [Activity 1.2.1.1] and site-specific Restoration Implementation and Maintenance Plans for each island [Activity 1.2.1.2]).

Safeguard Standard	Related Project Risk	Probability (P) (1?5) & Impact (I) (1?5)	Mitigation measures	Indicative Cost (USD)
Safeguard Standard 3: Pollution Prevention and Resource Efficiency	The project may lead to the generation of waste (both hazardous and non-hazardous, **SS3.2**). No hazardous waste is anticipated to be generated through the proposed project interventions. Building materials such as bricks and cement will need to be imported to the islands because of the absence of local production facilities and will likely be packaged to some degree. Some organic waste may be generated through project activities.	P = 2 I = 2	The packaging of imported materials will be limited and will be disposed of or recycled responsibly. Any organic waste generated by project activities will be composted or recycled and, where possible, used as inputs into the regenerative agricultural systems developed under the project.	**USD16,036** (1% cost of materials and equipment for activities 1.1.2.2, 1.1.3.1, 1.1.4.2 ? 1.1.4.5, 1.2.2.2, 1.2.2.4 and 1.2.3.2, total cost USD1,603,600). **USD16,000** (cost of agricultural compost shredder for Activity 1.1.4.5)

Safeguard Standard	Related Project Risk	Probability (P) (1?5) & Impact (I) (1?5)	Mitigation measures	Indicative Cost (USD)
	The project may lead to significant consumption of energy, water or other material inputs (**SS3.6**). Some energy will be used to transport goods and materials to the target islands using ships. Proposed project activities include the development of small-scale water infrastructure, including water tanks and drip irrigation systems.	P = 2 I = 2	Where possible the consumption of energy for transportation will be kept to a minimum with shipments being planned to align with routine trips to the islands and undertaken in bulk. Water infrastructure systems (Output 1.2.2) will be designed to be water efficient and will ensure that introduced agricultural interventions do not place an additional demand on existing water storage capacity within the target communities.	**USD12,000** (Transportation cost for water infrastructure under Activity 1.2.2.2) **USD4,449** (10% of the USD 44,498 contractual services fee under Activity 1.2.2.2 assumed to be dedicated to the design of water infrastructure interventions)

Safeguard Standard	Related Project Risk	Probability (P) (1?5) & Impact (I) (1?5)	Mitigation measures	Indicative Cost (USD)
Safeguard Standard 5: Cultural Heritage	Project interventions result in alterations to, or adverse impacts on, sites, structures or objects with historical, cultural, artistic, traditional or religious values (**SS5.2**). The sites in question are the traditional pulaka pits, which may be affected by the introduction of raised pulaka pits.	P = 2 I = 2	To preserve cultural heritage sites and physical resources, the project activities will be planned and executed in a manner that avoids any alteration, damage, or removal. The project will adhere to national heritage legislation and best practices guidelines, and regional experts will be consulted as necessary to ensure compliance. Sites of unique value at the community, national or international level will also be identified and protected. To minimize the transition away from traditional pulaka pits, actively used pits will additionally be made more resilient through locally appropriate climate-resilient agricultural practices such as intercropping, terracing and salt-tolerant species.	**USD136,000** (Introduction of diversified cropping strategies to existing pulaka pits [Output 1.1.4]).

Safeguard Standard	Related Project Risk	Probability (P) (1?5) & Impact (I) (1?5)	Mitigation measures	Indicative Cost (USD)
Safeguard Standard 6: Displacement and Involuntary Resettlement	The proposed project may potentially involve or lead to involuntary restrictions on land/water use that deny a community the use of resources to which they have traditional or recognizable use rights (**SS6.2**). 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.	P = 3 I = 3	The land ownership database, within the Department of Lands, will be updated under Output 2.2.2 to identify any existing or potential land ownership disputes as part of the ongoing land-zoning process. This will inform the design of the on-the-ground interventions to ensure that the project minimizes its impact on the environment and local communities. The extent of the conservation areas and restrictions introduced under Output 1.2.1 will be determined in close consultation with communities during project implementation, following best practices through similar projects such as the Ridge to Reef Project. The full range of stakeholder engagement mechanisms is outlined in the Stakeholder Engagement Plan (SEP, Appendix 19).	**USD200,342** (Procure modern software to facilitate assessment of land use zoning [Activity 2.2.2.1], provide training on the use of the software [Activity 2.2.2.2] and complete a detailed land-use assessment [Activity 2.2.2.3]) **USD12,000** (Stakeholder engagement workshops with each islands Kaupule and Falekaupule to establish Terrestrial Protected Areas and Locally Managed Marine Areas [Activity 1.2.1.3])

Safeguard Standard	Related Project Risk	Probability (P) (1?5) & Impact (I) (1?5)	Mitigation measures	Indicative Cost (USD)
Safeguard Standard 7: Indigenous Peoples	This project may involve: i) activities located on lands and territories claimed by indigenous peoples (IPs, **SS7.2**); and ii) the utilization and/or commercial development of natural resources on lands and territories claimed by indigenous peoples (**SS7.4**). All land in the country is owned by families or communities, as specified in land tenure arrangements in Tuvalu. Any modifications or use of these lands therefore needs consent from the traditional landowners.	I = 3 P = 2	The proposed project has been designed to comply with this land tenure system and the allocation of resources or use of land will be done in close consultation with communities and Kaupule. Representatives from diverse IP groups were engaged in community consultations during the PPG stage to ensure that proposed interventions were culturally appropriate. These engagements are outlined in Appendix 3, which highlights that community ownership and support for the project approach has been achieved as a result of these engagements. The SEP (Appendix 19) has made provision for continuous engagement with representatives from diverse IP groups. This will largely occur at the district level, in stakeholder engagements under Outputs 1.1.2 ? 1.1.5, 1.2.1, 1.2.3, 2.1.1 and 2.3.1.	**USD170,450** (Stakeholder engagement workshops under Outputs 1.1.2 ? 1.1.5, 1.2.1, 1.2.3, 2.1.1 and 2.3.1).

Supporting Documents

Upload available ESS supporting documents.

Title	Module	Submitted
Appendix 15. SRIF_CEO_Approval_Stage	**CEO Endorsement ESS**	

Title	Module	Submitted
SRIF PIF_Tuvalu_9 May 2022	**Project PIF ESS**	
SRIF PIF_Tuvalu	**Project PIF ESS**	

ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

Project Objective, Components, Outcomes and Outputs	Indicator	Baseline	Mid-term targets	End of project target	Means of Verification	Assumptions
Objective: To reduce vulnerability to climate change through adaptive agricultural practices and ecosystem management in Tuvalu.	Indicator 1: Number of direct project beneficiaries disaggregated by gender	0	Total: 2,200 (1,100 men, 1,100 women) 100 (50 men, 50 women) government officials trained on integrating EbA, climate-resilient agricultural and SLM into policies and plans. 1,700 (850 men, 850 women) who receive training on techniques and equipment for climate-resilient agriculture 400 (200 men, 200 women) who receive training on techniques and equipment for diversified livelihoods that increase the use of natural resources	Total: 4,300 (2,150 men, 2,150 women) 100 (50 men, 50 women) government officials trained on integrating EbA, climate-resilient agricultural and SLM into policies and plans. 3,400 (1,700 men, 1,700 women) who receive training on techniques and equipment for climate-resilient agriculture 800 (400 men, 400 women) who receive training on techniques and equipment for diversified livelihoods that increase the use of natural resources	Community surveys Project progress reports	Interventions introduced are successfully adopted by recipients. Training workshops are well attended by recipients

Project Objective, Components, Outcomes and Outputs	Indicator	Baseline	Mid-term targets	End of project target	Means of Verification	Assumptions
	Indicator 2: Area of coastal and forest ecosystems restored or placed under improved conservation.	0	260 ha, including: ? 20 ha in Nanumea, ? 29 ha in Nanumanga ? 41 ha in Nuitao ? 24 ha in Nui ? 79 ha in Vaitupu ? 28 ha in Nukufetau ? 39 ha in Nukulaelae	520 ha, including: ? 40 ha in Nanumea, ? 58 ha in Nanumanga ? 81 ha in Nuitao ? 49 ha in Nui ? 158 ha in Vaitupu ? 56 ha in Nukufetau ? 78 ha in Nukulaelae	Field surveys GIS surveys Project progress reports	All land identified will be available for restoration and will be restored during the project lifespan
Component 1: Identifying and implementing integrated land management and ecosystem restoration strategies for increased resilience.						
Outcome 1.1: Restoration and increased resilience of 13 ha of agricultural systems on 8 islands against the impacts of	Indicator 3: Number of raised concrete beds and accompanying irrigation systems introduced to 8 islands by the proposed project.	0	100 raised concrete beds and accompanying rainwater harvesting tanks and irrigations systems	449 raised concrete beds and accompanying rainwater harvesting tanks and irrigations systems	Field surveys Project progress reports	Transport delays do not affect the achievement of mid-term and end of project targets

Project Objective, Components, Outcomes and Outputs	Indicator	Baseline	Mid-term targets	End of project target	Means of Verification	Assumptions
climate change and salt-water intrusion through innovative land management and agricultural practices.	Indicator 4: Percentage increase in crop production from introduced climate-resilient practices	0	10% increase in crop production from climate-resilient practices introduced to raised concrete beds as well as within and surrounding active pulaka pits	30% increase in prop production from climate-resilient practices introduced to raised concrete beds as well as within and surrounding active pulaka pits	Community surveys and questionnaires	Gains in crop production are directly related to equipment and practices introduced through the project
	Indicator 5: Number of community members trained through workshops held by community training groups	0	At least 1,700 people trained through 24 workshops across all 8 target islands, consisting of 3 workshops per island over 1.5 years	At least 3,400 people trained through 64 workshops across all 8 target islands, consisting of 2 workshops per island per year over 4 years.	Workshop participant lists Project progress reports	Public transport schedules to and from all islands accommodate for workshop timelines Sufficient participants attend each training workshop
Output 1.1.1. National pulaka pit health and groundwater assessment undertaken on all 8 target islands. Output 1.1.2: 449 raised concrete beds introduced to 8 target islands to upscale the climate proofing project. Output 1.1.3. Alternative irrigation strategies, including drip irrigation, rooftop rainwater harvesting and water tanks installed to facilitate water supply to 449 raised concrete beds introduced on each of the 8 target islands. Output 1.1.4: Diversified cropping strategies introduced to 449 raised concrete beds and pulaka pits to promote the use of climate-resilient crops. Output 1.1.5. 8 community training groups ? including representatives from women?s groups ? established around target sites to generate knowledge of appropriate methodologies and upscale best practices of adaptation strategies among stakeholders.						

Project Objective, Components, Outcomes and Outputs	Indicator	Baseline	Mid-term targets	End of project target	Means of Verification	Assumptions
Outcome 1.2: Groundwater infiltration and flood-risk reduction services improved on 8 islands through SLM practices that include the restoration and conservation of degraded atoll ecosystems.	Indicator 6: Number of hectares of marine area declared a LMMA under the project	0	52 ha, including: ? 19 ha in Nanumea ? 10 ha in Nukulaelae ? 23 ha in Vaitupu	104 ha, including: ? 37 ha in Nanumea ? 21 ha in Nukulaelae ? 46 ha in Vaitupu	Field surveys Community agreements and LMMA management plans	Selected areas have not been declared LMMA through other project between the design and implementation phases of the proposed project.
	Indicator 7: Number of recipients with an additional or enhanced livelihood option by including training programmes with pre- and post- training surveys to assess the participants understanding of the livelihood options.	0	400 (200 men, 200 women) with new or enhanced livelihood option	800 (400 men, 400 women) with new or enhanced livelihood option	Community surveys or questionnaires Project progress reports	New or enhanced livelihood options adopted by recipients are a consequence of interventions under the project Community members will continue to adopt diversified livelihoods options after they have been introduced
Output 1.2.1: 180 ha of coastal ecosystems restored to enhance the provision of associated ecosystem services, including flood reduction and storm surge attenuation. Output 1.2.2: Groundwater recharge zones in and around ~62 active pulaka pit areas protected using EbA buffer zones to improve freshwater infiltration potential. Output 1.2.3: Sustainable, diversified livelihoods strategies introduced for ~800 people (400 women and 400 men) in local communities reliant on natural resource-based livelihoods based on sustainable fisheries management to conserve coastal ecosystems and their services.						

Project Objective, Components, Outcomes and Outputs	Indicator	Baseline	Mid-term targets	End of project target	Means of Verification	Assumptions
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.						
Outcome 2.1. Institutional uptake of EbA enhanced through policy revisions and capacity building among core government staff, professionals and community groups	Indicator 8: Number of policies and plans revised to incorporate SLM, EbA and climate-resilient agricultural approaches	0	1 sub-national plan under the Public Works Department	4 policies and plans, including 1 sub-national plan under the Public Works Department and 3 national policies or plans.	Drafted policy briefs Project progress reports	Policy changes will be adopted by government
	Indicator 9: Change in capacity perception index[1] for government officials to integrate EbA, climate-resilient practice and SLM into policies and plans.	To be determined at beginning of project implementation	Change in capacity perception index by at least 1 point	Change in capacity perception index by at least 3 points	Government staff survey and score card	Government staff capacitated under the project will be retained within their institutions throughout the project
Output 2.1.1: Revisions made to 3 national policies and procedures 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. Output 2.1.2: Training conducted for 100 government officials, with a focus on technical officers, coastal adaptation management professionals, gender experts, 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.						

Project Objective, Components, Outcomes and Outputs	Indicator	Baseline	Mid-term targets	End of project target	Means of Verification	Assumptions
Outcome 2.2: Develop and implement strategic action plans for streamlining EbA national policy and planning frameworks.	Indicator 10: Change in score indicating the degree of mainstreaming of SLM, EbA and climate-resilient agriculture principles into policies and plans, based on government staff surveys and score cards [2]	To be determined at beginning of project implementation	Change in score of at least 1 point from baseline.	Change in score of at least 3 point from baseline.	Government staff survey and score card	Policy revisions implemented will be retained after project closure
Output 2.2.1: Guidance Note for compliance monitoring and implementation of EbA policy recommendations prepared under Output 2.1.1. Output 2.2.2: Land-use zoning plan developed to enable EbA, climate-resilient agriculture and SLM under existing land tenure systems.						
Outcome 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.	Indicator 11: Percentage of the population with improved awareness of climate change impacts and climate change adaptation using EbA and climate-resilient agriculture	To be determined at beginning of project implementation	At least 20% of the population	At least 50% of the population	Population surveys Number of views of online material or website visits	Increases in awareness are a direct consequence of the proposed project and not other initiatives

Project Objective, Components, Outcomes and Outputs	Indicator	Baseline	Mid-term targets	End of project target	Means of Verification	Assumptions
Output 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. Output 2.3.2: A gender-responsive knowledge management and communication strategy developed for integrating EbA best practices and lessons learned into planning and policy. Output 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.						

[1] The score ranges from 1 to 5 and is ranked as: 1) no capacity built; 2) initial awareness raised; 3) substantial training in the practical application of the concepts; 4) knowledge effectively transferred and tested; and 5) demonstratable ability to apply or disseminate knowledge.

[2] The score ranges from 1 to 5 and is ranked as: 1) no implementation of SLM, EbA or climate-resilient agriculture principles mainstreamed into policy; 2) limited implementation of SLM, EbA or climate-resilient agriculture principles mainstreamed into policy; 3) moderate implementation of SLM, EbA or climate-resilient agriculture principles mainstreamed into policy; 4) SLM, EbA or climate-resilient agriculture principles mainstreamed into policy has mostly been implemented and enforced; and 5) all SLM, EbA or climate-resilient agriculture principles mainstreamed into policy have been fully enforced.

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

GEF Secretariate comment	Agency response at PIF stage
Part I ? Project Information	
1. Is the project/program aligned with the relevant GEF focal area elements in Table A, as defined by the GEF 7 Programming Directions?	

Adjustments are requested. For the 'Project Information' section: 1) Please include adaptation-related keywords in the taxonomy (e.g., "climate change adaptation", "coastal resilience", "small islands", "nature-based solutions" etc.) and please remove the term "focal areas" from the taxonomy. 2) Please enter some sectors. 3) As this is an adaptation project, it should have a Rio Marker value of "2" for Adaptation. For Table A: Please note that CCA-3 should be selected only if a project is directly supporting the NAP process (including implementation of NAP priorities). Please clarify if this is the case, otherwise kindly remove CCA-3 from Table A. If CCA-3 is selected, then the corresponding NAP-related box will need to be checked on the meta-indicator sheet. General: a) The Theory of Change cannot be read as the text is blurry. Please upload a sharper image. b) The various figures in Annex A do not display.	1) The usage of ?Focal areas? has been removed from the Taxonomy table. Climate change adaptation, coastal resilience, Small Island Developing States and nature-based solutions have been added in the Taxonomy table. 2) Sectors have been clarified in the table 3) Reference to the appropriate Rio markers for the project have been added in the table. Table A: This project will not contribute to NAP formulation/implementation, therefore reference to CCA-3 has been removed from the document. General: The Theory of Change file will be resubmitted as separate files alongside the PIF to avoid compression issues.
Not yet. Please also include "nature-based solutions" in the taxonomy; it does not appear yet.	?Nature-based Solution? has been added in the taxonomy table in Section G of the PIF (Page 6) as suggested.
2. Are the components in Table B and as described in the PIF sound, appropriate, and sufficiently clear to achieve the project/program objectives and the core indicators?	

Further information is requested: a) Table B: Please provide justification for the slightly elevated (5.2%) PMC request. b) Table B appears incomplete. While the main text refers to Outcome 1.2 and its subcomponents, these do not appear in Table B, which only shows Outcome 1.1. Main text below Table B: c) Please correctly format the sections between Table B and Part C, as it is hard to read, with table/figure headings separated from the tables; sections headings and main text indistinguishable from each other, and multiple sections presented as a single paragraph. Numbering the paragraphs would be helpful for comment provision. d) As mentioned above, please remove all reference to Objective CCA-3, unless clear explanation is provided that this project is directly supporting NAP formulation or implementation.	a) PMC costing has been adjusted to below 5% b) We believe this was a text error that took place in the document at portal submission. We have resubmitted table B with outcome budgets separated to avoid the portal submission issue. c) This was also the result of the abovementioned error which de-formatted Table B. WE have resubmitted the text in Part C, paragraphs numbered. d) CCA-3 has been removed from the PIF, as per above comment.
3. Are the indicative expected amounts, sources and types of co-financing adequately documented and consistent with the requirements of the Co-Financing Policy and Guidelines, with a description on how the breakdown of co-financing was identified and meets the definition of investment mobilized?	

Not yet. Please correct the categorization of co-finance for rows 2 and 3 of Table C. Grant finance is not labeled as recurrent expenditure.	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. The description is also added in the justification section of the portal.
Not yet. Please provide a brief description of the expected investment mobilized (grant co-finance).	Grant finance has been changed from ?Investment mobilized? to ?Recurrent expenditures? in rows 2 and 3 of the co-finance table and entered in portal.
4. Is the proposed GEF financing in Table D (including the Agency fee) in line with GEF policies and guidelines? Are they within the resources available from (mark all that apply)	
Yes.	
5. Is PPG requested in Table E within the allowable cap? Has an exception (e.g. for regional projects) been sufficiently substantiated? (not applicable to PFD)	
Yes.	
6. Are the identified core indicators in Table F calculated using the methodology included in the corresponding Guidelines? (GEF/C.54/11/Rev.01)	

Not yet. a) Core Indicator 1 has a value of 2,600 people. However, the PIF entry states that 3,400 direct beneficiaries are expected. Please keep both figures consistent. b) The proposed number of direct beneficiaries (even if 3,400) is lower than what we would expect for an LDCF grant of this size to achieve, as we aspire for high impact from the projects. We understand that the populations on these islands are sparse. Please explore ways to enhance impact, such as: (i) options to increase the number of direct beneficiaries to the extent possible, (ii) offering an expanded scope of adaptation measures for these communities, beyond what has been proposed, and in alignment with identified adaptation needs for the country as per national strategies/plans. Will the project share lessons learned or techniques with other islands facing the same issue? c) Re Core Indicator 4, please consider training a greater number of people if possible, and/or a "training of trainers" approach.	a) Beneficiary numbers in the LDCF Core Indicator Annex have been corrected accordingly b) (i) Accordingly, direct beneficiaries of the project have been increased to 4200 to comprise the total rural population of the country. This amounts to ~37% of Tuvalu?s population. 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) strengthened training programmes and knowledge sharing. (ii). Project alignment with national adaptation priorities has been clarified in section 7. Indirect beneficiaries have been increased to comprise the urban population of the country through the justification that many rural households have family ties in urban areas, and that the project will help reduce rural to urban migration is placing pressure on the country?s urban areas. Through our analysis it was found not possible to include the urban population as direct beneficiaries without significantly shifting the focus of the project design, as there is no room for agriculture or EbA interventions in urban areas. c) Number of beneficiaries trained has been increased accordingly. We have increased the number to 100 government staff, as well as adding the additional direct beneficiary numbers through community training. A

	training of trainers approach has been clarified in the project strategy to assist in upscaling objectives, as noted in paragraph 52.
7. Is the project/program properly tagged with the appropriate keywords as requested in Table G?	
Not yet. Please include adaptation-related keywords in the taxonomy (e.g., "climate change adaptation", "coastal resilience", "small islands", "nature-based solutions" etc.) and please remove the term "focal areas" from the taxonomy.	The usage of ?Focal areas? has been removed from the Taxonomy table. Climate change adaptation, coastal resilience, Small Island Developing States and nature-based solutions have been added in the Taxonomy table.
Please include "nature-based solutions"; it does not appear yet.	As provided above, ?Nature-based Solution? has been added in the taxonomy table in Section G (Page 6) as suggested. However, the option is not found in drop down menu in Portal.
Part II ? Project Justification	
1. Has the project/program described the global environmental/adaptation problems, including the root causes and barriers that need to be addressed?	
Yes.	
2. Is the baseline scenario or any associated baseline projects appropriately described?	

Not yet. (In addition to providing the agency response to the comments below, please also provide added explanation/description in the actual Portal entry text, where applicable. This comment applies to all review comments. Please also avoid highlighting the new text in the Portal entry. You may wish instead to number the paras for easy reference to changed/added text.) Please provide more context and background on "pulaka pits": a) How do they work, what is their significance, what is the extent to which island communities are dependent on them as a food source, and what would the impact on communities be in the absence of the proposed project interventions? b) Cultural factors are important but are just one consideration; what about nutrition, income, etc.? Is this their primary food crop? Why is diversification not possible? c) How does pulaka production relate to adaptation priorities identified in national strategic climate change related documents? Please provide this important background/baseline information.	Paragraph numbering has been added for easier tracking of the latest changes. Pulaka pit context: a) The construction and operation of the pulaka pits has been described in greater detail in paragraph 10, 11 and 12, was well as pulaka?s cultural and dietary significance. Island communities have become increasingly dependent on nutrient poor imported food because of the dual factors of i) the salinization of the pulaka pits and ii) imported starch foods flooding the markets. Therefore, communities are not as dependent on them as they were historically, however communities still show traditional preference for local foods. Without the project?s interventions, salinisation from increasing sea level rise (SLR) and storm surges, as well as prolonged droughts, will continue to impact pulaka production, with adverse consequences for rural communities? food security and cultural heritage. b) The nutritional benefits of traditional crops over imported staple foods has been clarified. Pulaka is the most important traditional crop in Tuvalu, while coconut is the most important economic crop. Coconut is eaten on a more frequent daily basis, while pulaka serves as a feast crop and reserve staple crop during prolonged drought periods when fruit crops fail. Diversification with high yield fruit crops is not possible in the pulaka pits due to saline conditions,

	while diversification with other salt-tolerant crops is not attractive when compared to pulaka due to yield and traditional preference. c) Prioritisation of increasing resilience of pulaka production in strategic national documents has now been noted in paragraph 81
3. Does the proposed alternative scenario describe the expected outcomes and components of the project/program?	

Not yet. a) Please discuss the decision to focus on a single crop (pulaka) in the context of the climate change adaptation good practice of diversification of crops and livelihoods. While we understand that the soils are not suitable for intensive agriculture, would it be possible to diversify subsistence agriculture, including with salt-tolerant crop species that may survive poor soils? b) What are some of the livelihood diversification options under consideration, mentioned in Output 1.2.3? Please provide a menu of potential activities for the various subcomponents, especially for EbA, cropping and livelihoods. c) We appreciate the activities focused on improving the enabling environment for EbA. However it is unclear what actual on-the-ground EbA investments are being proposed. The PIF states that the project will support "restoration and conservation of degraded atoll ecosystems" and in "and 180 ha of coastal ecosystems surrounding the pits". Please describe the proposed activities. If not known yet, please discuss in broad terms, by providing a suite of options. d) Please identify the full suite of potential activities that the project will support, clarifying their potential help communities adapt to current and future climate, including variability and extremes. At present the focus seems to be on plastic lining of the pits, raising the bed height, and rainwater harvesting, with possible drip/tank irrigation. As mentioned earlier in the review, please consider an expanded scope of activities, and/or beneficiaries. e) Please consider more environmentally friendly solutions than plastic lining. Along with issues relating to plastic pollution, what assurance is there that chemicals from the plastic will not leach into the soil and contaminate the crops? What assurance is there that communities will have access to good quality plastic in subsequent years if/when they need to replace it for any reason? f) It appears the primary source of irrigation for the pits is expected to be harvested rainwater. Has an assessment been undertaken--which includes precipitation projects under climate change scenarios--that shows that this will be reliable and sufficient, especially given that there will likely be competing uses for it? g) As part of Component 2, please include a stocktake of national policies and plans in order to identify the best entry points for mainstreaming EbA. h) Please seek opportunity for continuous training or "training of trainers", perhaps in synergy with other related interventions. i) We appreciate the proposed land use zoning exercise, as well as intent to involve religious leaders in awareness and outreach.	a) Aside from being an essential component of Tuvalu?s cultural heritage, there are several benefits to cultivating pulaka that make it the most appropriate crop of choice for the proposed project. The justification for selecting a single crop is explained in paragraph 38 by first discussing the criteria for selection, followed by an evaluation of the benefits and drawbacks of each potential crop and, finally, an explanation of why pulaka is the most appropriate crop for the proposed project. Pulaka cultivation is practised by ~80% of Tuvaluan households, particularly on the outer islands, creating a suitable foundation from which to build the project. Coconut is the only other subsistence crop capable of cultivation under extreme atoll conditions. However, the crop performs poorly in drought conditions and becomes increasingly susceptible to extreme winds with age. It would require considerable additional investment to incorporate coconut crops into the project. b) Rural Tuvaluans have limited options for diversified livelihoods beyond subsistence agriculture. However, local sustainable fisheries are a viable livelihood model that will be developed under the project. Specifically, the project will explore a locally managed marine area (LMMAs) approach to fisheries conservation and management, as has been adopted in several pacific island countries. This approach relies on

	traditional authority to establish and manage marine conservation and managed use sites. The basic approach is that through traditional authority, no-take ?Tabu? sites are established over multiple years while other areas are either open or under certain restrictions. The spill over from the ?Tabu? sites provide benefit as food source for community. 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, supported by capacity building for management and monitoring of the sites so they are able to gauge the effectiveness of the approach. There is a well-established Pacific LMMA network that the project will engage with to assist through South-south sharing of experiences, lessons learnt and capacity building. This information has been added in paragraph 47. c) Options for on-the-ground EbA interventions implemented under 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 resulting from storm surges (paragraph 43). A detailed assessment of site-specific EbA interventions will be

	conducted during the PPG phase of the project. D) More detail on EbA options have now been included (under response to point C above), as well as greater detail livelihood diversification (under response to point B above). It has been noted that EbA interventions will act as a buffer to climate shocks on subsistence agriculture, with livelihood diversification will provide further adaptation options to communities. e) 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 historically trialed various techniques to address soil salinization. The project will make use of environmentally neutral geotextile to ensure the ecological sustainability of this intervention. 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 the case of this project, impermeable sheeting will be used. f) The drip irrigation will be supplementary to ? and not serve as a replacement for ? existing irrigation methods such as groundwater 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. A high-level estimation of rainwater storage capacity over dry periods has been included (paragraph 46), as based on the National Building Code and national average rainfall. The PPG phase of the project will determine the exact number of rainwater harvesting tanks necessary, as well as calculate how much rainwater can be stored under climate change scenarios. g) At PIF stage, the project has identified: i) Te Kete (Tuvalu National Sustainable Strategy); ii) Vakafenua (Climate Change Policy); and iii) the Climate Change Resilience Act 2019 as entry points for mainstreaming EbA. Additionally, it has been noted (paragraph 51) that 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. As part of the full project formulation process, national policies and plans (including agricultural plans, water plans and biodiversity plans) will be reviewed to identify any gaps for EbA mainstreaming. Additionally, where EbA has already been mainstreamed, these policies will be reviewed to ensure that they make adequate

	provision for supporting the proposed project. h) It has now been noted (paragraph 52) that the project?s community training and institutional capacity building activities will follow a training of trainers approach to assist in upscaling the lessons learned of the project and in replicating these benefits beyond the project?s lifespan.
Please discuss the eventual disposal plan for the plastic that will be provided through this project. Will there be measures in place to dispose of it in an environmentally friendly manner when the time comes?	The project will use a biodegradable, impermeable geotextile with a lifespan of 200 years, therefore a disposal plan would not be necessary. 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 trialed various techniques to address soil salinisation. The information is reflected in footnote 95 and explained in paragraph 63.
4. Is the project/program aligned with focal area and/or Impact Program strategies?	
Yes. However, please remove Objective CCA-3 from Table A and references to it in the main text, for the reasons described above.	Accordingly, CCA-3 has been removed from the document.
5. Is the incremental/additional cost reasoning properly described as per the Guidelines provided in GEF/C.31/12?	

Pending response to above review comments.	Accordingly, table 3 has been updated with the additional details under the responses to the above comments
6. Are the project?s/program?s indicative targeted contributions to global environmental benefits (measured through core indicators) reasonable and achievable? Or for adaptation benefits?	
Not yet. The information provided discusses the proposed solutions in the context of the saline intrusion experienced thus far. It does not discuss whether and how the proposed solutions will deliver adequate adaptation solutions in the context of future, continued climate change and associated sea level rise and potentially higher storm surge events. Please discuss.	Please note for programming under the LDCF, this Fund is to address urgent and immediate adaptation needs of vulnerable communities. This concept addresses those needs. It is fully aligned with national adaptation priorities and is therefore fully supported by national stakeholders. In consultation with country representatives and regional experts, the proposed project?s solutions have been noted to be the most effective adaptation tools in the context of Tuvalu?s extreme vulnerability to the future impacts of SLR.
Not yet. It is important that the GEF deliver sustainable solutions that can cope with anticipated climate change impacts--especially through its adaptation portfolio. For example, if storm surge heights eventually increase to a point where saline water enters the pulaka pits, the effort of this project will be in vain (we assume the pulaka pits are intended for use by communities beyond the 4 years of duration of this project). Thus, we request a screening or assessment of potential climate risk to this project, given projected climate change including sea level rise. (Also, we note that the NAPA includes as an 'urgent and immediate adaptation need' a different project relating to pulaka pits, one which is focused on saltwater-tolerant pulaka.)	We developed the climate risk screening in the SRIF and explained how the project strategy addresses those risks. Kindly refer to the revised SRIF.
7. Is there potential for innovation, sustainability and scaling up in this project?	
The project has a scalable approach.	
Project/Program Map and Coordinates: Is there a preliminary geo-reference to the project?s/program?s intended location?	
Yes.	
Stakeholders: Does the PIF/PFD include indicative information on Stakeholders engagement to date? If not, is the justification provided appropriate? Does the PIF/PFD include information about the proposed means of future engagement?	

Yes for PIF stage. By CEO Endorsement: Please provide detailed information on the role of NGOs and civil society in project design and also implementation.	Well noted. Role of local communities in design and implementation of the project, has been added to paragraphs 79 and 80 of the Coordination section. NGOs, CBOs and civil societies will be consulted during project design phase to define role of NGOs and civil society. The information will be provided in CEO ER.
Gender Equality and Women?s Empowerment: Is the articulation of gender context and indicative information on the importance and need to promote gender equality and the empowerment of women, adequate?	
a) Please clarify whether the project will develop and submit a Gender Action Plan by CEO Endorsement. b) Please include analysis and measures specific to, or which contribute to, building resilience to climate change impacts.	a) Yes, a Gender Action Plan will be developed as part of the PPG phase. This information has been included in paragraph 75. b) Thank you for the comment. Specific measures that contribute to building resilience to climate change impacts have been added to paragraph 74 in the gender equality and women?s empowerment section.
Private Sector Engagement: Is the case made for private sector engagement consistent with the proposed approach?	
Cleared. This project does not focus on the private sector.	
Risks to Achieving Project Objectives: Does the project/program consider potential major risks, including the consequences of climate change, that might prevent the project objectives from being achieved or may be resulting from project/program implementation, and propose measures that address these risks to be further developed during the project design?	
Thank you for including potential risks posed by Covid-19 in the risks table. Please also discuss how the project will contribute to green recovery in the wake of adverse impacts of Covid-19, including economic, etc, i.e., opportunities it provides.	Thank you for this comment. Specifically, the interventions proposed aim to contribute towards 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. These details have been revised into the PIF under paragraph 46.

Coordination: Is the institutional arrangement for project/program coordination including management, monitoring and evaluation outlined? Is there a description of possible coordination with relevant GEF-financed projects/programs and other bilateral/multilateral initiatives in the project/program area?	
Not yet. Please provide additional information on the institutional structure of the project. If feasible, explore the role of the local community as a key partner in designing and implementation of project to ensure ownership and long-term sustainability of the investment.	Thank you for this comment. Additional information on the institutional structure of the project, as well as the role of local communities in design and implementation of the project, has been added to paragraphs 79 and 80 of the Coordination section.
Consistency with National Priorities: Has the project/program cited alignment with any of the recipient country?s national strategies and plans or reports and assessments under relevant conventions?	

Further information is requested: a) Please demonstrate consistency with current climate change adaptation strategies/plans/reports for Tuvalu. While we understand that adaptation is a key and continuous priority, all of the examples provided appear outdated. b) Please point to current national strategic documents that clearly identify pulaka pit strengthening as an adaptation priority.	The response in Paragraph 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.
Knowledge Management: Is the proposed ?knowledge management (KM) approach? in line with GEF requirements to foster learning and sharing from relevant projects/programs, initiatives and evaluations; and contribute to the project?s/program?s overall impact and sustainability?	

Further information is requested. Will lessons learned or adaptation techniques from this project be shared with other islands facing the same issue?	Thank you. Yes, the lessons learned and best practices from the proposed project will be shared with other SIDS and islands in the Pacific Region where the same problems are encountered. This has been clarified and expanded in the Knowledge Management and Scalability sections under para 94.
Environmental and Social Safeguard (ESS): Are environmental and social risks, impacts and management measures adequately documented at this stage and consistent with requirements set out in SD/PL/03?	
The SRIF has been provided. However, further information is requested related to the climate risk screening, namely, what would be the impact of continued climate change and sea level rise on the project and its intended benefits? Will the proposed measures be able to withstand further changes?	As noted in a previous response, CoP guidance for this Fund is to address urgent and immediate adaptation needs of vulnerable communities. At present, the proposed interventions have been identified by GoT and regional experts as the most suitable for combatting the continued impacts of climate change and sea level rise into the future.

Not yet. a) In order to be a sound adaptation project, it is essential that the project aims to cope with and continue to deliver benefits to communities amid changing climatic conditions, to the extent these can be projected. Please include in the SRIF a consideration of climate change risks to the project (not only from current climate variability but also projected climate change, including sea level rise), and how these will be mitigated. This screening/analysis is recommended by STAP for all GEF projects. b) We suggest that the agency develop concrete steps and process to engage and consult with vulnerable communities and indigenous peoples during the PPG stage to fully integrate their perspective into the project design and implementation including their traditional and local knowledge, c) We suggest that the agency develop a concrete plan to develop assessment of socioeconomic, environmental and climate change risks impacts, and indigenous peoples plan (IPP) during PPG or first year of the project implementation, and d) Please add a summary of assessment results and actions that will be taken during the PPG and early stage of the project implementation in the ESS section of the Portal. e) In the Safeguard Risk Identification Form (SRIF), the agency safeguard team states that ?Considering its rapid population increase, worsening water and land and contamination issue, the project would require assessment of socioeconomic, environmental and climate change risks impacts, and reflect them in the ESMP. Considering the presence of indigenous local communities, IPP (or well-developed stakeholder engagement plan) is also required.? It is, however, not clear from PIF nor Safeguard Risk Identification Form (SRIF) whether the project is planning to develop ESMP and IPP during PPG or first year of the project implementation. Please clarify.	a) We have further developed the climate risk screening in the SRIF and explained how the project strategy addresses those risks. 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. Kindly refer to the revised SRIF. b) Extensive stakeholder consultations will be done during PPG phase. Vulnerable communities and indigenous people will be engaged through surveys, interviews and focus group discussions to fully integrate their perspective. c) 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. d) Added in the ESS section of the portal: The environmental and social management plan and stakeholders? engagement plan will be prepared in PPG phase. e) An ESMP and IPP will be developed during the PPG phase. The PIF (para 70) and SRIF have been revised accordingly to reflect that these plans will both be prepared during the PPG phase.
Part III ? Country Endorsements	
Has the project/program been endorsed by the country?s GEF Operational Focal Point and has the name and position been checked against the GEF data base?	

No, the OFP Endorsement letter has not yet been provided. Please upload this.	The OFP letter has been drawn up and submitted in portal. We have submitted again with the updated package.
No. The amounts specified in the letter exceed available LDCF resources for Tuvalu. The remaining $5 million for Tuvalu needs to include all fees and PPG. Please revise and resubmit the LoE with correct figures, and with the tables adjusted accordingly.	The budget has been revised and the changes have been reflected in the relevant tables in the PIF. The total including fees and PPG is now $5 million. The renewed LoE is uploaded in the portal with this submission. .
Additional recommendations to be considered by Agency at the time of CEO endorsement/approval.	

1) Please provide information on how NGOs and civil society have been engaged in project design and details on how they will be engaged in project implementation. 2) Detailed information on the ecosystem-based adaptation measures that will be supported. 3) Detailed information on diversified and resilient livelihoods to be supported by the project.	1) NGOs and civil society organisations engaged with during the PPG phase included Live and Learn and the Tuvalu National Council of Women (TNCW), who were engaged with through in-person consultations in Funafuti. As per Appendix 19: Stakeholder Engagement Plan, these stakeholders will be further engaged with during project implementation. Specifically, Live and Learn will be involved in providing training or technical input for lessons learned on climate-resilient agriculture and diversified livelihood interventions under the project. Additionally, Live and Learn will be coordinated with to ensure climate-resilient agricultural practice interventions are complementary with their initiatives, including the distribution of Foodcubes through Live and Learn. The TNCW will be engaged with to provide guidance into ensuring the gender responsiveness of the project?s implementation and contributing to gender-responsive diversified livelihoods options. Other NGOs that will be engaged with during project implementation include the Centre for Pacific Crops and Trees, who will assist in identifying regionally-appropriate crop varieties to be introduced through the project, and the Tuvalu Association of Non-Governmental Organisations (TANGO), who will contribute to the implementation and refinement of diversified livelihoods strategies.

	2) Through Output 1.2.1, 534 ha of degraded or threatened terrestrial or coastal ecosystems will be restored and conserved across all target outer islands. This will include 430 ha of terrestrial or coastal ecosystems using a combination of assisted natural regeneration and active replanting of drought-resilient and resource-provisioning plant species, as well as the conservation of 104 ha of marine ecosystems. Assisted natural restoration will be promoted by establishing Terrestrial Conservation Areas (TCAs) and Locally Managed Marine Areas (LMMAS) for coastal ecosystems ? including littoral coastal forests, mangrove forests and coral reefs ? in areas ~200 m adjacent to pulaka pits. This approach will incorporate existing community-managed land conservation models that have been used and expanded by previous projects such as the R2R Project. For forest and mangrove ecosystems that are severely degraded, active restoration may be needed in addition to establishing the above conservation areas. This will involve the removal of invasive alien plant species and planting indigenous, multi-use species that are salt-tolerant. Based on the methodology used in the Ridge to Reef project, local labour will be employed for this from the target island communities. Appropriate species will be confirmed in the restoration plans described above and will draw from the inventory of

	native trees created under the GEF Agro-ecosystems Project. Potential examples of native species include, inter alia, Indian beech (P. acidula), Pandanus, mei (A. altilis or A. ariannensis) and mangrove species such as the common mangrove (R. stylosa) or red-flowered mangrove (L. littorea). Seedlings for the restoration will be provided through nurseries on each island that have been upgraded through Output 1.1.4. Under Output 1.2.2, 90 ha of groundwater recharge zones within 50 m of active pulaka pits will be strengthened and conserved to encourage increased runoff capture and groundwater infiltration. This will assist in expanding the freshwater lenses underlying the pulaka pits and reduce the impact of saltwater intrusion. First, site-specific groundwater recharge zone plans will be developed for each island, which will involve the detailed mapping of interventions for each island?s groundwater recharge zones and consultations with community representatives and landowners. Based on the above groundwater recharge zone plans, managed aquifer recharge interventions, including vegetated infiltration ponds and drainage trenches, will be installed within the groundwater recharge zones. These will be designed to capture runoff that would otherwise be lost to the ocean and allow it to infiltrate into the ground. Measures for improved

	infiltration will primarily be placed inland of the pulaka pits to reduce the likelihood of saltwater inundation during storm surges related to TCs. The drainage trenches will be designed to capture and channel water to the infiltration ponds and the pulaka pits. For both the drainage trenches and infiltration ponds, naturally occurring coarse sand and coral rock will be used on the base of the structures to maximise water infiltration potential. Once the infiltration basins and drainage trenches have been constructed, indigenous species will be planted across the infiltration zones, using drought-tolerant, multi-use species such as puka, Pandanus, breadfruit, seaside cordia (C. subcordata) and beach gardenia (G. speciosa). As with Output 1.2.1, seedlings for this restoration will be sourced from nurseries on each island (Output 1.1.4). To protect the groundwater recharge zones ? particularly directly following restoration ? as well as crops within the pulaka pits, fences will be installed along the perimeter of the groundwater recharge zones to prevent invasion by livestock such as cattle or pigs. Labourers will be employed from the local communities to facilitate the installation of the managed aquifer recharge structures, vegetative restoration and construction of the fencing. These community members will receive training for the implementation and monitoring of structures and vegetation under this output

	through community training groups established through Output 1.1.5. 3) Output 1.2.3 will be synergistic with climate-resilient agricultural practices and ecosystem conservation under Outcomes 1.1 and 1.2, respectively. Specifically, other outputs under Outcomes 1.1 and 1.2 will assist in increasing the availability of natural and agricultural resources that will support the diversification of livelihoods for 800 recipients across the eight target islands. Concurrently, the design of the livelihoods to be sustainable with a focus on SLM will support the conservation of ecosystems restored through other outputs under Outcome 1.2, which will further promote the provision of ecosystem services. Options identified and validated through the options analysis for diversified sustainable fisheries and terrestrial resource-based livelihoods will be implemented across the eight target islands. Sustainable fisheries livelihoods will focus on reducing overfishing in reef ecosystems by increasing the accessible ocean area available to small-scale fisherfolk to include pelagic areas. This will lessen the overall fishing pressure in coastal marine areas, including protective reefs, while diversifying fisherfolk's potential catch to include other commercially valuable species such as tuna. Interventions that will be introduced by the

	proposed project to achieve this include the provision of FADs, safety equipment, and durable fishing gear. The FADs will be biodegradable and non-tangling to minimise potential negative impacts on marine life and will assist in increasing the viability of pelagic fishing for fisherfolk. The safety equipment and durable gear will additionally enable fisherfolk to fish farther out in more challenging ocean conditions and reduce economic losses or injury to fisherfolk. Fisheries livelihoods will also be supported by the establishment of the LMMAs under Output 1.2.1, which will assist in increasing overall fish stocks. Moreover, sustainable fish processing practices such as fish salting or drying will be promoted. Livelihoods that depend on terrestrial natural resources will also be diversified. These livelihoods will expand potential benefits to recipients not involved in fishing and assist in promoting the sustainable management of terrestrial and coastal ecosystems. One example of a livelihood to be supported is the manufacture of cultural handicrafts that are traditionally made by women, including woven mats, headdresses, fans and necklaces. These crafts are made of natural materials such as Pandanus or coconut leaves, indigenous flowers, puka seeds and shells. The availability of many of these materials will be supported by intercropping and restoration interventions

	under Outputs 1.1.1 and 1.1.2, while the regulation of resource provision from established conservation zones will ensure resources are utilised sustainably. Improved agricultural provision through Output 1.1.1 will also support another potential diversified livelihood, namely agro-processing. This approach will introduce equipment and practices for the manufacture of a wider variety of food products that use crops that will be promoted through Output 1.1.1. Potential products include ones that can be preserved and sold at markets in Funafuti such as coconut oil, coconut sap sugar, breadfruit flour, pandanus juice sun-dried banana and banana chips. Recipients and the wider community will be trained in sustainable practices and the maintenance or operation of any introduced equipment for each of the livelihoods identified above. This training will include awareness raising on the benefits of using sustainable livelihood practices to support healthy ecosystems. Training will consider traditional knowledge as well as national and international experts and best practices, facilitated by the community training groups established in Output 1.1.5.

GEF Work Program comment	Agency response at PIF stage

Describe briefly how the pandemic overall is addressed in the project, including associated impacts, risks and opportunities. Projects are required to identify and establish likely impacts and risks from COVID-19, and how they will be dealt with in the context of delivering GEBs and/or climate adaptation and resilience benefits.	In Tuvalu, from 3 January 2020 to 6:00pm CEST, 12 May 2022, there have been 0 confirmed cases of Covid-19 with 0 deaths, reported to WHO. As of 4 April 2022, a total of 12,528 vaccine doses have been administered in a population of est 11,700. 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, which this project does.
Describe further how risks from COVID-19 have been analyzed and mitigation strategies incorporated into the design. Project documents are expected to include consideration to the risks that COVID-19 poses for all aspects of project design and eventual implementation	National or regional restrictions to entry to consultants and equipment and materials resulting from the Covid-19 pandemic may result in project delays. To mitigate this risk, 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. The Agency will make provisions in the project workplan to do its best so the project remains on schedule.

Describe further how the project has identified potential opportunities to mitigate impacts (if any) created by COVID-19 to deliver GEBs and/or climate adaptation and resilience benefits, and contribute toward green recovery and building back better.	The project focusses on increasing the climate-resilience of a staple food crop in the country. Most of the population are subsistence farmers that participate in livestock production, including pigs, free-range chickens and ducks at the household level. One of the most predominant forms of subsistence crop agriculture in the country involves the traditional practice of growing pulaka. As one of the main impacts on Tuvalu has been on food imports, this project will strengthen food security as well as climate resilience. Tuvaluan women are traditionally responsible for the family?s food security and production, often growing crops in homestead gardens, rearing small livestock and producing handicrafts. 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 conservation 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.
Government of Germany	**Responses**

The proposed ecosystem-based adaptation (EbA) measures seem appropriate but rather general in nature and should be further specified during the PPG stage. In this context it is essential that all project activities, EbA and technological solutions, are based on current and projected climate change information. For instance, while the proposal refers to sea level rise (SLR) and aims to address its impacts, it remains unclear, what level of SLR the pulaka cultivation as planned in the proposal would withstand. Germany therefore requests assurance that all project activities consider relevant climate change impacts, and that available climate change information, including projections on SLR, are fully incorporated into the project design.	Walls of up to 1m around the pulaka pits have been tried before successfully. This technology will be adopted to protect crops from the impacts of overland flooding and storm surge, reducing the risk of saltwater inundation. Concrete raised beds have been trialed and constructed on several islands in Tuvalu in the National Adaptation Programme of Action 2 (NAPA II) and Government of Tuvalu (GoT) Climate Proofing Project. The introduction of these beds has been well received by recipient communities on the islands of Nui, Nuitao, Nanumea and Nukulaelae, supporting the rationale for upscaling this intervention across all of Tuvalu?s islands. In addition, replanting and restoring coastal vegetation, such as mangroves, can significantly ameliorate wave impact, with reductions in wave height ranging from 13% to 66% per 100 meters of mangrove coverage. Under this observation, a 200 m restoration belt of mangrove and other littoral species has the potential to reduce storm surge wave height by at least 20% compared with degraded areas. The potential impact of the proposed EbA measures against sea level rise ? specifically saltwater intrusion and the reduction in storm surge wave height ? has however been expanded in the CEO Endorsement Request and Project Document, based on findings and analyses in Appendices 23 and 25. At PIF approval, we proposed the option to relocate the pulaka pits to higher grounds. However, during the PPG phase, community members raised concerns regarding the relocation of pulaka pits given the complexities of landownership.

The proposed project aims to support 4,200 people as direct beneficiaries, thereby targeting the whole rural population of the country. While Germany appreciates the aim to benefit as many people as possible, it does not seem likely that the whole rural population would be direct beneficiaries, or, for instance, take part in the trainings offered by the proposed project (see PIF p. 15, Number of people trained 4,300). We suggest adjusting the figures for a more feasible account of actual direct beneficiaries.	The proposed 4,200 direct beneficiaries is the targeted number confirmed in the PIF. The number was increased from the initial target of 2,600 to 4,300 based on the Secretariat comments of March 2022. This amounts to ~37% of Tuvalu?s population. The majority Tuvalu?s rural population is engaged in or dependent on agricultural or natural resource-based livelihoods, meaning that the entire rural population ? which is still relatively small given the country?s small population ? is eligible to benefit from the project. With regards to the trainings, multiple community training workshops per island per year have been budgeted to ensure sufficient opportunities for participants to attend. Thus, the 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) strengthened training programmes and knowledge sharing. As this is a five-year project, we consider the beneficiary number is achievable.
Finally, Germany agrees with the additional recommendations of the GEF Secretariat (see PIF review p. 29), especially on the importance of including a safe disposal plan for the material planned to be used in the pulaka pits, as well as consulting with vulnerable communities and indigenous peoples during the PPG stage and fully integrating their perspective and knowledge into the project design.	Following engagements undertaken during the PPG stage, Output 1.1.1: Rehabilitation of 3 historically degraded pulaka pit areas carried out in the PIF has been change to Output 1.1.1: National pulaka pit health and groundwater assessment undertaken on all 8 target islands. Geotextiles will therefore not be used in the rehabilitation of degraded pulaka pits because of: i) logistical constraints and risks associated with this approach at scale; and ii) indications from the affected communities of a preference for the project to instead focus on strengthening existing pulaka pits and providing concrete raised beds. The plastic disposal plan for the geotextiles recommended in the PIF, therefore, is no longer applicable. Protocols for the disposal or recycling of other plastics generated through the project have been elaborated on in the SRIF.

ANNEX C: Status of Utilization of Project Preparation Grant (PPG). (Provide detailed funding amount of the PPG activities financing status in the table below:

PPG Grant Approved at PIF: **150,000**	
Project Preparation Activities Implemented	***GETF/LDCF/SCCF Amount ($)***

	Budgeted Amount	*Amount Spent To date*	*Amount Committed*
Workshops	10,000	3,236	
Professional services	110,750		91,747
o International Consultants			*54,020*
o National Consultants			*27,900*
o Local consultations			*3.041*
o International travel and DSA			*6,786*
Total	**120,750**	**3,236**	**91,747**

If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue to undertake the activities up to one year of CEO Endorsement/approval date. No later than one year from CEO endorsement/approval date. Agencies should report closing of PPG to Trustee in its Quarterly Report.

ANNEX D: Project Map(s) and Coordinates

Please attach the geographical location of the project area, if possible.

Atoll	Pit Number	Latitude	Longitude	Approx. Area (m2)
Funafuti				
	Funafuti 1	-8.523948297	179.1958138	3,580
	Funafuti 2	-8.520806631	179.1983961	10,462
Nanumanga				
	Nanumanga 1	-6.299849139	176.3206586	4,253
	Nanumanga 2	-6.299349881	176.3211534	2,342
	Nanumanga 3	-6.292746531	176.3167406	493
	Nanumanga 4	-6.276298439	176.3225359	3,722
Nanumea				
	Nanumea 1	-5.651549772	176.0759689	958
	Nanumea 2	-5.651188661	176.0761667	934
	Nanumea 3	-5.649734983	176.0741762	3,042
	Nanumea 4	-5.650954911	176.0758721	130
	Nanumea 5	-5.649669025	176.0734879	130
	Nanumea 6	-5.649970128	176.073331	73
	Nanumea 7	-5.650459269	176.0737979	138
	Nanumea 8	-5.650311789	176.073557	96
	Nanumea 9	-5.650449436	176.0740177	97
	Nanumea 10	-5.650543519	176.074348	75
	Nanumea 11	-5.650604292	176.074653	127
	Nanumea 12	-5.650628872	176.0750914	109
	Nanumea 13	-5.650601833	176.0749098	123

Niutao				
	Niutao 1	-6.11170685	177.3441816	23,533
	Niutao 2	-6.107787447	177.3503201	3,565
	Niutao 3	-6.10725455	177.3499143	366
	Niutao 4	-6.11226795	177.3472017	546
	Niutao 5	-6.107046061	177.3488626	1,505
Nui				
	Nui 1	-7.240842667	177.1480183	915
	Nui 2	-7.242133342	177.1482296	29,691
	Nui 3	-7.242435075	177.1494875	2,904
	Nui 4	-7.243768539	177.1488964	12,947
	Nui 5	-7.243522906	177.1494324	1,581
	Nui 6	-7.244517011	177.1487062	485
Nukufetau				
	Nukufetau 1	-8.027385103	178.3098241	76
	Nukufetau 2	-8.027219856	178.3091837	1,516
	Nukufetau 3	-8.028979067	178.3080474	802
	Nukufetau 4	-8.029249247	178.3089059	176
	Nukufetau 5	-8.029832628	178.3097566	290
	Nukufetau 6	-8.030114683	178.3096163	217
	Nukufetau 7	-8.030248369	178.3087425	1,177
	Nukufetau 8	-8.030169125	178.3082543	918
	Nukufetau 9	-8.030894308	178.3096831	388
	Nukufetau 10	-8.031117122	178.3094813	1,230
	Nukufetau 11	-8.031253714	178.3090406	214
	Nukufetau 12	-8.028437861	178.3081664	979
Nukulaelae				
	Nukulaelae 1	-9.351363428	179.8168939	3,348
	Nukulaelae 2	-9.372860336	179.8086279	15,367
	Nukulaelae 3	-9.377441592	179.8108575	5,652
	Nukulaelae 4	-9.378197414	179.8103686	592
Vaitupu				
	Vaitupu 1	-7.464407239	178.6715669	603
	Vaitupu 2	-7.470354842	178.6754841	2,031
	Vaitupu 3	-7.478203383	178.6769557	6,556
	Vaitupu 4	-7.487809339	178.6921865	844
	Vaitupu 5	-7.488307642	178.6921465	632
	Vaitupu 6	-7.488634589	178.6919687	885
	Vaitupu 7	-7.490481619	178.6913379	615
	Vaitupu 8	-7.490903508	178.691221	10,017
	Vaitupu 9	-7.492256164	178.6908464	689

	Vaitupu 10	-7.493646536	178.689109	200
	Vaitupu 11	-7.463130558	178.6701634	1,284
	Vaitupu 12	-7.473652956	178.6716286	3,350
	Vaitupu 13	-7.478956658	178.6770197	292
	Vaitupu 14	-7.479149956	178.6767463	293
	Vaitupu 15	-7.479491108	178.6764903	136
	Vaitupu 16	-7.479904264	178.6765846	295

Figure 9. Location of target islands.

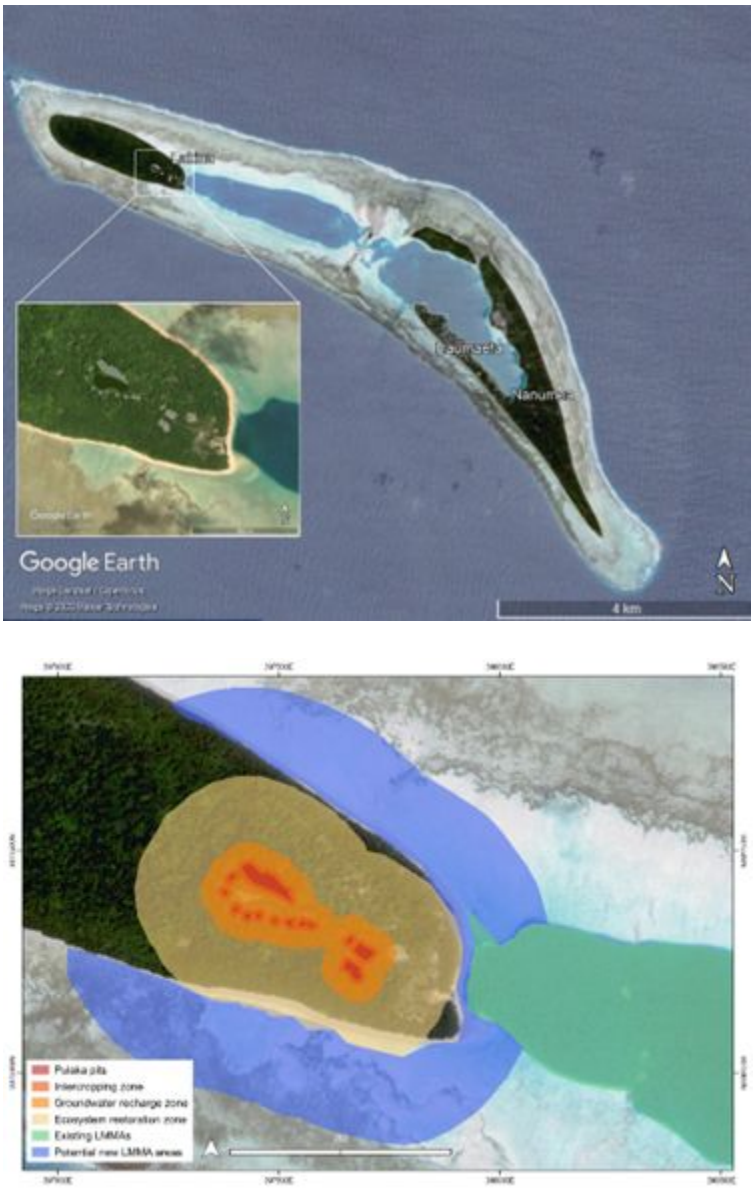

Figure 10. Maps of Nanumea intervention sites.


Tonga
Nanumanga
Google Earth
N
1 km

Figure 11. Maps of Nanumanga intervention sites.

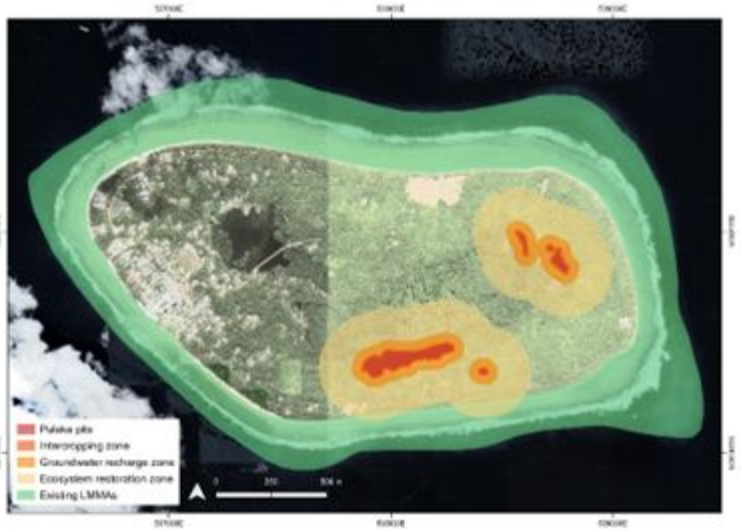

Figure 12. Maps of Niutao intervention sites.

Figure 13. Maps of Nui intervention sites.

Figure 14. Maps of Vaitupu intervention sites.

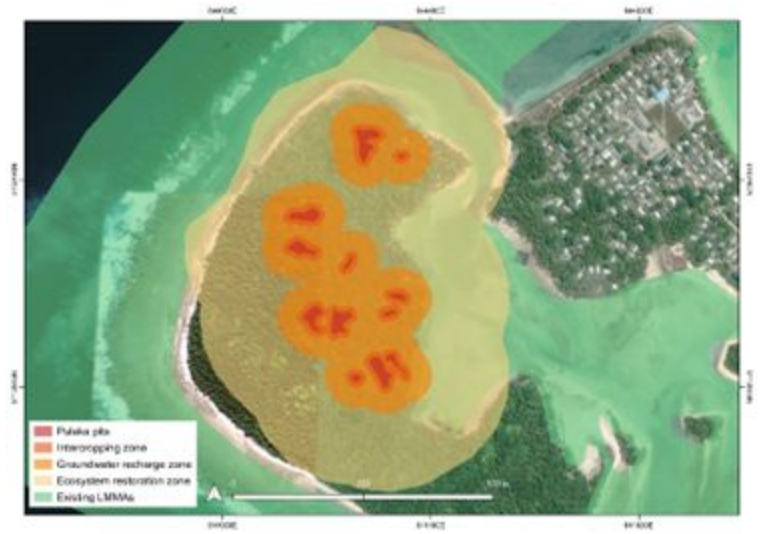

Figure 15. Maps of Nukufetau intervention sites.

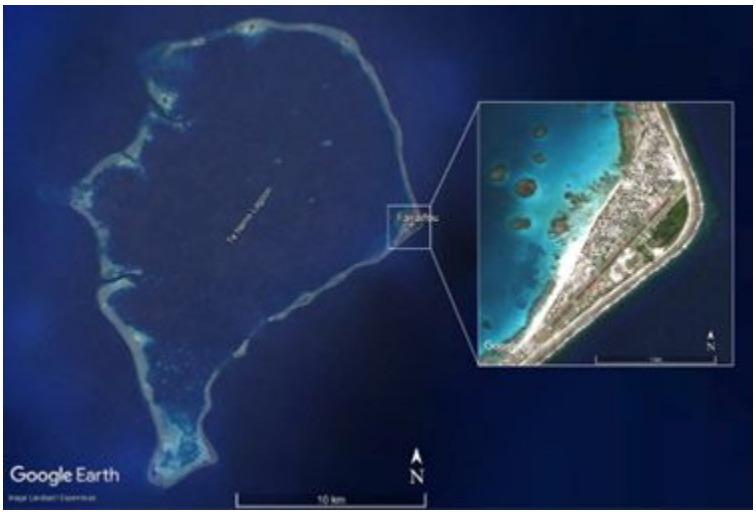

Figure 16. Maps of Funafuti intervention sites

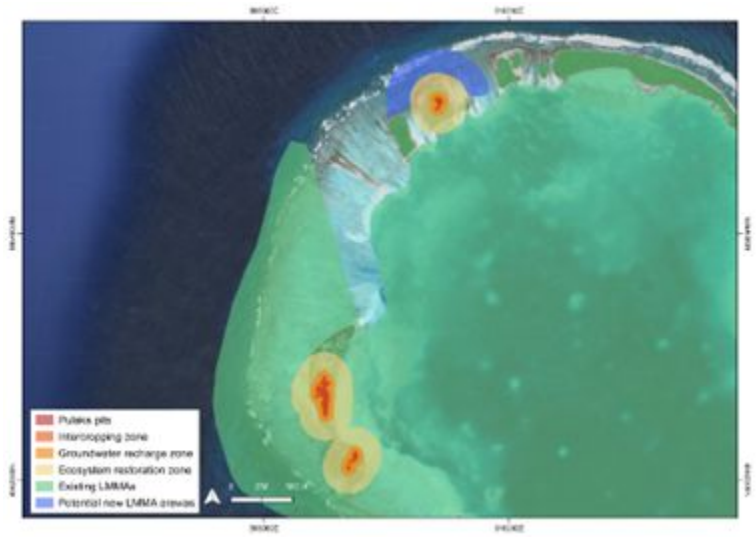

Figure 17. Maps of Nukulaelae intervention sites.

GEO LOCATION INFORMATION

The Location Name, Latitude and Longitude are required fields insofar as an Agency chooses to enter a project location under the set format. The Geo Name ID is required in instances where the location is not exact, such as in the case of a city, as opposed to the exact site of a physical infrastructure. The

Location & Activity Description fields are optional. Project longitude and latitude must follow the Decimal Degrees WGS84 format and Agencies are encouraged to use at least four decimal points for greater accuracy. Users may add as many locations as appropriate. Web mapping applications such as OpenStreetMap or GeoNames use this format. Consider using a conversion tool as needed, such as:https://coordinates-converter.com Please see the Geocoding User Guide by clicking here.

Location Name	Latitude	Longitude	Geo Name ID	Location & Activity Description
Funafuti 1	-8.523948297	179.1958138	3,580	
Funafuti 2	-8.520806631	179.1983961	10,462	
Nanumanga 1	-6.299849139	176.3206586	4,253	
Nanumanga 2	-6.299349881	176.3211534	2,342	
Nanumanga 3	-6.292746531	176.3167406	493	
Nanumanga 4	-6.276298439	176.3225359	3,722	
Nanumea 1	-5.651549772	176.0759689	958	
Nanumea 2	-5.651188661	176.0761667	934	
Nanumea 3	-5.649734983	176.0741762	3,042	
Nanumea 4	-5.650954911	176.0758721	130	
Nanumea 5	-5.649669025	176.0734879	130	
Nanumea 6	-5.649970128	176.073331	73	
Nanumea 7	-5.650459269	176.0737979	138	
Nanumea 8	-5.650311789	176.073557	96	
Nanumea 9	-5.650449436	176.0740177	97	
Nanumea 10	-5.650543519	176.074348	75	

Location Name	Latitude	Longitude	Geo Name ID	Location & Activity Description
Nanumea 11	-5.650604292	176.074653	127	
Nanumea 12	-5.650628872	176.0750914	109	
Nanumea 13	-5.650601833	176.0749098	123	
Niutao 1	-6.11170685	177.3441816	23,533	
Niutao 2	-6.107787447	177.3503201	3,565	
Niutao 3	-6.10725455	177.3499143	366	
Niutao 4	-6.11226795	177.3472017	546	
Niutao 5	-6.107046061	177.3488626	1,505	
Nui 1	-7.240842667	177.1480183	915	
Nui 2	-7.242133342	177.1482296	29,691	
Nui 3	-7.242435075	177.1494875	2,904	
Nui 4	-7.243768539	177.1488964	12,947	
Nui 5	-7.243522906	177.1494324	1,581	
Nui 6	-7.244517011	177.1487062	485	
Nukufetau 1	-8.027385103	178.3098241	76	
Nukufetau 2	-8.027219856	178.3091837	1,516	
Nukufetau 3	-8.028979067	178.3080474	802	
Nukufetau 4	-8.029249247	178.3089059	176	
Nukufetau 5	-8.029832628	178.3097566	290	

Location Name	Latitude	Longitude	Geo Name ID	Location & Activity Description
Nukufetau 6	-8.030114683	178.3096163	217	
Nukufetau 7	-8.030248369	178.3087425	1,177	
Nukufetau 8	-8.030169125	178.3082543	918	
Nukufetau 9	-8.030894308	178.3096831	388	
Nukufetau 10	-8.031117122	178.3094813	1,230	
Nukufetau 11	-8.031253714	178.3090406	214	
Nukufetau 12	-8.028437861	178.3081664	979	
Nukulaelae 1	-9.351363428	179.8168939	3,348	
Nukulaelae 2	-9.372860336	179.8086279	15,367	
Nukulaelae 3	-9.377441592	179.8108575	5,652	
Nukulaelae 4	-9.378197414	179.8103686	592	
Vaitupu 1	-7.464407239	178.6715669	603	
Vaitupu 2	-7.470354842	178.6754841	2,031	
Vaitupu 3	-7.478203383	178.6769557	6,556	
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Vaitupu 5	-7.488307642	178.6921465	632	
Vaitupu 6	-7.488634589	178.6919687	855	
Vaitupu 7	-7.490481619	178.6913379	615	
Vaitupu 8	-7.490903508	178.691221	10,017	

Location Name	Latitude	Longitude	Geo Name ID	Location & Activity Description
Vaitupu 9	-7.492256164	178.6908464	689	
Vaitupu 10	-7.493646536	178.689109	200	
Vaitupu 11	-7.463130558	178.6701634	1,284	
Vaitupu 12	-7.473652956	178.6716286	3,350	
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Vaitupu 14	-7.479149956	178.6767463	293	
Vaitupu 15	-7.479491108	178.6764903	136	
Vaitupu 16	-7.479904264	178.6765846	295	

ANNEX E: Project Budget Table

Please attach a project budget table.

ANNEX F: (For NGI only) Termsheet

Instructions. Please submit an finalized termsheet in this section. The NGI Program Call for Proposals provided a template in Annex A of the Call for Proposals that can be used by the Agency. Agencies can use their own termsheets but must add sections on Currency Risk, Co-financing Ratio and Financial Additionality as defined in the template provided in Annex A of the Call for proposals. Termsheets submitted at CEO endorsement stage should include final terms and conditions of the financing.

N/A

ANNEX G: (For NGI only) Reflows

Instructions. Please submit a reflows table as provided in Annex B of the NGI Program Call for Proposals and the Trustee excel sheet for reflows (as provided by the Secretariat or the Trustee) in the Document Section of the CEO endorsement. The Agencys is required to quantify any expected financial return/gains/interests earned on non-grant instruments that will be transferred to the GEF Trust Fund as noted in the Guidelines on the Project and Program Cycle Policy. Partner Agencies will be required to comply with

the reflows procedures established in their respective Financial Procedures Agreement with the GEF Trustee. Agencies are welcomed to provide assumptions that explain expected financial reflow schedules.

N/A

ANNEX H: (For NGI only) Agency Capacity to generate reflows

Instructions. The GEF Agency submitting the CEO endorsement request is required to respond to any questions raised as part of the PIF review process that required clarifications on the Agency Capacity to manage reflows. This Annex seeks to demonstrate Agencies? capacity and eligibility to administer NGI resources as established in the Guidelines on the Project and Program Cycle Policy, GEF/C.52/Inf.06/Rev.01, June 9, 2017 (Annex 5).

N/A