TUVALU COASTAL ADAPTATION PROJECT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

FUNAFUTI

Prepared by: FCG ANZDEC Ltd

Date: 7 October 2020

Prepared for: The Pacific Community

FCG

Quality Information

Document	Environmental and Social Impact Assessment: Funafuti, Tuvalu Coastal Adaptation Project
Date	7 October 2020
Prepared for	Pacific Community
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Revision History

Version	Version Date	Details	Authorised Name/Position
1	27 Aug 2020	Initial Draft for Review	Kate Walker/Environmental Specialist Patrina Dumaru/Social Specialist
1.1	7 Oct 2020	Final Draft	Kate Walker/Environmental Specialist Patrina Dumaru/Social Specialist

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Acronyms and Abbreviations

ADB	Asian Development Bank
AOI	Area of Impact
CCA	Community Conservation Areas
CBD	Convention on Biological Diversity
C-ESMP	Contractors Environmental and Social Management Plan
CFC	Community Fishery Committee
CMS	Convention of Migratory Species
DoE	Department of Environment
DPO	Disabled Persons Organisation
EDSCP	Erosion, Drainage, Sedimentation and Control Plan
EISA	Environmental and Social Impact Assessment
EKT	Ekalesia Kelisiano Tuvalu
EPA	Environmental Protection Act
ERW	Explosive Remnants of War
ESI	Environmental and Social Indicator
ESP	Environmental and Social Policy
GAD	Gender Affairs Department
GBV	Gender Based Violence
GCF	Green Climate Fund
GFDRM	Global Facility for Disaster Risk Management
GoT	Government of Tuvalu
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
ICH	Integral Cultural Heritage
IUCN	International Union for Conservation of Nature
LCC	Live coral cover
LDC	Least Developed Country
LMMA	Locally Managed Marine Area
MCT	Ministry of Communications and Transport
MHARD	Ministry of Home Affairs and Rural Development
MFAT	Ministry of Foreign Trade and Affairs
MFEP	Ministry of Finance and Economic Planning
MNREE	Ministry of Natural Resources, Energy and Environment
MPUE	Ministry of Public Utilities and Environment
MICRO	Maritime Investment for Climate Resilient Operations
MSL	Mean Sea Level
NBSAP	National Biodiversity Strategies and Action Plan
NCD	Non-Communicable Diseases
NEMS	National Environmental Management Strategy
NGO	Non-Governmental Organisation
OIMIP	Outer Island Maritime Investment Project
PEAR	Preliminary Environmental Assessment Report
PM	Project Manager

PMU	Project Management Unit
PWD	Public Works Department
QEP	Queen Elizabeth Park
SECP	Stakeholder Engagement and Consultation Plan
SES	Social and Environmental Standards
SPC	Pacific Community
TC	Tropical Cyclone
TCAP	Tuvalu Coastal Adaptation Project
TCS	Tuvalu Cooperative Society
TEC	Tuvalu Electric Corporation
TPS	Tuvalu Police Service
TWG	Technical Working Group
UNDP	United Nations Development Program
USP	University of South Pacific
UXO	Unexploded Ordinance
WB	World Bank
WMD	Waste Management Department
YCA	Yellow Crazy Ant

1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

The Government of Tuvalu (GoT) has received funding from the Green Climate Fund (GCF) for the Tuvalu Coastal Adaptation Project (TCAP) which has the overall objective of reducing the vulnerability of Tuvalu to the impacts of coastal hazards associated with climate change. In turn, the islands of Nanumaga, Nanumea and Funafuti will be subject to the construction of hard and soft coastal protection infrastructure to reduce inundation and coastal erosion.

The proposed works at Funafuti were screened during the restructure of the GCF project (June 2019) and have been classified as 'moderate risk' according to UNDP Social and Environmental Standards. Moderate risk projects are those that include activities with potentially adverse social and environmental risks and impacts, but which are limited in scale, can be identified with a reasonable degree of certainty, and can be addressed through application of standard best practice, mitigation measures, and stakeholder engagement during project implementation.

This ESIA has been prepared in response to Tuvaluan law and overall aim is to provide an Environmental and Social Impact Assessment for all project elements on Funafuti, including ancillary sites and activities for the works. It provides a description of the baseline conditions and details the predicted qualitative and quantitative impacts of the project activities. It also provides the set of mitigation, monitoring, and institutional measures to be taken during the implementation of TCAP.

1.2 PROJECT SUMMARY

On Funafuti, land reclamation on the lagoon shore of Fogafale Island is proposed as the most appropriate coastal adaptation/protection solution. The proposed reclamation will start from the northern boundary of the Queen Elizabeth Park (QEP) reclamation area and extend to the northern Tausoa Beach groin (Figure 1). It will extend seaward to a similar extent as QEP and its overall dimensions will be approximately 710m in length by 100m wide, giving a total area of approximately 7.1Ha (17.5 acres) (Figure 1). It will require approximately 250,000m^3 of fill material.

Figure 1: Extent of TCAP reclamation works on Funafuti

The lagoon foreshore of the reclaimed land will be hardened with a well-designed and well-built retaining wall (bunding). The concept design of the bunding will be formed from geotextile mega bags overlaid with a protective layer of smaller geotextile bags (Figure 2). The surface of the reclaimed area will be graded to drain into stormwater channels on the landward side of the new area. The drains will be open channel drains with crossing points provided at intervals along its length (locations still to be determined). The open channel drains will be designed such that overland flow through the existing coastal village (of Vaiaku) will also drain into the channel.

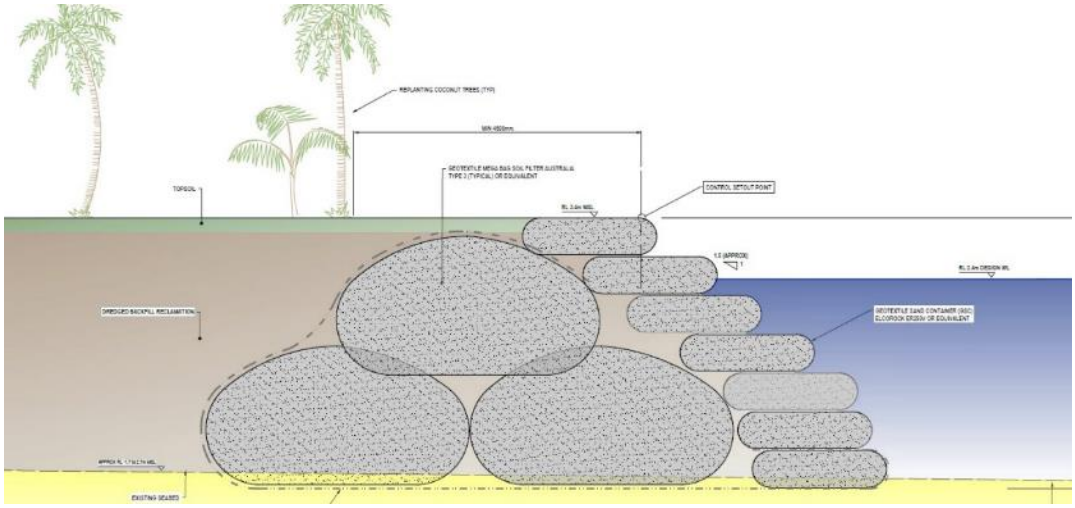

Figure 2: Funafuti Mega Bag Retaining Structure. Source: TCAP Concept Design Report (June 2020, draft)

The TCAP reclamation works will incorporate improvements to the small boat harbour at the northern end of the reclamation area, at the site of the existing Catalina Harbour and boat ramp area. The harbour will be protected by a breakwater made from rocks and will be fitted with bollards along its length for securing vessels. The harbour wall will be approximately 70m long and will be able to berth

small fishing vessels typically used in the area. The harbour will be accessible at all tides, it will be a public facility, and the primary point of access from land will be over the reclaimed area.

The proposed reclamation works will require an estimated 250,000m^3 of suitable fill material, which will be obtained from Fogafale lagoon. Previous successful dredging of the lagoon for similar volumes have used a cutter suction dredge, which has proven to be a cost-effective method. An indicative location for the proposed TCAP aggregate source area is presented as the yellow circle in Figure 3. The final location(s) will take into account the results of previous lagoon aggregate resource surveys to ensure that the selected location(s) have sufficient quantities of aggregate of the required quality to supply the 250,000m³ required for the reclamation area and of suitable quality to fill the geotextile mega bags forming the bund.

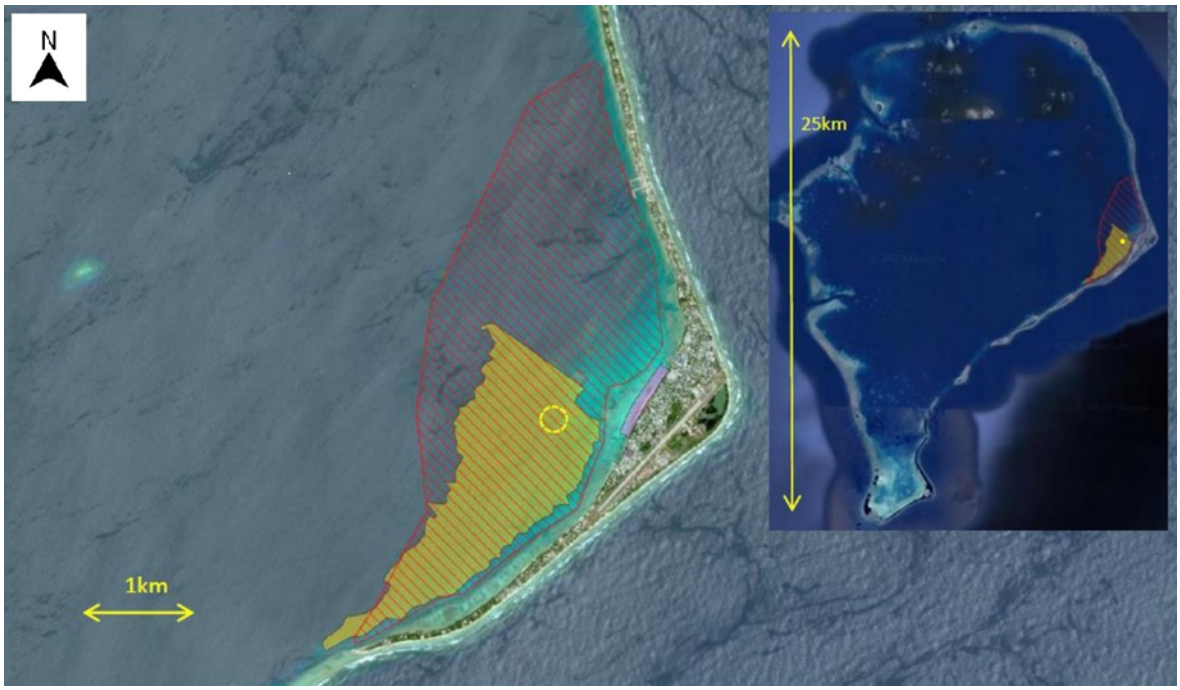

Figure 3: Indicative location of the proposed TCAP aggregate source area shown by the yellow circle. The orange polygon is the primary resource area identified by Smith (1995), and the red dashed polygon is the zone of dead coral and eutrophication mapped in the Tuvalu Borrow Pit ESIA

1.3 ENVIRONMENTAL AND SOCIAL MANAGEMENT

The planned works on Funafuti have the potential to create a variety of impacts through their implementation. These impacts can be either positive (e.g., additional safe raised land and improved coastal protection for community members) or negative (e.g., loss of beach access for recreation and fishing) depending on the activity and receptors involved. The impact of this project on the physical, biological, and social environment has been assessed and is described in detail in this report. The key potential project impacts and risks will occur during the construction phase of the project and have been identified as the following:

- Increased water turbidity during dredging works
- Changing access to, and use of, the coastal marine environment
- Loss of marine habitat in the immediate reclamation area
- Increased risk of traffic accidents during construction works
- Solid waste management associated with construction

- Use of heavy machinery on the beach leading to increased sedimentation during construction
- Fuel or other hazardous spills while construction machinery present
- Noise and dust disturbance during construction.

This ESIA contains the recommended mitigation measures for the Funafuti investments for pre-construction, construction, and operational phases in order to avoid, reduce, or mitigate all identified impacts. The tables (Appendix B) for each phase include details of the mitigation measures required, the cost allocation, the responsible entity(ies), and the applicable project phase. Monitoring measures are also provided for each project site. A summary of the key protective mitigation measures is provided in the table below.

The Contractor for the TCAP works will be required to produce a Contractor's Environmental and Social Management Plan (C-ESMP). The C-ESMP will be the Contractor's governing document for the implementation of this ESIA's recommendations during works. The C-ESMP will be developed, reviewed and approved by the TCAP Project Management Unit and disclosed prior to commencement of civil works.

Impact Area	Key Management Measures
Dredging and Fill Works	• Develop and implement a site-specific Dredge Management Plan and a Sampling and Analysis Plan to address water turbidity and water quality management. • Dredge method will be via a pipeline for conveying slurry to fill sites in order to minimise losses to lagoon waters. • Dredging will be limited to the sand excavation area identified in the ESIA • No ecologically significant areas are included in the design. Dredging concentrates on the zone of dead coral and eutrophication identified in the lagoon. • Dredge plume to be monitored and dredge works halted if plume extends further than 1km. • Controls in place to minimise wind-blown sediment from the reclamation into the surrounding households. • Dredge waters will be discharged within the revetment wall to allow filtering and control of dredge wastewater. • Strict control on de-watering release – by pumping to a contained area by using sediment curtains, and by route monitoring of turbidity – will be required in the C-ESMP. Care will be taken to ensure de-watering does not occur towards the island.

Retaining Structure	• Ensure comprehensive consultation are held with the boatowners along the shoreline and their views incorporated into the design process where possible. Design will be responsive to community feedback to the greatest feasible extent. • The retaining geotextile structure will be designed to absorb and reduce wave energy, prevent overtopping, and minimise any wave reflection issues • Reclamation works will not extend to existing terrestrial vegetation line. • Reclaimed land will drain to stormwater drain. • Set back area (for construction) will be defined as a minimum of 20m from seaward edge of reclamation and recommendations will be made to GoT to encourage this to be developed into a recreational area. • Catalina Harbour will be designed with safe loading of passengers in mind. A rock breakwater will be constructed at the northern extent of the reclamation bund to protect the Catalina Harbour. • Areas accidentally damaged during works will be restored by clean-up, re-contouring, and planting. • The removal and transfer to safer ground of epifaunal species such as sea cucumbers will be carried out by the Contractor to avoid burial. • Ensure that any erosion- and sediment-control devices are installed, inspected, and maintained as required. • No trees in the vegetation line will be removed or damaged during construction works. • Communities will be educated on best practices to use such as advise around not fixing anchors to the containers and to contact public works department if damage is observed. • Communities will be allowed the space, time and equipment needed to gather shells over subsequent levels of dredged sand
Noise and Vibration	• Minimise nuisance from noise, especially closer to residential areas and sensitive receptors, through establishment and communication to affected parties of working hours, including night works. • Care will additionally be taken to avoid increase of noise and quantity of work equipment outside of advertised hours and through populated areas. Advertise working hours at the site entrance. • Signage to outline complaints procedure and to provide contact details of recipient of complaints. • Contractor will develop a work schedule or operations with Kaupule to identify hours and days of no work due to religious and cultural activities.
Community Services and Infrastructure	• Through ongoing consultations, determine if the coastal reclamation could negatively impact fisherfolk, boat owners and users, and other potentially vulnerable groups in the community adjacent to the project site. • Explore additional and more culturally sensitive options for boat mooring for the adjacent community, other than the Catalina Harbour option. • Waste management practices will prioritise reduce, reuse, recycle • Preference shall be given to materials that can be used to construct the project that would reduce the direct and indirect waste generated. • All hazardous or contaminated waste will be exported from Tuvalu under the conditions of the Waigani Treaty and will be coordinated in consultation with the Waste Management Department. • Disposal of waste shall be carried out in accordance with the Government of Tuvalu requirements. Waste that cannot be recycled, reused, composted, or otherwise disposed of in Tuvalu will be exported and disposed of in a licensed facility in another country. • Any dangerous goods (including batteries) stored on site shall be stored in accordance with Tuvalu regulations and international best practice. • The Contractor will be responsible for repairing any damage caused by construction works to the existing road network. • Additional burden from the TCAP works on the freshwater supply will be avoided through water conservation practices and the use of portable desalination plants or dedicated water harvesting systems

Hazardous Substance Management	• Prepare spill management plan addressing measures. • Store and handle all chemicals, fuels, oils, and potentially hazardous materials as specified in relevant standards and guidelines. • Hydrocarbon wastes shall be stored in colour-coded and labelled drums placed in secure storage areas on site. • Where possible, fuel and chemical storage and handling shall be undertaken at designated petrol stations on the island or at the project site on impermeable, bunded surfaces (preferably over drip trays). • Onsite storage of fuel and chemicals shall be kept to a minimum. • Emergency clean-up kits for oil and chemical spills will be available onsite and in all large vehicles.
UXO/ERW	• The dredge will be fitted with a suitable screening mechanism to exclude explosive remnants of war (ERW). • Contractor will undertake an updated magnetometry survey of the proposed dredge area and identified magnetic anomalies (potential ERW) will be avoided during dredging. • The Contractor's C-ESMP will detail their protocols for safely handling and disposing of ERW in the event that any ERW are encountered during construction.
Social Environment	• Ensure opportunities to incorporate men's and women's views and interests into project decisions and implementation are purposefully created and enabled in the stakeholder engagement processes throughout the project life. • Create community recreational and social areas within the 20m construction set back area on the reclaimed land. • Develop and implement a communication plan for the project and in particular the messaging that the Catalina Harbour is a public facility for all community members. • The communities, in coordination with their Kaupule, will provide the Contractor with a list of skilled and unskilled laborers. The Kaupule will also coordinate with the villages to ensure that job opportunities are fairly distributed. Women will be encouraged to participate in the workforce and in uptake of job opportunities. Persons with disabilities will also be encouraged to participate in the workforce and with jobs that are appropriate and significant. • The island community will have the opportunity to provide food, beverages, and housekeeping services for incoming workers to the island for 3-4 months. Provision of food services; provision of fresh water or coconuts; sale of food items such as local fruits, root crops, vegetables, etc.; sale of handicrafts; and laundry services are examples of income-generating activities.

2 INTRODUCTION

2.1 PROJECT BACKGROUND

Tuvalu is the fourth-smallest nation in the world. It comprises nine inhabited islands with a population of 10,640 and a total land area of 26km^2. Funafuti atoll, where the nation's capital is located, is home to about half the population. With extremely low elevations above sea level, Tuvalu is one of the most vulnerable countries in the world to the impacts of climate change in the form of sea level rise, inundation, and extreme weather events. This high level of vulnerability, along with general development challenges, are likely to have severe long-term effects on sustainable development in the country.

The Government of Tuvalu (GoT) has received funding from the Green Climate Fund (GCF) for a project that enables them to implement measures that are urgently required to reduce the impact of increasingly intensive wave action on key infrastructure as a result of climate change-induced sea-level rise and intensifying storm events. Building coastal resilience is an urgent national priority, and the formulation of this 7-year project – the Tuvalu Coastal Adaptation Project (TCAP) – has been led at the highest political level by a Technical Working Group (TWG) comprising key government departments and non-governmental organisations (NGOs) representing vulnerable communities.

Implemented by the United Nations Development Programme (UNDP) in partnership with the GoT, TCAP's overall objective is to reduce the vulnerability of Tuvalu to coastal hazards associated with climate change and sea level rise. Three islands – Nanumaga, Nanumea and Funafuti are to receive construction of hard and/or soft coastal protection infrastructure to enhance coastal adaptation and reduce inundation and coastal erosion.

The GCF financing, through TCAP, is enabling the GoT to address the financial and capacity constraints at all levels – from technical to community awareness – that have so far prevented a sustainable coastal protection solution. TCAP targets areas which have a high concentration of settlements with expected direct benefits to 3,100 people, or 29% of Tuvalu's population. It is expected that TCAP will make 35% of high-value vulnerable coastline (2.7km in length) more resilient to the effects of increased wave intensity and sea level rise. The project will also strengthen institutional and community capacity for sustaining and replicating project results.

The project has three inter-related outputs that aim not only to achieve impact potential but also to enable conditions for scaling up and replicating the project impact beyond the immediate target areas. The outputs will lead to longer-term outcomes which include reduced vulnerability of Tuvalu to future impacts of climate change, reduced loss from potential natural disasters, enhanced livelihoods, and food and water security. All these outcomes contribute to strengthening climate-resilient sustainable development of the country.

Two Environmental and Social Impact Assessments (ESIA) have been prepared to support the development of coastal projection on these three islands. The Pacific Community (SPC) has was engaged by the UNDP to conduct the ESIAs for these three islands. This document is the ESIA for the Funafuti components of the project.

2.2 SCOPE AND OBJECTIVES

The proposed physical works associated with the project at Funafuti were screened during initial GCF project appraisal and have been classified as 'moderate risk' according to the UNDP Social and Environmental Standards (SES). Moderate risk projects are those that include activities with potential adverse social and environmental risks and impact, that are limited in scale, can be identified with a

reasonable degree of certainty, and can be addressed through application of standard best practice, mitigation measures and stakeholder engagement during project implementation. The UNDP SES does not require a full ESIA to be prepared for projects of moderate risk, however as noted below, Tuvaluan law requires the preparation of an ESIA for the Funafuti works.

To support the implementation of this moderate risk project, this ESIA has been produced to ensure integration of environmental and social stewardship into the project as required by Tuvalu's Environmental Protection (Environmental Impact Assessment) Amendment Regulations 2017 and to also fulfill the requirements of the Green Climate Fund's project approval process. This ESIA relates to the Funafuti works; the Nanumaga and Nanumea works are addressed in a separate ESIA.

As the project is an adaptation intervention, positive environmental and social impacts are recognised to reduce vulnerability to climate change and vice versa. This study defines vulnerability as the susceptibility of being harmed when exposed to an external shock or hazard primarily driven by climate change[1]. Therefore, this report assesses the direct and indirect environmental and social impacts of the coastal protection infrastructure in the context of climate vulnerability.

The overall aim of this report is to provide an ESIA for the hard and soft coastal protected infrastructure proposed for Funafuti, which encompasses all project elements including ancillary sites and activities for the works. As part of that process, this ESIA has undertaken screening of the projects and scoping of the potential impacts; it provides a description of the baseline conditions, and it details the predicted qualitative and quantitative impacts from the project activities. It also provides the set of mitigations, monitoring, and institutional measures to be taken during the implementation of TCAP to avoid, offset or reduce adverse environmental and social impacts to within acceptable levels. The ESIA also focuses on safeguard management through project implementation by providing clear instructions, responsibilities and guidelines to Contractor, Engineers and the TCAP Project Team.

The Tuvalu Department of Environment (DoE) has produced a Scoping Form for Funafuti, which has determined the scope of this ESIA under Section 5 of the EIA Screening Template of the Environmental Protection (Environmental Impact Assessment) Amendment Regulations 2017. The form lists the DoE TOR for the TCAP ESIA (Appendix 1), which has been used to guide the contents of the report.

In addition to this, the Green Climate Fund and the UNDP both have environmental and social standards or policies that describe how both entities integrate environmental and social considerations into their decision-making and operations to effectively manage environmental and social risks and impacts and improve outcomes. The ESIA has also been developed in compliance with these standards to ensure that the TCAP works are managed appropriately - especially on matters related to integrating environmental and social considerations into decision-making and operations to effectively manage environmental and social risks and impacts and to improving outcomes. The ESIA is guided by human rights, gender equality and environmental sustainability principles as emphasised in the following resources:

- GCF Environment and Social Policy[2]
- UNDP Social and Environmental Standards[3]

[1] Adger, W. N. (2006). Vulnerability. *Global environmental change*, *16*(3), 268-281.
[2] The Green Climate Fund, 2018, *Environment and Social Policy*, GCF
https://www.greenclimate.fund/sites/default/files/document/environment-social-policy.pdf
[3] UNDP, 2014, Social and Environmental Standards.
https://www.undp.org/content/undp/en/home/librarypage/operations1/undp-social-and-environmental-standards.html

2.3 INTEGRATION OF THE ESIA

It is the responsibility of the TCAP Project Management Unit (PMU), to ensure that the requirements of the TCAP ESIA are fully integrated into all project preparation and planning. The ESIA shall form part of any bid documentation for physical works, and it shall be the PMU's responsibility to ensure that any bid documentation is subject to review against the mitigation measures stipulated in this ESIA to ensure that all appropriate safeguard measures are captured at the bid stage.

It is further the responsibility of the PMU to ensure that the mitigation and monitoring plans within this ESIA are considered in review of any Terms of Reference for Technical Assistance developed for the project. The safeguard requirements for any design or supervision of the project will be fully integrated into the TOR to ensure that all safeguard responsibilities allocated within the ESIA are realized at the tender stage.

In this way, the management measures in this ESIA will be fully integrated within TCAP, enabling them to be fully appreciated by all responsible parties in order to achieve successful implementation.

2.4 DISCLOSURE

As part of the requirements of the law in Tuvalu, GCF policy, and UNDP SES, the ESIA is to be publicly disclosed. Disclosure will be the responsibility of the TCAP PMU. The PMU will ensure the ESIA Executive Summary is translated into Tuvaluan prior to disclosure in hard copy at the TCAP office and at the Department of Environment on Funafuti and on their website.

3 PROJECT DESCRIPTION

3.1 PROJECT SITE

This ESIA focuses on the Funafuti project site (Figure 4). The coastal protection works will take place along a section of the lagoon-side coastline bounded to the south by the newly reclaimed Queen Elizabeth Park (QEP) and in the north by the WW2 Catalina Harbour. The site has been subject to beach protection and nourishment work[4] in recent years, which has created a new, artificial sandy beach for the community and fishing boats to use. Prior to this, the proposed project site was an erosive, rocky shoreline. The original sandy beach was lost in 1943 during dredging and reclamation works associated with WW2 military engineering.

TCAP proposes to undertake land reclamation on this 710m section of shoreline (Figure 5), which has been identified as a high vulnerability coastal area in terms of its relationship between the shoreline exposure to marine hazards and the location of the concentration of people, property and infrastructure. [5] The TCAP reclamation will extend seaward as far as the pre-existing features (approximately 100m). The proposed works will provide robust coastal protection to the island and will also provide much needed additional safe, flood free raised land and by extension, also help alleviate the pressure on the existing overcrowding and reduce the propensity for new settlements in increasingly marginal exposed sites.

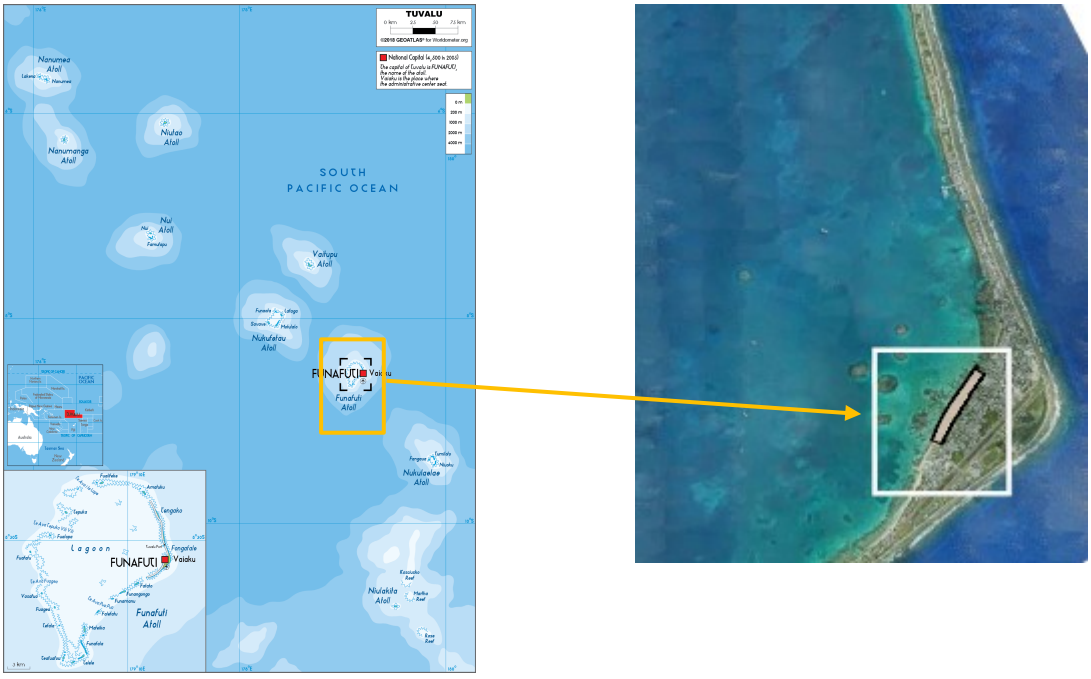

Figure 4: TCAP Project sites bounded by white boxes on Funafuti

[4] Tuvalu Tausoa Beach Nourishment Project, JICA 2015
[5] Webb, A. 2018. TCAP Technical Report: Evaluation of Priorities and Options to Address Coastal Hazards in Fogafale.

Figure 5: Proposed project reclamation site between Queen Elizabeth Park and Catalina harbour

3.2 SCOPE OF WORKS

The scope of works described below are based on the currently available design plans contained in the Draft TCAP Concept Design Report[6].

On Funafuti, land reclamation on the lagoon shore of Fogafale is proposed as the most appropriate coastal protection solution. The proposed reclamation will start from the northern boundary of the Queen Elizabeth Park (QEP) reclamation area and extend to the northern Tausoua Beach groin. It will extend seawards to a similar extent as QEP and its overall dimensions will be approximately 710m in length by 100m wide giving a total area of approximately 7.1Ha (17.5 acres) (Figure 6) and will require approximately 250,000m^3 of fill material.

[6] Lewis, J and Webb, A. 2020. TCAP Concept Design Report (draft)

Figure 6: Extent of TCAP reclamation works on Funafuti

The reclamation will be filled to a height at least 2m above the highest measured sea level at Funafuti (highest astronomical tide (HAT). The surface will be sloped to ensure good drainage and will have a natural berm and buffer at the seaward edge to help provide a minimum 20m 'construction set back' area from the landward edge of the reclamation bund. The lagoon foreshore of the reclaimed land will be hardened with a well-designed and well-built retaining wall (bunding). The concept design bunding show geotextile Mega Bags overlaid with a protective layer of smaller geotextile bags (Figure 7). As can be seen in Figure 7, the retaining Mega Bag wall will sit directly on the reef flat, the reef surface will need to be prepared and scraped to provide hard strata to minimise the possibility of settlement of the bund. The TCAP reclamation will be designed to ensure that ties into the existing QEP reclamation without causing any damage to it.

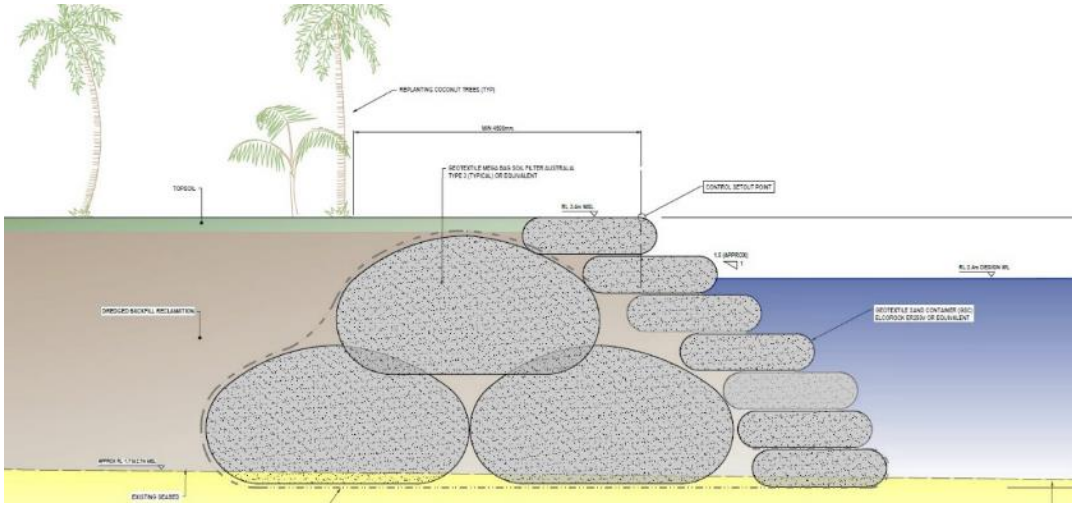

Figure 7: Funafuti Mega Bag Retaining Structure. Source: TCAP Concept Design Report (draft)

The surface of the reclaimed area will be graded to drain into stormwater channels on the landward side of the new area. The drains will be gently sloped (1:4) open channel drains with wide culverts along its length to enable pedestrians and vehicles to traverse across unnoticed. Localised filling will be carried out on the existing coastline as necessary to match the top of the proposed stormwater drains (Figure 8) and ensure overland flow paths from the existing coastal settlement.

Figure 8: Overview of proposed reclaimed land with drainage on the land side (green) and potential land side infill areas highlighted (red bounded box)

The TCAP reclamation works will incorporate improvements to the small boat harbour at the northern end of the site, in the existing Catalina harbour and boar ramp area (Figure 9). The harbour will be protected by a breakwater made from rocks that will be reclaimed from the two existing beach groins located with the reclamation area. The harbour wall will be geotextile bags, which will be staggered to enable them to be used as steps by users of the harbour. The harbour wall will also be fitted with bollards along its length for securing vessels. The wall will be 70m long and will be able to berth small fishing vessels of the size that currently typically use the area. The harbour will be able to be accessed at all tides and will be a state-owned public facility. The primary point of access to the harbour from land will be over the reclaimed area.

Figure 9: Existing structures at Catalina Harbour (left) and proposed design for new harbour (right)

3.3 CONSTRUCTION METHODOLOGY

Work will commence on the current shoreline and work its way out to the bunded wall location, creating a workable platform for the excavator and other machinery. Once at the bund location, the excavator will scrape the covering sediment from the reef flat and lay out the mega bags to be filled using dredged sand. The mega bag bunding walls will be completed and then the rest of the reclamation area will be backfilled. The mega bags will be laid out as close to low tide as practical so that water depth will be 1m or less.

Construction machinery and equipment will be needed. Excavators and dredging equipment will be needed, as well as machinery to help place and fill the mega bags. There is existing machinery on Funafuti that may be used for the project if it is in good working order and available, but it is possible that all required items will need to be shipped into Funafuti and delivered to the project site.

For equipment that needs to be shipped in, it will be the responsibility of the Contractor to develop their methods for shipping the required equipment and materials and to ensure that no adverse environmental or social impacts occur as a result of shipping, loading, unloading, or haulage.

3.4 SOURCE MATERIAL DREDGING

The proposed reclamation works will require an estimated 250,000m^3 of suitable fill material, which will obtained from Funafuti lagoon using a suitable dredge. Previous dredging[7,8] of the lagoon for similarly scaled volumes has proven this to be a cost effective and successful method. The materials to be dredged will be obtained from the lagoon using a suitably experienced and qualified contractor who

[7] Queen Elizabeth Park Reclamation, Funafuti 2016
[8] Tuvalu Borrow Pit Reclamation Project, Funafuti, 2014

will bring the necessary equipment and ensure that the requirements of this ESIA are followed during the works as part of the contract.

An indicative location for the proposed TCAP aggregate source area is shown by the yellow circle in Figure 10. The indicative location is within the primary resource area (24 million m³) identified by Smith (1995) and within the zone of dead coral and eutrophication identified by Kaley and Peacock (2014). This location (yellow circle) is indicative only and the final location(s) of the TCAP dredging will be determined once a dredging contractor has been selected as there are a number of considerations that will determine the final location/s.

The specific considerations that the TCAP experts will take into account when selecting the final dredging location(s) with the dredge contractor include the following: operational limits of the dredge equipment, health and safety risks, mapped sediment thickness and characteristics, specific design requirements of the reclamation, future reclamation plans, feedback from community consultations, and economic factors. Operational limits of the dredge equipment that will be taken into account when selecting the final location(s) include the maximum depth of operation and distance to pump dredged material to the reclamation area. Risks posed by UXO are site-specific health and safety hazards, which will impact the final location of the dredging, and which will be managed in conjunction with the selected dredging contractor.

The final source location(s) will take into account the results of the previous lagoon aggregate resource surveys to ensure that the selected location(s) have sufficient quantities of aggregate to supply the 250,000m³ for the reclamation area and suitable quality to fill the mega bags required by the project. This will include, through a required Sampling and Analysis Plan, ensuring the selected location(s) can cater to the specific quality requirements (namely clean sand) of the geotextile mega bags which will be installed on the exterior of the reclamation. Any areas previously identified as having a relatively high silt component will be avoided to minimise any potential turbidity and sedimentation issues. The final location will take into account prospective future plans for further reclamation in the shallow areas of the lagoon adjacent to Fongafale islet. The final location(s) will be seaward of the prospective reclamation areas in order to prevent the creation of excavations which would require further infilling during any future reclamation works. Feedback from community consultations will be taken into account when deciding on the final location(s), in order to mitigate (as far as practically possible) any concerns the community may have in terms of the location of the dredging. Finally, the economics of dredging will be taken into account when selecting the final location(s) – specifically, the proximity of the location(s) to the area of reclamation.

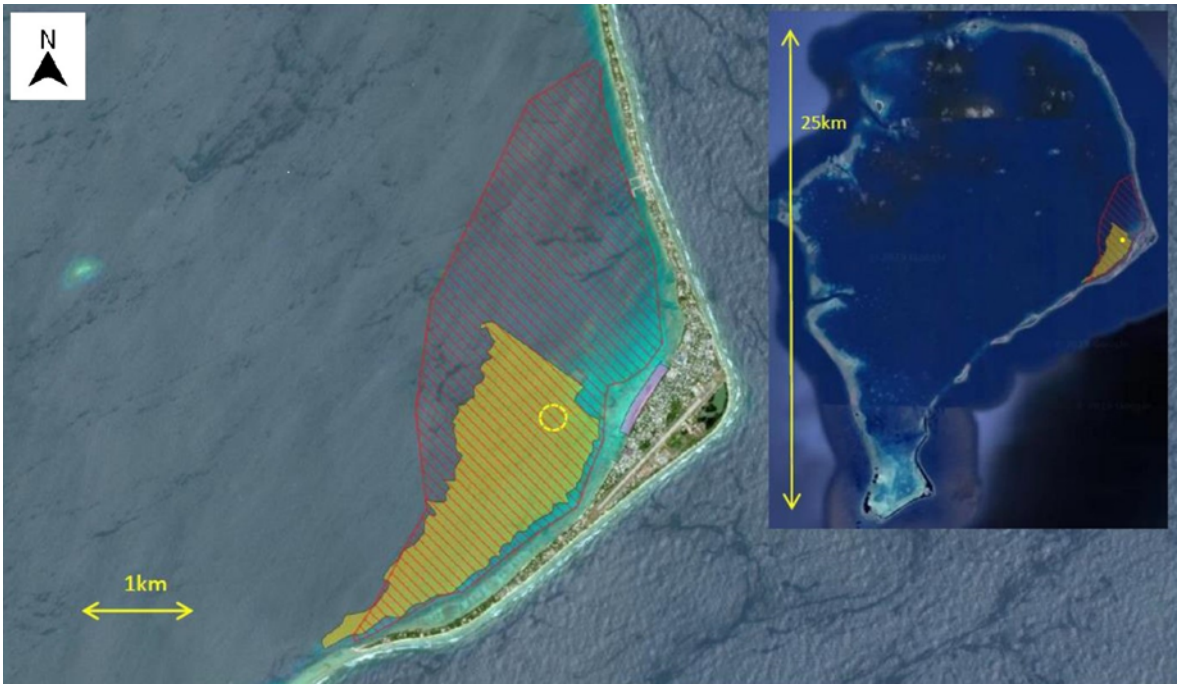

Figure 10: Indicative location of the proposed TCAP aggregate source area shown by the yellow circle. The yellow polygon is the primary resource area identified by Smith (1995), and the red dashed polygon is the zone of dead coral and eutrophication mapped in the TCAP Borrow Pits ESIA. Source: Webb and Hawes, 2019

Dredging is most likely to be done using a suction dredge. Such dredges are unavailable in Tuvalu and would be bought in from elsewhere. Such dredges suck material by means of specialised sand pumps and discharge through a floating pipeline which terminates at the deposit area. During dredging, the vessel remains fixed in the same location using spuds and/or anchors while the dredge arm swings sideways and the suction head removes the sand. Figure 11 shows an example of a typical suction dredge, while Figure 12 shows a pipeline coming ashore from the dredge vessel. Due to the weight of such pipelines, heavy machinery is often required to reposition them on land.

Figure 11: Example of suction dredge with dredge pipe off stern. Source: Fogafale Lagoon Shore Reclamation Preliminary Environmental Assessment

Figure 12: Dredge pipeline on shore for the Tuvalu Borrow Pit Reclamation Project. Source: Hall Contracting

4 ANALYSIS OF ALTERNATIVES

4.1 INTRODUCTION

The primary objective of the TCAP project is to provide improved climate resilience in the form of coastal protection to the exposed high value shoreline of the target islands, including Funafuti, in a way that provides unhindered support to the existing coastal processes. This section examines the technically and financially feasible alternatives to achieve the objectives on Funafuti. These alternatives were considered during the project design development[9] and have led to the validation of the project as it is described in Section 3.

4.2 THE 'NO PROJECT' ALTERNATIVE

The 'no project' alternative for the purposes of this ESIA is the situation where the coastal protection works do not proceed on Funafuti. Under this scenario, there are no adverse environmental or social impacts caused by the reclamation works.

However, the need to protect the high value shoreline of the island, and therefore the need for the project, is driven by the government and the community's stated need to protect the island's community and infrastructure from the increasing impacts of storm-driven marine flooding. Should the project not proceed, shoreline inundation events will continue to worsen, and related safety risks currently experienced by the community will be exacerbated and will likely increase as the effects of climate change become more pronounced. Furthermore, as Funafuti is already densely developed and there is scarcity of available land, 'no project' would likely mean that people and assets would have little option other than to adapt to living in suboptimal conditions, as there is nowhere available for relocation.

The 'no project' option is not considered to be a feasible or sustainable option in the opinion of this ESIA. The 'no project' option does not meet the community and government goals.

4.3 ALTERNATIVE INTERVENTION LOCATIONS

During early project development, a number of intervention locations along the high value lagoon shore were assessed[10] (Figure 13). The scoping report identified that of the 'zones' along the high value coast, either zone 3 and 4, or zone 6 were those that would be most suitable for TCAP to target under the project. In zone 6, the shoreline runs very close to a number of properties and also to the main road. There is very little in the way of a buffer between the lagoon and the infrastructure, making this a vulnerable section of the developed shoreline. Zone 6 is also the longest stretch of vulnerable coastline. Zones 3 and 4 do currently have a buffer of a sand beach providing them with some level of resilience to marine flooding; however, the beach is artificial and without ongoing and substantive nourishment works, it will eventually be lost though erosion, which will increase the vulnerability of this shoreline zone significantly.

Ultimately, the decision over which zone to target under TCAP works was determined by the available budget and the understanding that, for the most effective and complete intervention with the available funds, zones 3 and 4 were the only viable and constructive option. This decision was also balanced with the fact that the GoT does have plans for ongoing reclamation along the lagoon foreshore, and this will

[9] Webb, A. 2018. TCAP Technical Report: Evaluation of Priorities and Options to Address Coastal Hazards in Fogafale.
[10] Tuvalu Coastal Adaptation Project Detailed Project Proposal Document, UNDP, April 2017

eventually include works in zone 6. The decision to target zones 3 and 4 was made collaboratively with the government and other key stakeholders, after weighing up all the options.

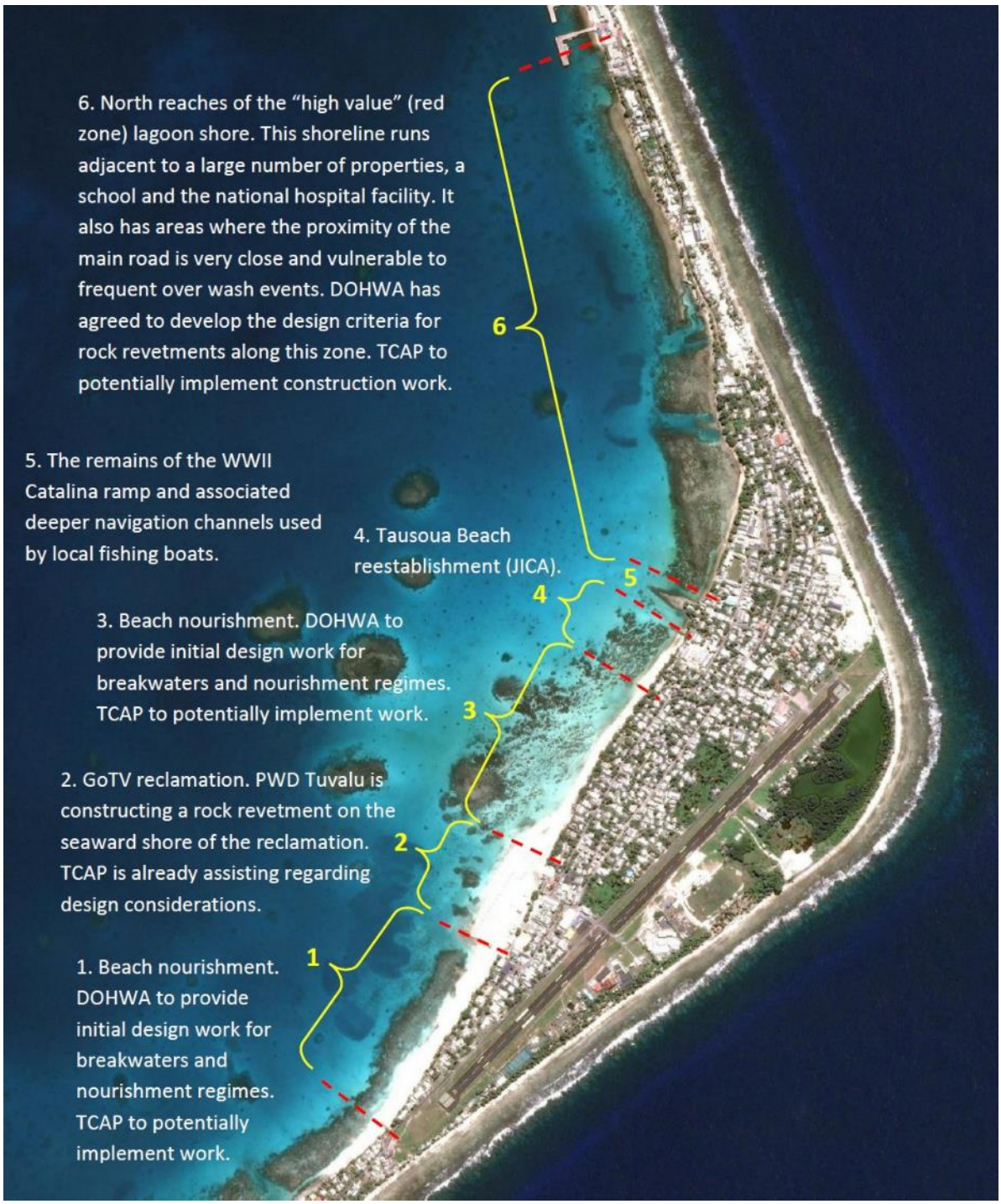

Figure 13: High value shoreline of Funafuti zoned and discussed to inform the final location selection of TCAP. Source: TCAP Technical Report: Evaluation of Priorities and Options to Address Coastal Hazards in Fogafale.

4.4 ALTERNATIVE DESIGN APPROACHES

When looking at the design alternatives for TCAP, the main considerations have been either reclamation of an area, ongoing nourishment to create and/or maintain existing artificial beaches, or

the creation of a foreshore seawall. Foreshore seawalls can stabilize the foreshore position and prevent nuisance wave overtopping if well designed. However, lagoon foreshore seawalls cannot address the increasing issue of marine flooding of low-lying land caused by sea level rise. It was also important to consider that a foreshore seawall would become obsolete in the face of the GoT's ambitions to undertake further reclamation works and eventually move the shoreline beyond any constructed seawall.

There has been reasonable success with beach nourishment on the Fogafale lagoon foreshore; however, there is no evidence that regimes of subsequent nourishment can be implemented. This exacerbates the additional risks regarding use of any perceived "new land" accreting via nourishment efforts and the subsequent loss and damage that will occur.

Foreshore reclamation has been identified as the preferred solution as it is the only engineering alternative that provides a complete suite of potential benefits: shoreline stabilization, wave overtopping protection, and provision of higher, safer land. Reclamation interacts positively with the situation of exposure to cyclone waves on the oceanside coast of Fogafale because it provides safe land, which lessens the pressure to build in ever more exposed locations near the ocean-side berm. Likewise, in the case of landfall of another catastrophic event such as cyclone Bebe (1972), a community shelter built on the raised lagoon shore land would be the only safe, flood free infrastructure on island. Finally, on low-lying atoll islands with such scant land resources, well planned and implemented reclamation is the only pragmatic, viable solution to flooding associated with long-term sea-level rise.

Additionally, reclamation has the potential to generate new freshwater resources via 1) the collection and storage of rainwater from the roofs of buildings constructed on the reclamation, and 2) the potential development of a new freshwater lens in the area of the reclamation.

4.5 ALTERNATIVE RETAINING REVETMENT OPTIONS

The draft concept design report[11] provides a high-level assessment of the various design options for the reclamation retaining structure.

Rock revetment bund: a rock revetment would sit on the same footprint as the proposed geotextile structures. Rock revetments would provide voids and hollows that would reduce the reflection of waves hitting the outer wall. However, there are no suitable local sources of rocks large enough to afford protection from the wave heights expected to be generated within the lagoon. As such, all rock would need to be imported and would add significant cost to the project. Concrete armour units would incur the similar significant costs as imported rock.

Sheetpile bund: A sheetpile bund was also assessed for the Funafuti reclamation. For installation, dredging and reclamation, work would be completed all the way to the seaward edge of the footprint and the sheetpiles would then be driven into the desired location. Any sediment seaward of the sheetpiles would be reclaimed using a long arm excavator and placed within the reclamation area. It is highly recommended that the sheetpiles have some sort of concrete capping running along their top edge. This capping beam would inhibit corrosion and protect the sheetpiles from any damage that may be caused by vessels (inevitably) berthing against the structure. Sheetpile bunds were determined to be unsuitable for this project. As the sheetpiles would be in the water for most of their design life, there is a serious risk of Advance Low Water Corrosion (ALWC), which forms just below the waterline of unprotected steel structures in marine environments. In addition to this, as well as this being a less

[11] Lewis, J and Webb, A. 2020. TCAP Concept Design Report (draft)

aesthetic options, the cost for regular application of coatings like silane as well as installation of anodes would also need to be factored into any maintenance plan for the structure.

5 POLICY, LEGISLATIVE AND REGULATORY FRAMEWORK

5.1 INTRODUCTION

The policies, legislation, regulations, and environmental standards of the GoT that pertain to this development, along with all applicable GCF and UNDP safeguard policies and standards, have been assessed to ensure this project complies with all legal requirements. The subject areas reviewed include environmental quality, health and safety, protection of critical habitats, protection of endangered species, site selection gender and social inclusion, stakeholder engagement, culture and heritage protection, equitable economic development and land use control at the local and national levels.

Ministry of Foreign Affairs, Trade, Tourism, Environment and Labour (MFATTEL) has the responsibility for administering the Environmental Protection Act (2008) and the Environmental Protection (Environmental Impact Assessment) Regulations (2012). Within MFATTEL, the Department of Environment (DoE) has the responsibility, under the legislation, for reviewing, assessing, and monitoring projects.

For all development projects on Tuvalu, a Preliminary Environmental Assessment report (PEAR) is required in accordance with Regulation 8, and a full EIA must be prepared for activities with potential for significant impacts as identified in the PEAR, meaning that an EIA isn't automatically triggered for every proposed project. In the case of TCAP, the DoE has already determined that a full EIA is needed for the proposed works on Funafuti and has issued the required TOR for the EIA in DoE Scoping Forms for Development Approval (Appendix D). Furthermore, the UNDP SES requires that an environmental assessment be carried out for all Moderate Risk projects, although not necessarily a full ESIA. This assessment fulfills all GCF and UNDP policies as well as applicable national laws and will be used as the basis for the Development Approval request submission to the DoE.

5.2 APPLICABLE TUVALU POLICIES, LEGISLATIONS, REGULATIONS AND STANDARDS

5.2.1 Environmental Protection Act 2008

The Environmental Protection Act (EPA) is the principal law governing the protection and management of the environment. This Act defines the GoT's role in relation to all environmental management and decision-making processes. In relation to this ESIA, one of the principle roles of the EPA is outlining the requirements and making provisions for an EIA and monitoring of environmental impacts.

Under the EPA, the DoE is also responsible for ensuring the proper regulation, monitoring, and control of solid wastes to minimise its impact on environmental quality. The DoE is mandated to regulate waste collection and disposal systems and set operational standards by applying guidelines for waste management operations within Tuvalu.

The Act also authorises the Minister to make regulations relating to pollution control, waste management, hazardous wastes and substances, and other matters. Section 16 of the Act permits the Kaupule[12] on each island to set up an Island Environment Committee whose functions are to identify priority environmental concerns, liaise with the DoE or the Minister, and participate in programs undertaken by the DoE.

[12] The Kaupule is an elected body that acts as the executive arm of the Falekaupule which is a traditional assembly of elders with legal powers and functions to govern their respective islands of origin.

5.2.2 Environmental Protection (Environmental Impact Assessment) Regulations 2012

The regulations detail the required content of an EIA and this ESIA has been developed according to these stipulations. In brief, the regulations require a full assessment to contain (a) a summary of the development proposal and its consequences; (b) a description of the development proposal and objectives; (c) a description of the development proposal including technical description, site boundaries and justification for the proposal; (d) review of the alternatives; (e) a description of the affected environment; (f) analysis of environmental consequences. In addition to these requirements listed under Regulation 21, a full assessment of baseline conditions and a schedule of compliance monitoring will be included in the EIA.

The Regulations also make provision for the DoE to identify and use a suitably skilled and qualified external review consultant to support the DoE at the cost of the project proponent.

The Regulations state that after review of the full assessment, the DoE may issue instructions for the proponent to undertake consultations and may provide full details for the proposed consultation process.

5.2.3 Waste Operations and Services Act 2009

This Act, in combination with the EPA, gives the DoE responsibility for waste management in Tuvalu and the collection and disposal of solid waste and other wastes related operations. The DoE is also responsible for implementing the international conventions relating to the management of hazardous wastes. Additionally, the regulatory control of waste dumps and waste disposal sites shall be exercised by the DoE in relation to environmental impact assessment and the imposition of standards, and the designated waste management operators relating to the management of wastes.

The Act states that waste dumps and waste disposal sites shall be managed by each Kaupule or the Solid Waste Agency (SWA), if the need exists for additional technical and operational capacity for the proper disposal of wastes. In the context of TCAP, as the project is taking place on Funafuti, the SWA will be an important stakeholder in the waste management plan. The storage and disposal of hazardous wastes shall be undertaken in consultation with the SWA.

Section 12 of the Act states that all landfill sites, waste dumps, and waste disposal facilities in Tuvalu must be licensed by the SWA.

5.2.4 Conservation Areas Act 2008

The Conservation Areas Act (CAA) makes provisions for the declarations and management of conservation areas. The Minister may declare any part of the territory of Tuvalu as a conservation area (CA) upon the request of a Kaupule after due consultation with the Kaupule recommending the establishment of a CA. The objectives of the CA are to protect the coastal, marine, and terrestrial environment; to conserve the living and non-living natural resources of the island communities and to provide for their sustainable utilization by present and future generations; to preserve biological diversity of the CA, especially those species that are endemic, threatened, or of special concern and the coastal and marine habitats upon which the survival of these species depend.

Of Tuvalu's eleven (11) marine and terrestrial CAs, only Funafuti CA is covered by a formal Marine Protected Area declaration that has been legally gazetted under this law.

5.2.5 Employment Act 2008

This Act outlines the obligations of employers towards their staff. In the context of the TCAP project there are several aspects that are noteworthy. Firstly, the employer requires a recruitment license

when: (a) the employer employs more than 25 people at one time; or (b) the workers are to be recruited from more than 25 miles (40km) from the place of work. The issuance of this license is to enable the GoT to consider the impact of removing a number of adult males from their home area for the duration of employment. The application for this license requires detailed information on the health, safety and welfare of the employees.

Secondly, section 43 of this Act states that no person shall recruit a worker under the apparent age of 18. The Commissioner may grant permission to employ persons from 15 years of age with parental or guardian consent for employment in Tuvalu for light work duties.

The Act also stipulates the maternity arrangements for female employees, including 12 weeks paid maternity leave with at least 25% of her regular salary. The Act also makes provisions for the allowance of twice daily breaks to breastfeed any nursing babies. This Act also protects women from dismissal for absences relating to pregnancy complications, unless this absence exceeds 12 weeks.

Part XI of the Act provides for the care of workers and details the legal requirements governing the following: rations, water, sanitary arrangements, housing, medical care and treatment, hospital maintained by the employer, conveyance of workers by sea and reporting of deaths.

5.2.6 Laws of Tuvalu Act Cap. 1.06

To complement the Constitution and Acts of Parliament, this act declares other sources of law that apply in and may be enforced by the courts in Tuvalu. One such source is “customary law” that is defined as “the customs and usages, existing from time to time, of the natives of Tuvalu”. These are referred to in some laws as the “aganu” of Tuvalu. The basic rule is customary law shall have effect as part of the law of Tuvalu, unless it is inconsistent with a written law or its application is likely to cause injustice or is not in the public interest.

Schedule 1 of this Act provides guidance for the determination and recognition of customary law. Clause 4 of this schedule says that in relation to civil matters, customary law may be applied or recognized in selected matters such as:

(a) the ownership by custom of or of rights in, over or in connection with land owned by a native or natives (in this Schedule referred to as “native land”) or –

(i) anything in or on native land; or

(ii) the produce of native land, including rights of hunting on, or gathering, or taking minerals, from, native land; or

(b) the ownership by custom of rights in, over or in connection with any area of the territorial sea or any lagoon, inland waters or foreshore, or in or on the seabed, including rights of navigation, fishing or gathering.

(c) the ownership by custom of water, or of rights in, over or to water; or

(d) the devolution of native land or of rights in, over or in connection with native land, whether –

(i) on the death or the birth or the adoption of a person; or

(ii) on the happening of a certain event; or etc.

The relevance of this law is that customary rights over coastal waters and resources (such as fishing rights), foreshore and land areas are recognized by the law and should be respected and appropriately acknowledged in order to ensure that the local communities buy-in and support the project.

5.2.7 Public Health and Safety Regulations (Revised 1990)

These regulations set out the required standards in and around villages for maintaining public health. In relation to TCAP, the following regulations are applicable:

- No stagnant water shall be allowed to lie in such lands for more than 24 hours unless treated to the satisfaction of a sanitary inspector by efficient drainage or with petroleum or other suitable oil
- No tins, bottles or receptacles capable of holding water shall be allowed to remain upon any such premises or land
- All tanks, vats and vessels used for retaining water shall be efficiently covered with mosquito proof gauze, or shall be treated with petroleum or other suitable oil to the satisfaction of a sanitary inspector
- No person shall deposit or cause to be deposited any empty tin, bottle or other receptacle in any street road or public place
- Every house or building in daily occupation shall be provided by the owner thereof with latrine accommodation approved by the sanitary inspector and,
- All garbage and rubbish which can be readily destroyed by fire shall be so destroyed; and all other garbage and rubbish shall be placed in tins and covered with fly proof covers, and such tins shall be placed daily in positions convenient for collection.

5.2.8 Foreshore and Land Reclamation Act (1969)

Under this Act the State owns the foreshore and the seabed. This is subject to public rights of navigation, fishing and passing over foreshore as well as any private rights which may exist. “Foreshore” is defined as “the shore of the sea or of channels or creeks that is alternately covered and uncovered by the sea at the highest and lowest tide”. In short, this refers to the intertidal zone. The Act further states (4(1)) that the Minister may, in accordance with this section, authorise the reclamation of land over and upon the foreshore or the seabed irrespective of the ownership of land bordering on or of whether any land borders on such foreshore or sea-bed.

Conditions of this Ministerial authority (Subsection 4(2)) are subject to:

Notification of the proposed reclamation shall be published:

(a) in two successive issues of a government publication.

(b) by being broadcast on two successive days over the Tuvalu radio: and

(c) by posting at each police station on the island where the land is to be reclaimed.

Notification under subsection 4(2) shall:

(a) describe the proposed reclamation and give the approximate area to be occupied in connection therewith; and

(b) call upon all persons having objections to the reclamation or any claims of private right in respect thereof to submit to the Lands Officer before the expiration of such period, being not less than 6 weeks, as may be specified in such notification, such objections or claims in writing specifying the nature thereof and giving an estimate of any loss which it is alleged would be incurred by reason of the extinguishment of any private right.

5.3 INTERNATIONAL TREATIES AND ORGANISATIONS

5.3.1 International Labour Organisation

The primary objective for the ILO Office for Pacific Island Countries is to assist Government and Employers' and Workers' Organisations of the Pacific Island Countries in their efforts to reduce Decent Work deficits (as part of a global goal) and to pursue development for dignity through the achievements of rights at work, employment, social protection and social dialogue. Tuvalu joined the ILO in 2008 and since that time has ratified one convention, the Maritime Labour Convention (2006)

5.3.2 Convention on Biological Diversity (CBD) (1998)

The CBD is a multilateral treaty with three goals:

1. Conservation of biodiversity
2. Sustainable use of its components, and
3. Fair and equitable sharing of benefits arising from genetic resources.

The convention was opened for signature at the Earth Summit in Rio de Janeiro in 1994 and was ratified by Tuvalu in 2002. As part of its obligations to the CBD, Tuvalu has developed a National Biodiversity Strategies and Action Plan (NBSAP) in which the GoT identifies cross-cutting issues under the CBD. When considered in relation to this project, Cross-Cutting issue 2: Sustainable Development and Environmental Management is the most applicable. Objectives that have been highlighted and which relate to this project include:

- All development activities regardless of its nature and magnitude must be first subject to an EIA; and,
- Consolidate all national efforts and activities under international conventions related to the environment in order to meet Tuvalu's obligations and thus strengthen its position to attract international assistance.

5.3.3 Convention for the Protection of the World Cultural and Natural Heritage

This convention founded the UNESCO World Heritage Site List (the List). To be a site on this List, it must be a place of special cultural or physical significance. The programme catalogues names and conserves sites of outstanding cultural or natural importance to the common heritage of humanity.

Tuvalu became a signatory to this convention in 2004. It does not have any approved sites on the List, but does have two tentative items for consideration for the List, neither of which are in the geographic range impacted by this project.

5.3.4 Waigani Convention

The objective of the Convention is to reduce and eliminate transboundary movements of hazardous and radioactive waste, to minimize the production of hazardous and toxic wastes in the Pacific region and to ensure that disposal of wastes in the Convention area is completed in an environmentally sound manner.

The Waigani Convention is modelled on the Basel Convention and constitutes the regional implementation of the international hazardous waste control regime. Tuvalu became a signatory to the Waigani Convention in 2001 and is therefore obliged to undertake the following:

- to take all appropriate measures to ban the import and export of hazardous waste to and from the Convention area (Art. 4.1).
- to prohibit dumping of hazardous wastes and radioactive wastes in the Convention Area (4.2).
- to ensure that within the areas of its jurisdiction the generation of hazardous wastes is reduced (art.4.4); and,
- to ensure availability of adequate treatment and disposal facilities for the environmentally sound management of hazardous wastes in the Convention Area (4.5)

5.3.5 Other Applicable Agreements

Tuvalu is signatory to several international agreements that will need to be considered by the Contractor, particularly if they charter a cargo vessel to bring goods into the country. These agreements are as follows:

- Protocol to The International Convention for the Prevention of Pollution from Ships 1978
- International Convention on Standards of Training, Certification and Watchkeeping For Seafarers 1978
- International Plant Protection Convention 1979
- United Nations Convention on The Law of The Sea 1983
- Convention for The Protection of The Ozone Layer 1985
- Convention for The Protection of The Natural Resources and Environment of The South Pacific Region1987
- Protocol for The Prevention of Pollution of The South Pacific Region by Dumping 1986
- United Nations Framework Convention on Climate Change 1992
- Convention on Persistent Organic Pollutants 2001
- International Convention on The Control of Harmful Anti-Fouling Systems on Ships 2001
- International Convention for The Control and Management of Ships' Ballast Water and Sediments 2004
- Paris Agreement under the United Nations Framework Convention on Climate Change 2016

5.4 UNDP SOCIAL AND ENVIRONMENTAL STANDARDS

At the project level, UNDP SES Standards[13] support the implementation of the UNDP's commitments to promote respect for human rights, gender equality, and environmental sustainability. The Standards set out specific requirements relating to different social and environmental issues. During the project development phase, the proposed TCAP works on Funafuti were screened against these Standards and triggered screening criteria were identified. As part of this ESIA process, the screening checklist has been revisited and some additional criteria have been triggered as part of the ESIA's precautionary approach. The following table highlights the original and expanded screening results. All the highlighted have been incorporated into the impact assessment.

[13] United National Development Program Social and Environmental Standards (2014) https://www.undp.org/content/undp/en/home/librarypage/operations1/undp-social-and-environmental-standards/

Table 1: UNDP SES Standards applicable to the TCAP Funafuti works. Additional standards added through ESIA screening highlighted in gray.

Standard	Triggered Criteria
Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management	The project could potentially cause adverse impacts to habitats (e.g. modified, natural, and critical habitats) and/or ecosystem and ecosystem services
	The project will result in consequential development activities that could lead to adverse social and environmental effects.
	The project does pose risk of introducing invasive alien species
Standard 3: Community Health, Safety and Working Conditions	Elements of the project construction, operation, or decommissioning post potential safety risks to local communities.
	The project involves large-scale infrastructure development
	The project poses potential risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological and radiological hazards during Project construction, operation or decommissioning.
Standard 5: Displacement and Resettlement	The project could lead to economic displacement due to restriction of access to resources.
	The project could possibly affect community-based property rights
Standard 7: Pollution Prevention and Resource Efficient	The project potentially results in the generation of waste (both hazardous and non-hazardous)
	The project includes activities that require significant consumption of raw materials, energy and/or water

In addition to the identified Standards, the project also triggers Principle 2 (Gender Equality and Women's Empowerment) of the UNDP SES. This principle requires that UNDP projects be gender responsive in their design and implementation. This ESIA seeks to identity and integrate the different needs, constraints, contributions and priorities of women, men, girls and boys into the project. It provides mitigation measures which ensure that both women and men are able to participate in and benefit from the project in a meaningful and equitable way.

5.4.1 GCF Environmental and Social Policy

The GCF Policy on Environmental and Social Policy (ESP) sets out mandatory requirements for identifying and addressing Environmental and Social Risk and Impacts in GCF-financed projects; and for documenting, monitoring, and reporting on associated measures throughout the project cycles. Implementing the Policy is the responsibility of the implementing entity (for TCAP this is UNDP) and they are expected to do this by having in place the necessary policies, procedures, systems and capabilities to implement the policy. The UNDP SES has been assessed to meet the GCF ESP and therefore, along with Tuvaluan law, is the vehicle used to implement those standards at all levels of project implementation, including by executing partners.

6 NATURAL ENVIRONMENT BASELINE

6.1 INTRODUCTION

This section provides the baseline data on the physical and biological characteristics of the environment as they relate to the proposed TCAP works on Funafuti. This baseline data set will provide a benchmark for future monitoring. The area considered for assessment of baseline conditions covers all physical project sites and is inclusive of an extended potential "area of impact" (AOI). This will be large enough in extent to capture all potential direct and indirect impacts from the proposed projects.

All baseline data were obtained through a combination of desktop studies, consultations (stakeholders and communities) and site visits i.e. both primary and secondary sources.

6.2 LOCATION AND SETTING

Tuvalu is a volcanic archipelago and consists of three reef islands: Nanumaga, Niutao, Niulakita and six true atolls: Funafuti, Nanumea, Nui, Nukufetau, Nukulaelae and Vaitupu. Its small, scattered group of atolls have a total land area of approximately 26km^2 making it the fourth smallest country in the world. Tuvalu lies over an area of the South Pacific Ocean approximately 500km long and 28km wide, half way between Australia and Hawai'i (Figure 14) and approximately 1,000km northeast of Fiji. It stretches from the latitude of 5°S to 10°S and longitude of 176°W to 180°W, encompassing approximately 900,000km^2 of EEZ waters.

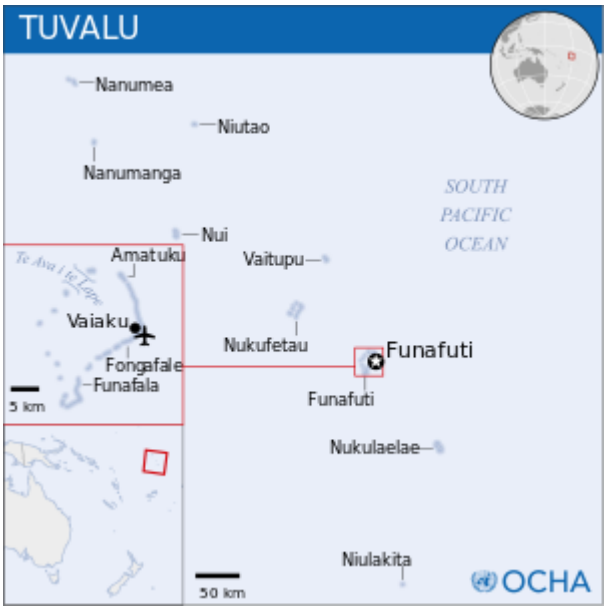

Figure 14: Geographic context of Tuvalu with Funafuti highlighted

The islands of Tuvalu are very low lying with average land heights little more than 1 or 2 meters above sea level. Like other coral atolls and islands, the soil is derived from limestone that has been formed as a result of coral formation over thousands of years. Tuvalu is geologically very young, with most of its islands having poorly developed sandy or gravel coastline soils.

Funafuti is the largest atoll and comprises 33 separate islets with a total land area of 270ha (2.7km^2) around the central Fogafale lagoon (Figure 15), which is approximately 25.1km by 18.5km in an east–west direction, , making it the fourth smallest island in Tuvalu. Of the islets, only four have areas greater than 1 ha, and five greater than 5 ha. Most of the land extends as a chain of islets around the eastern

side and the extreme south. The islets are very narrow, typically about 100m wide and elongated in shape. The greatest width (650m) is at the very centre of Fogafale, which also houses the capital buildings, the main town, and the international airport. Fogafale is the largest islet in Funafuti and together with Tegako islet (to which is it connected via a causeway) accounts for 60% of the total land area of the atoll.

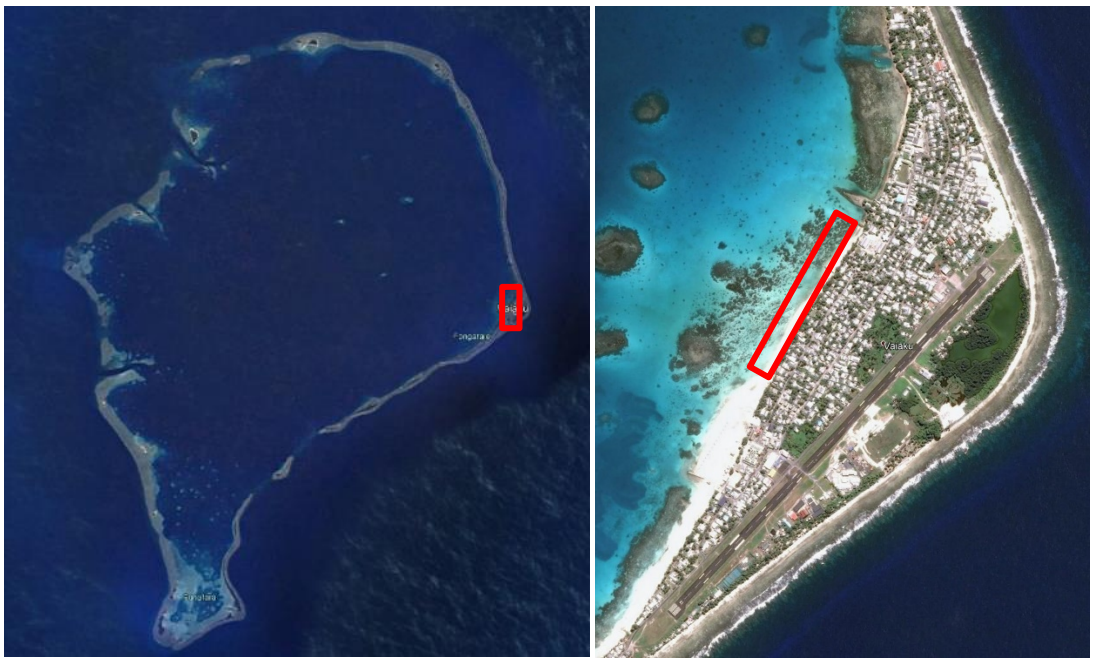

Figure 15: Funafuti atoll with the main island Fogafale and islets surrounding Fogafale Lagoon. Funafuti is indicated by red-bounded box (right). Funafuti showing main area of development, runway and TCAP project site in red box (left)

The Fogafale lagoon occupies an area of about 205km^2 and is up to 55m deep; the surrounding atoll rim is cut by several deep passages on the western side and a single deep passage to the southeast. These passages permit ship access to the lagoon and to the only deep-water wharf in the country. The distance between the atoll's eastern and western sides narrows in the south, where the lagoon is 2-3km wide and shallow, with large areas of sand and reef exposed at low tide.

6.3 PHYSICAL ENVIRONMENT

6.3.1 Meteorology

The climate of Tuvalu is tropical throughout the year and is divided into two predominant seasons: a wet (November to April) and dry (May – October) season; however, rainfall averages more than 200mm each month of the year in Funafuti (Figure 16). This is due to the location of Tuvalu near the West Pacific Warm Pool, where thunderstorm activity occurs year-round.

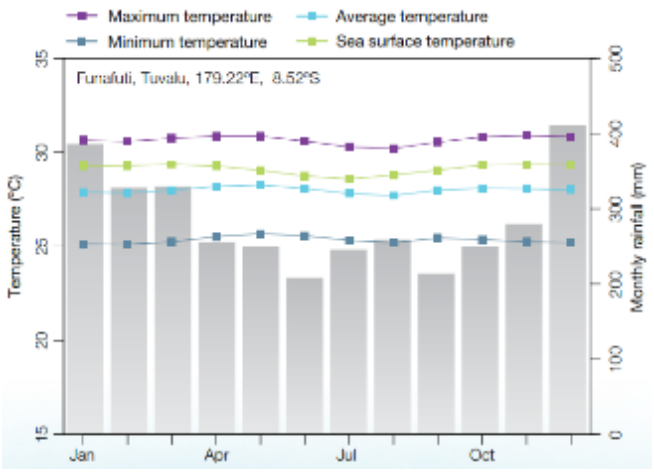

Figure 16: Seasonal rainfall and temperature in Funafuti

Annually, the average rainfall for the period 1942-2005 was 2875mm[14]; however, rainfall varies from 3500mm/year in the southern islands to 2700mm/year in the northern islands. Dry spells and droughts are relatively uncommon but do occur. Rainfall in the southern Tuvalu atolls is high and reliable throughout the year, but less so in northern atolls. Sixty percent of the rain falls in the November to April period, known as the wet season. There is a significant inverse relationship between rainfall and the El Nino/Southern Oscillation Index leads the rainfall response by several months.[14]

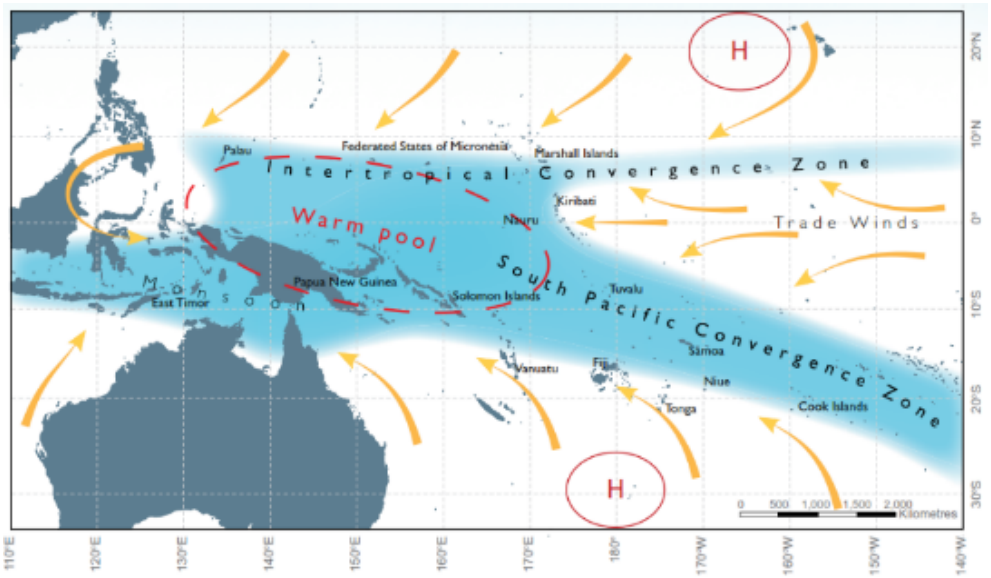

Figure 17: The average positions of the major climate features in November to April.

Tuvalu's wet season is affected by the movement of the South Pacific Convergence Zone. This band of heavy rainfall is caused by air rising over warm waters where winds converge, resulting in thunderstorm activity. The West Pacific Monsoon can also bring heavy rainfall to Tuvalu during the wet season. The Monsoon is driven by large differences in temperature between the land and ocean, and its arrival usually brings a switch from dry to wet conditions.

In Funafuti, there is little variation in temperature throughout the year (Figure 16). The maximum temperature is between 31-32°C and the minimum temperature between 25-26°C all year round. Air

[14] http://informet.net/tuvmet/climate.html

temperatures are strongly tied to the ocean temperatures surrounding the islands and atolls of the country, hence the stability.

The prevailing winds on Funafuti are dominated by the easterly trades that blow throughout the year but are generally stronger in the dry season. Wind data from Funafuti shows surface winds are predominately from the east, southeast, and northeast. Winds from the north, northwest, and west are more common in December to February, the summer months. Mean monthly wind speeds range from 7 to 12 knots, and there is a distinct maximum from June to September. Strong westerly and northwest winds occur at times during the summer and these sometimes reach gale force. Tropical cyclones occasionally begin to develop close to Tuvalu, but it is rare for them to develop into true tropical cyclone rated winds while in the area. Damaging storms associated with tropical cyclones do nonetheless occur in Tuvalu and this is discussed later in Section 6.3.6.

6.3.2 Geology and Soils

There have been multiple studies of the geological resources within the Fogafale lagoon and this section provides a review of those studies as they related to the dredging works proposed for TCAP.

The atoll soils of Tuvalu are young, shallow, and alkaline like the original core limestone parent material. They range from 250mm to 1m in depth and consist of a variable layer of organic material, coral sand, and rock fragments overlaying a limestone platform. The chemical structure of the soils makes the scarce trace elements of iron, manganese, copper and zinc unavailable to plants. Activity of soil microorganisms is limited, soil water holding capacity is low, and the groundwater is often saline.[15]

6.3.2.1 Sand Resources in Fogafale Lagoon

According to the TCAP Design Report (June 2020, draft), the proposed TCAP reclamation will require approximately 250,000m³ of fill material. In line with the proven methodology utilised during previous projects in Funafuti (including the Tuvalu Borrow Pits Project and Queen Elizabeth Park Reclamation), TCAP intends to source the required fill material via dredging submarine aggregate from the lagoon. Three previous studies have mapped lagoon aggregate resources within the vicinity of the proposed TCAP reclamation works.[16] [17] [18]. The results of these three studies form a comprehensive dataset to inform the proposed TCAP reclamation works.

Gibb (1985) conducted a study to determine presence and qualities of reclamation materials in the Funafuti Lagoon. The study involved the collection and analysis of seismic, bathymetric and sediment data over a broad area of the lagoon. The study concluded that “for use as general land reclamation material, a medium to fine calcareous sand deposit varying in thickness to 25m and generally in depths of water wherein excavation by dredging is practicable (2-4m thick) blankets virtually the whole lagoon bed in water over 10 m deep”.

Smith (1995) conducted a detailed study in the lagoon adjacent to Fongafale islet to map in detail the quantities and qualities of sediment available for reclamation purposes in this area of the lagoon. The study incorporated and built upon previous data collected by Gibb (1985). The study involved the collection of bathymetric, seismic, and sediment data. Particle size distribution testing and composition analysis was conducted on sediment samples. The study identified a primary resource area (Figure 18) with a sediment volume of 24 million m³. The volume of sediment required for the TCAP reclamation (250,000m³) accounts for only 1% of the total identified resource in this area. The extent of the

[15] Lane, J. 1993. Tuvalu: State of the Environment Report. SPREP 1993
[16] Gibb, A (1985), Tuvalu Lagoon Bed Resources Survey Report. Australian Development Assistance Bureau (Volume 1-2).
[17] Smith, R (1995), Assessment of Lagoon Sand and Aggregate Resources Funafuti Atoll, Tuvalu. SOPAC Technical Report 212.
[18] Smith, R (2015a), Sand Resources and UXO Survey, Funafuti Lagoon, Tuvalu. SPC Geoscience Division Technical Report PR209

identified primary resource area was defined based on the following criteria; the north eastern extent of the resource area was terminated based on the presence of extensive patch reefs in this area in 1995 (Figure 18), the eastern extent was terminated by the 5m isobath, based on an exclusion zone to mitigate against potential coastal erosion associated with dredging, and the western extent was terminated by the 25m isobath based on practical limitations of dredging beyond this depth. The sediment is typically characterised as Halimeda-rich gravelly sand and sandy gravel, with occasional localised areas of foraminifera-rich sand. The sediment typically contains only traces of silt, which is a favourable characteristic in terms of reducing the potential for turbidity and sedimentation associated with dredging.

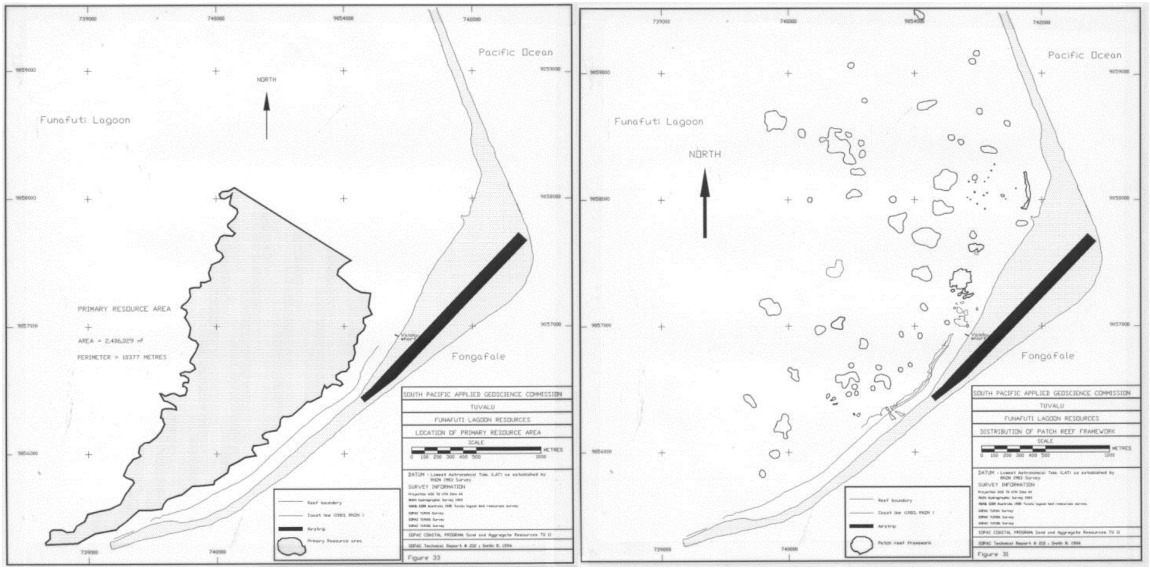

Figure 18: Primary sediment resource area (l) and patch reefs (r) identified by Smith 1995. Coral patch reef features were used to delineate the north eastern extent of the primary resource area

A map showing a combination of the lagoon sediment resources mapped by Gibb (1985) and Smith (1995) was generated by Kaley and Peacock (2014) as part of an environmental and social study for the Tuvalu Borrow Pits Project (Figure 19).

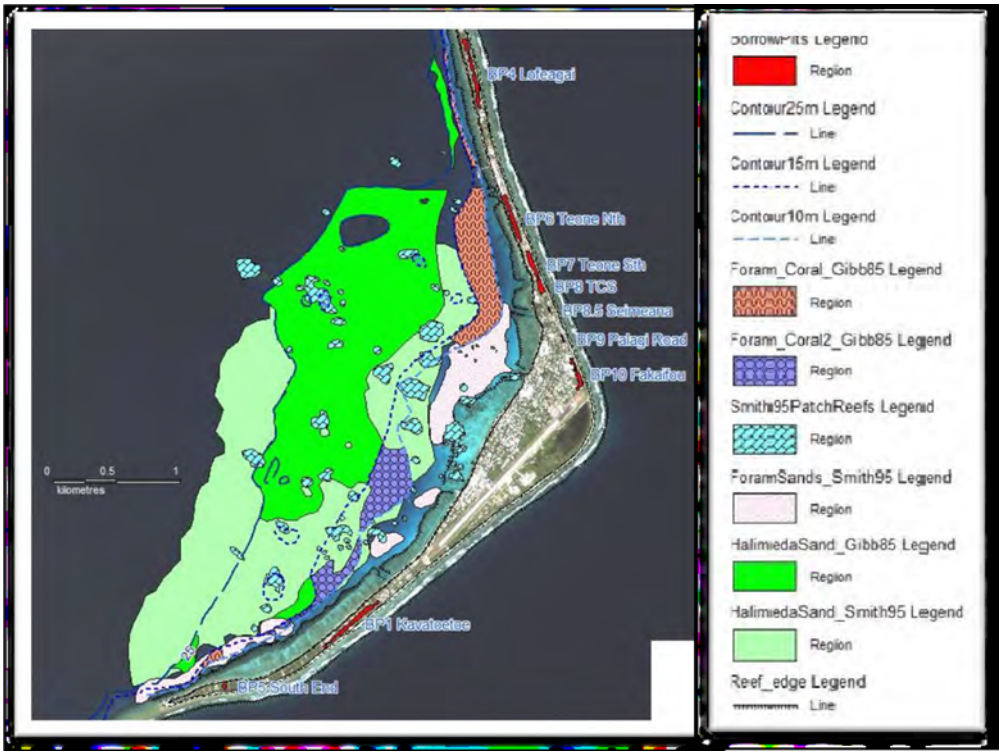

Figure 19: Lagoon sediments available near Fogafale islet as mapped by Gibb (1985) and Smith (1995). Source: Tuvalu Borrow Pits ESIA

Kaley and Peacock (2014) also mapped a 'zone of dead coral and eutrophication' in the vicinity of the mapped sediment resources (Figure 20).

Figure 20: Zone of dead coal and eutrophication. Source: Tuvalu Borrow Pit ESIA

6.3.2.2 Unexploded Ordinance

Smith (2015) conducted a further study to identify specific dredging areas for the Tuvalu Borrow Pits Project. Borrow pits 9 and 10 were located immediately inland of the northern extent of the proposed TCAP reclamation. Subsequently, the area investigated as a prospective location for dredging sediment to infill borrow pits 9 and 10 is within 300m of the proposed TCAP reclamation. A magnetic survey was also conducted in this area to identify the potential risks posed by unexploded ordinance (UXO) (Figure 21). The study noted that "of all the potential borrow areas mapped, Borrow Area 9-10 appeared to be the most contaminated with numerous, but low-intensity, anomalies detected. Anomaly sizes suggest small targets, mostly buried by a superficial layer of sediment. As this area was the designated seaplane base during the war, many of these anomalies may be items dropped or dumped during routine servicing; and loading/unloading operations. The limited documentation found on wartime activities in this area indicates some seaplanes were bombed and destroyed; but it is not clear if this was at the mooring base or on land. As moored seaplanes would have been priority targets in a bombing raid, it is considered that this area has a higher risk factor for buried UXO." This highlights the elevated risk of UXO within the vicinity of the Catalina Harbour located at the northern extent of the proposed TCAP reclamation. The study concluded; "furthermore, based on the limited thickness of unconsolidated sands < 2 m in Borrow Area 9-10, this area should not be considered as a resource area. Alternatively, should Borrow Area 9-10 be required as a source for borrow pits 9 and 10, then more detailed mapping for sediment thickness and anomaly delineation should precede any dredging." Therefore, this area is likely unsuitable in terms of sourcing the required aggregate for the required TCAP reclamation fill.

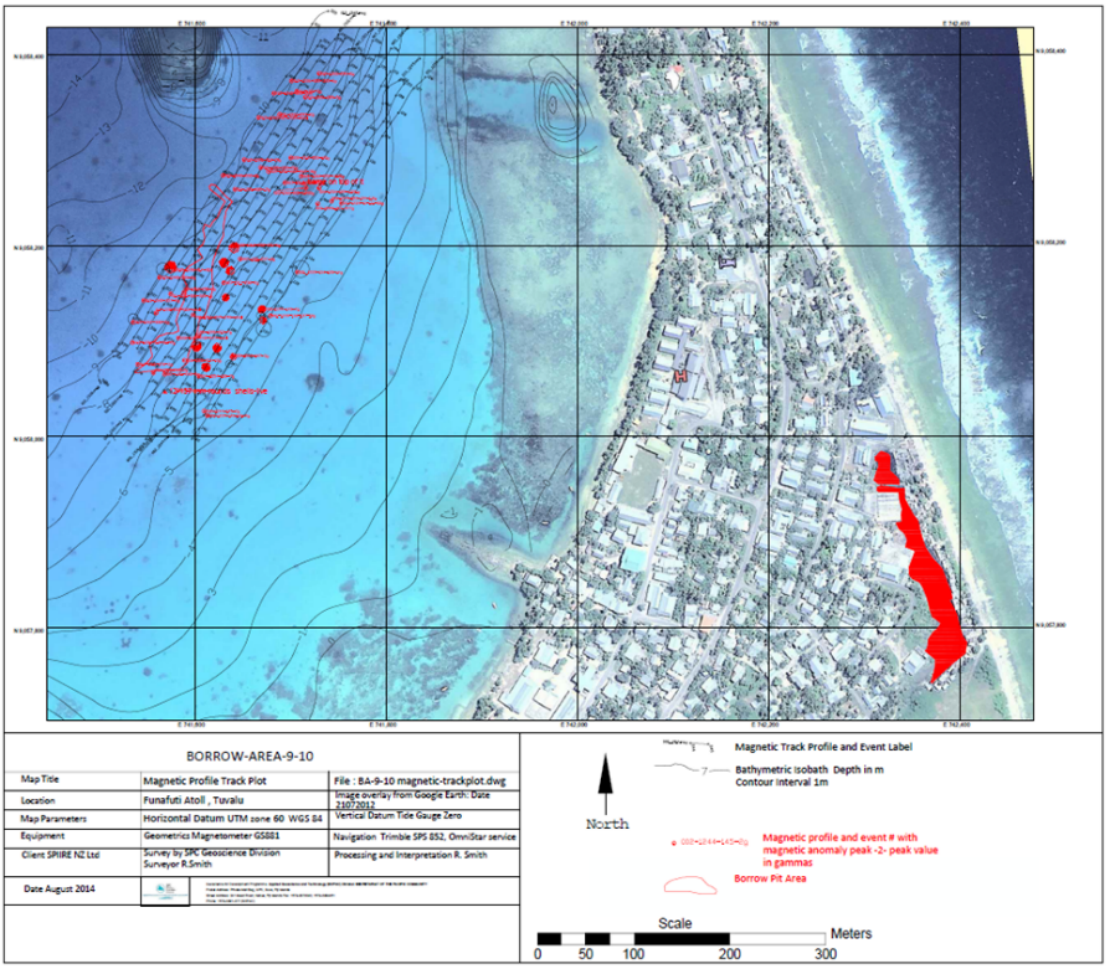

Figure 21: Magnetometer survey results for borrow area 9 and 10. Source: Smith, R (2015b), UXO Survey Funafuti Lagoon, Tuvalu, DRAFT. SPC Geoscience Division.

Additional magnetometric surveys were conducted by Smith (2015) to investigate the UXO risk associated with dredging for the Queen Elizabeth Park reclamation works. The surveys also identified a series of magnetic anomalies as shown in Figure 22. This further identifies the need for TCAP to carefully manage risks posed by UXOs during the proposed reclamation works.

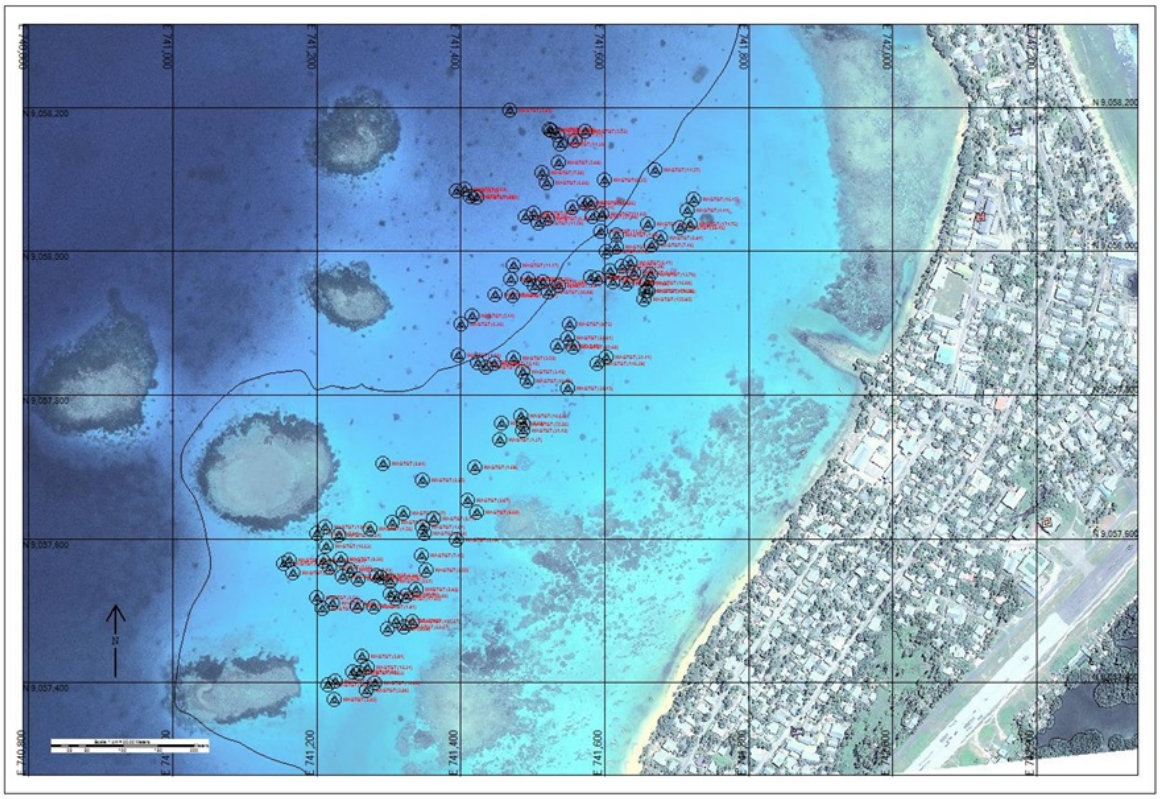

Figure 22: Magnetic anomaly map. Source: Smith, R (2015b), UXO Survey Funafuti Lagoon, Tuvalu, DRAFT. SPC Geoscience Division.

6.3.3 Topography and Coastal Geomorphology

The TCAP Funafuti Preliminary Environmental Assessment[19] provides an excellent overview of the topographic and coastal geomorphic environment on Funafuti, particularly in relation to the proposed TCAP reclamation site. The following section is informed by that assessment

Fongafale islet is a long and narrow strip of extremely low elevation with a broad "V" shaped outline. On the ocean-side fringe of the islet there are coral rubble berms up to 3 m above mean sea level, marking the highest points of the islet. Other areas are below 2 m above mean sea level over a large portion of the islet.

On the ocean side, both the active beach and ridge are made up of coarse coral rubble that often includes slab fragments and large blocks up to 1 m in diameter. The ocean-side ridge crest is commonly quite narrow and is frequently located right at the vegetation-beach edge. The ridge form is asymmetrical with a steep seaward slope and gentler backslope inclining toward a central depression, to the interior flat, or to the lagoon. This kind of simple single ridge with a steep crest is associated with the elongated islets of the eastern side of Funafuti.

The ridge is constructed of reef materials initially emplaced during exceptional storms and reworked during quiet periods. Incremental build-up of a single high ridge may result from wash-over during

[19] Hawes, P and Webb, A. 2019. TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment

several storm–fair weather episodes. Alternatively, each episode may result in the formation of a new ridge seaward, thus enlarging the islet. The ocean-side ridge mapped on Funafuti coincides with what is called the 'outer hurricane bank'.

The centre of the Fogafale Islet comprises a landform termed the ‘central depression’. This forms an almost continuous trough, which varies from an open V-shape, at the inland meeting of the opposing ocean and lagoon ridge backslopes, to a wider trough with a concave profile. Typically, the central depression has the lowest land elevation on the island and is the area most likely to be inundated by a rise in water level.

The lagoon-side ridges of Fogafale and Tegako are less pronounced than the older ocean-side coastal ridges, which protect them from ocean swell and storm waves. The ridges are lower, typically extending 1-2m above lagoon reef flat level, the absolute elevation varying dependent on exposure and lagoon fetch length. Whether bank-like or mound-like, the ridges are typically built of foraminifera or algal sand and mollusks derived from the adjacent lagoon, together with some coral fragments and gravel. On Fogafale and Tegako the ridges are very linear and may include cemented beach rock outcrops in the intertidal zone. At the northern end of Tegako, it was assessed that the lagoon shoreline was undergoing erosion (McLean and Hosking, 1992).

The topography of Fongafale Islet is closely tied to its history. Fongafale Islet was used as a military base by the United States during WWII. An airfield, a naval base, and other related facilities were constructed in 1942. Senior residents remember that there was a long, low-gradient, sandy beach prior to WWII. Modifications of the lagoon side of Fongafale islet during WWII include a 2.3 km long piece of reclamation with wood and coral rock seawall, a long borrow pit (ship passage) beside the seawall was made by excavating reefs, and other channels normal or parallel to the seashore.

These developments changed the shoreline and sedimentation patterns. The seawall was placed at about the former low tide line and suffered erosion after it was built. The borrow pits (or channels) have been filled with sand transported by wave and long-shore currents and with sand and/or gravel eroded from the reclaimed land.[20]

These changes can also be seen in the series of aerial photographs in Figure 23, which focus on central Fogafale (the project area). In 1941 (top left), Fogafale had little development and no airstrip. At that time, the Fogafale shore is a broad sandy beach some 40m wide from its seaward edge to the vegetation line. By 1943 (top right), immense disturbance has occurred with the filling of low-lying inland areas to build the airstrip and most of the Fogafale lagoon shore has been subject to dredging and reclamation. The magnified inset image in 1943 shows the darker material being filled over the top of the original white Fogafale sandy beach behind a makeshift seawall. This seawall is the dark line which can be traced along the lower edge of the beach all the way down the shore. The 1971 image (bottom left) shows the still moderate rate of development on Fogafale as there is little development on the eastern side of the runway and large areas of coconut woodland still exist between the lagoon side village and the runway. By 2017 (bottom right), huge changes can be seen and these characterise much of the island today. Housing and development cover practically all available land. Likewise, the level of development on the eastern side of the runway has been dramatic.

[20] JICA (2011b) Study for Assessment of Ecosystem, Coastal Erosion and Protection / Rehabilitation of Damaged Area in Tuvalu: Vol II. Rep Volume II: Main Report, 1-412, Kokusai Kogyo Co. Ltd & Fisheries Engineering Co. Ltd.

Figure 23: Central Fogafale, these images trace the change on Fogafale over time from 1941 to 2017. Source: TCAP Preliminary Environmental Assessment

Due to the massive change brought about by the WWII military build-up, today there is no part of Fogafale's lagoon shore that remains undisturbed, and the central part of Fogafale's lagoon shore (the project area) was comprehensively destroyed through reclamation, dredging, and other engineering in the 1940s.

Prior to the 1940s, longshore sediment transport was the predominant mechanism that delivered sand to the Fogafale lagoon shore. As discussed above, engineering in the 1940s comprehensively destroyed this natural system, and closure of an ocean/lagoon passage in the northern part of Fogafale (also in the 1940s) also reduced sediment supply onto this shoreline. Otherwise, wave energy is the main mechanism by which sediments are redistributed on this shore. However, until the recent nourishment projects, "sediment redistribution" was simply perceived as loss and erosion.[21]

In recent years, there have been further engineered changes to the lagoon foreshore, most notably the development of the QEP reclamation in front of the main government office and hotel. This covers 25m of shoreline and is 100m wide, with a surface area of 2.5Ha. The seaward edge of the reclamation is hardened revetment, and the rest is bordered by sand-filled, stacked geotextile bags.

The area immediately to the north of QEP is the proposed TCAP project site and is an area that has also recently been engineered. In 2015, JICA implemented a beach nourishment project at Tausoa beach to provide shoreline rehabilitation and a community beach area. The project included groin construction and nourishment with cobble and dredged sand.[22] Initially, the project created a comparatively wide sandy beach compared to the pre-project conditions, and was valued as a recreational area for the entire community and provided some measure of improved protection from storm waves on the lagoon shore. However, ongoing erosion of the rehabilitated beach, particularly the northern end, has led to local authorities again dumping concrete waste over the foreshore in an attempt to hold the shoreline position.

[21] Hawes, P and Webb, A. 2019. TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment
[22] Webb, A. 2018. TCAP Technical Report: Evaluation of Priorities and Options to Address Coastal Hazards in Fogafale.

It is not likely that these rehabilitated beaches can persist indefinitely without further engineering and ongoing sand replenishments, and there is good understanding in the community that the beach is an engineer or artificial feature requiring ongoing maintenance.[23] The proposed TCAP works would replace this erosive engineered beach environment with elevated reclaimed land.

The ultimate results of the many and varied engineering activities mean that today there are essentially no natural sedimentary processes of even a regenerative capacity left on the central Fogafale lagoon shoreline.[24]

6.3.4 Bathymetry

The Funafuti lagoon is characterized by a wide (18km) and deep (maximum 54.7m depth) basin in its northern part and a very shallow basin in its southern part. Figure 24 shows the bathymetry of the Funafuti atoll. The reef flat on the ocean side is about 100m wide in front of storm ridge. Outside the reef edge, water depth increases rapidly and are over 1,000m deep within 1-1.5km from shore. The lagoon-side reef flat is 55-350m wide, including a 15-25m wide beach.

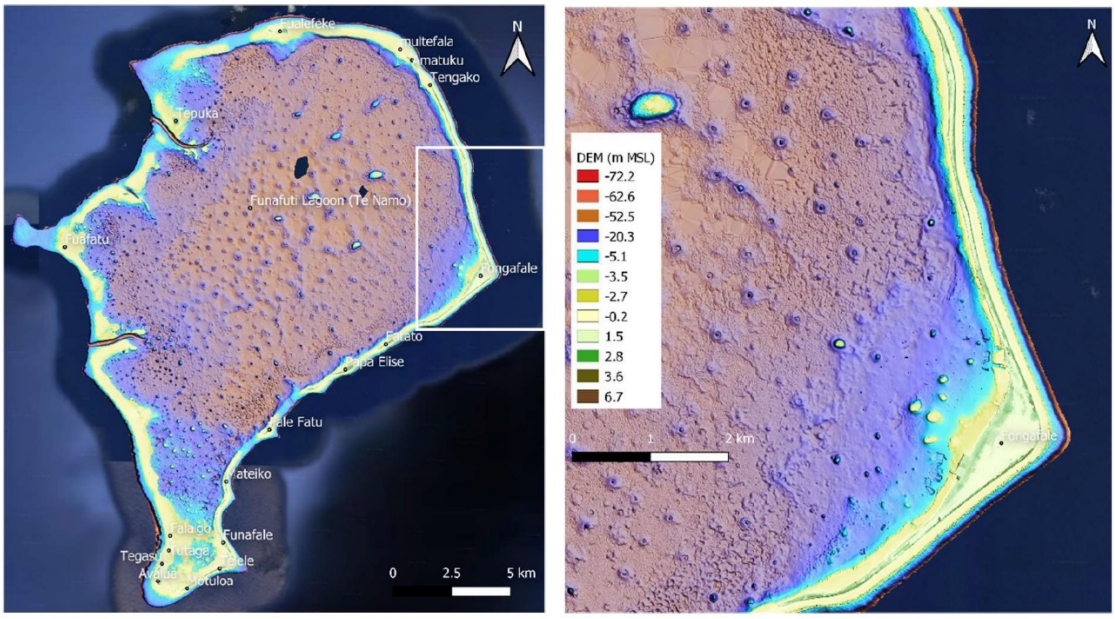

Figure 24: Left: Funafuti digital elevation mode. Right: Close up of Fogafale Islet. Source: TCAP Draft Concept Design Report, 2020

6.3.5 MetOcean Conditions

6.3.5.1 *Waves*

Lagoonal Wave Climate: The Funafuti Lagoon is protected on all sides from oceanic swell by fringing intertidal reef flats and 29 islets with only five small navigable passes. Analysis in the TCAP Draft Concept Design Report (2020) shows that the wave climate within the lagoon is generally limited to that which can be generated across the relatively small 20km north-south and 16km east-west fetches.[25]

[23] Webb, A. 2018. TCAP Technical Report: Evaluation of Priorities and Options to Address Coastal Hazards in Fogafale.
[24] Hawes, P and Webb, A. 2019. TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment
[25] Tuvalu Coastal Adaptation Project Draft Concept Design Report (2020)

In preparation for the Tausoa Beach replenishment work, wave characteristics were recorded in the lagoon over three periods (Nov 2009, Feb 2010 and Feb-Mar 2010)[26]. One of the sampling sites was immediately offshore from the proposed reclamation. The range of significant wave height observed across these periods was 0.2 to 0.4m, the wave period ranged from 2 to 4.5 seconds and the wave direction between 70 and 80°.[27] In December 2017 a subsequent 20-day wave monitoring exercise was undertaken 2km off the study site in 23m of water as part of the Ministry of Fisheries Master Plan and Feasibility Study for Coastal Erosion

Extreme Wave Conditions: To determine the wave climate on the ocean side of Fongafale's eastern shore, a regional wave hindcast model was used. Average significant wave height is 1.8m with the largest waves occurring in the dry season attributed to Southern Ocean swells travelling from the south west. The dry season also sees a high frequency of waves generated along the east and south trade fetch attributed to the strengthening and predominance of the trade winds during those months.[28]

The wet seasons sees less frequent (and less intense) waves generated from the southerly sector, with a greater frequency in waves arising from the north. These waves are most likely attributed to large events in the Northern Pacific. The largest waves can be seen to occur from the north and north west and are most likely attributed to the passage of tropical cyclones in the region.[29]

These cyclone driven wave impacts on the oceanside of Fogafale can be so severe that they cause flooding across the whole islands. TC Bebe in 1971 saw a catastrophic level of wave overtopping with water depths up to 1.5m of fast-moving water over the main runway and through much of the settled area of Fogafale.[30] The SPC Marine Science Team carried out modelling for TCAP to determine the potential return period for catastrophic cyclone landfall at Funafuti which determined that events like those experienced during TC Bebe were estimated to be a 1 in 100 year event. However, this return frequency does not account for the climate change and thus the frequency is expected to increase. The TCAP design takes this into account and provides safe, raised land on the shore furthest from the ocean-side deep water coast.[31]

6.3.5.2 Tides and Currents

Tuvalu has diurnal tidal cycle consistent with other island nations in the Pacific. Of importance, the highest spring tide (called king tides in the Pacific) can have a significant impact on the local infrastructure through overtopping and flooding. The height of a king tide is affected by the warm-water effect. Tuvalu can be severely affected by king tides. The tides of February 2011 reached within about a meter of the level of the national government building, on the central lagoon ridge at about 4.2m above the lowest astronomical tide.[32]

Tidal cycles produce the bulk of ongoing water exchange in the reclamation site, and water current data associated with this site[33] shows that tidal signals are the dominant variable changing water direction and speed. That said, the velocities recorded are very small. The highest recorded peak velocity was under 0.2 m/sec, otherwise, for the majority of the time and over all states of tide, velocities remained

[26] JICA (2011b) Study for Assessment of Ecosystem, Coastal Erosion and Protection / Rehabilitation of Damaged Area in Tuvalu: Vol II. Rep Volume II: Main Report, 1-412, Kokusai Kogyo Co. Ltd & Fisheries Engineering Co. Ltd.
[27] Hawes, P and Webb, A. 2019. TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment
[28] Tuvalu Coastal Adaptation Project Draft Concept Design Report (2020)
[29] Tuvalu Coastal Adaptation Project Draft Concept Design Report (2020)
[30] Hawes, P and Webb, A. 2019. TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment
[31] Hawes, P and Webb, A. 2019. TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment
[32] Lin, C. C., Ho, R., and Cheng, Y, H (2014) "Interpreting and analysing King Tide in Tuvalu", Natural Hazards Earth System Science, 14, 209–217
[33] Damlamian, H (2008) Hydrodynamic Model of Funafuti: Water Circulation and Applications. SOPAC Technical Report 133.

lower than 0.05 m/sec. Generally, sand-sized sediment particles (~1mm diameter) require velocities of 0.3 – 0.4 m/sec to even begin mobilization.[34]

6.3.6 Natural Hazard Vulnerability and Risks

Cyclones and Storm Surge Potential: Historical cyclone tracks have been extracted from the International Best Track Archive for Climate Stewardship (IBTrACS) database from 1950 to 2019 in order to understand the exposure of the islands to the passage of tropical cyclones. Figure 25 shows that there have been 4 cyclones passing within a 300km radius of the islands since 1950. This equates to one cyclone every 17.5 years passing in their direct vicinity. It is expected, however, that the islands would still experience the effects of large waves from cyclones generated in the South Pacific passing outside the 300km search radius, due to the remoteness and exposure of Tuvalu's islands to wind and waves in all directions.[35]

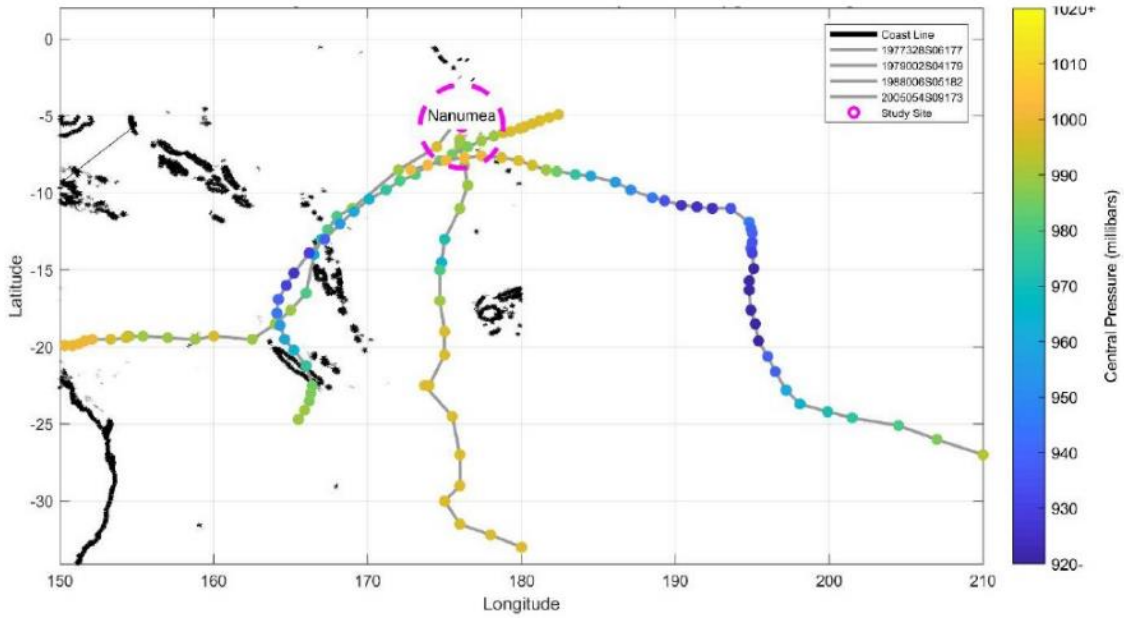

Figure 25: Cyclone tracks showing active storms found within 300km radius of Nanumea and relevant to Funafuti for the period 1950-2019. Source: TCAP Draft Concept Design Report (2020)

The Global Facility for Disaster Risk Management (GFDRM) classes the risk in Tuvalu to flooding from storm surges as high. This means that potentially damaging waves are expected to flood the coast at least once in the next 10 years.

While direct passes from cyclones are rare on the islands, storm surges and large waves from distant cyclones have caused devastating damage in recent years. These cyclones are not reflected in Figure 25 due to their tracks being greater than 300km from Funafuti, but caused the following devastation to the islands:

[34] Hawes, P and Webb, A. 2019. TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment
[35] Tuvalu Coastal Adaptation Project Draft Concept Design Report (2020)

i. Tropical Cyclone (TC) Bebe in 1972, a Category 3 cyclone, which knocked down 90% of the houses on Funafuti and resulted in flooding as a result of sea water coming up through the coral to a depth of 1.5m.
ii. In March 2015, Category 5 TC Pam resulted in 3-5m high waves causing significant damage to agriculture and infrastructure on most islands; however, Funafuti escaped the worst of the damage. The impact of TC Pam was compounded in Tuvalu by previous flooding from king tides that peaked at 3.4m on 19th February and caused considerable road damage across Tuvalu.
iii. Category 4 TC Ula affected Tuvalu in early 2016 with 3-4m-high waves affecting all islands. [36]
iv. In January 2020, Category 3 TC Nino heavily impacted Funafuti with damaging storm surges resulting in significant inland inundation, coastal erosion, and vessels being washed onto the shore.

Earthquakes: Tuvalu is situated in a relatively quiet seismic area but is surrounded by the Pacific 'ring of fire,' which aligns with the boundaries of the tectonic plates. According to the GFDRM, Tuvalu is classified as "very low risk" based on the information that is currently available. This means that there is a less than 2% chance of a potentially damaging earthquake in the project area in the next 50 years. Based on this information, the impact of an earthquake need not be considered in the different phases of the project, particularly during design and construction.[37]

Tsunamis: Tsunamis are long period waves generated by disturbance in the water column and may be caused by tectonic movement, underwater landslides, volcanic eruptions, or meteor impacts. An assessment in 2009 indicated that Tuvalu has the third lowest tsunami hazard of the Pacific countries assessed, with a maximum tsunami amplitude of 1.6m for a 2000-year return period (comparatively, the highest is 5.2m for PNG, and the lowest is 1m for Nauru).[38]

Looking at the islands of Tuvalu, the assessment found that most of the energy originating from Tuvalu's major source of risk (the New Hebrides trench) is likely to be directed towards the southern islands of the archipelago due to the orientation of the trench. Subsequently, the maximum tsunami amplitude (2000-year return period) is lower for the northern islands when compared to the national maximum of 1.6m in Nukulaelae (the most southern island) however, this would be relevant for Funafuti.[39,40]

6.3.7 Climate Change

The Pacific–Australia Climate Change Science and Adaptation Planning Project (PACCSAP) is using Conformal Climate Atmospheric Models (CCAM), at 60km downscaled dynamic modelling, to predict the possible impacts of climate change over the next 90 years (Table 2). Dynamic downscaling is a methodology for providing more detailed climate projection information for a specific region, in this case in Tuvalu.

The models predict that, in Tuvalu over the 21st century, surface air temperature and sea surface temperatures will increase. There is a very high confidence in this prediction among the models. The majority of models simulate a <1°C increase in annual and seasonal mean temperature by 2030; however, by 2090, under a high emission scenario, temperature increases greater than 2.5°Care simulated by almost all models.

[36] ADB Tuvalu Outer Island Maritime Infrastructure Project Initial Environmental Examination, Cardno 2016
[37] Global Facility for Disaster Risk Management: http://thinkhazard.org/en/report/252-tuvalu/EQ
[38] Thomas, C and Burbidge, D (2009). A Probabilistic Tsunami Hazard Assessment of the Southwest Pacific Nations. Geoscience Australia Professional Opinion. No. 2009/02
[39] Lee, G., Roqica, D., Sovea, T. and Momoivalu, V. 2020. TCAP Preliminary Geotechnical Investigation Report: Nanumea Island, Tuvalu. Pacific Community (SPC)
[40] Lee, G., Roqica, D., Sovea, T. and Momoivalu, V. 2020. TCAP Preliminary Geotechnical Investigation Report: Nanumaga Island, Tuvalu. Pacific Community (SPC)

The wet and dry season annual average rainfalls are projected to increase by less than 5% by 2030; however, by 2090, most of the models agree that a >5% increase can be expected. While the baseline hasn't been provided in the report, for extreme rain events, the intensity and frequency of days of extreme rainfall are projected to increase with a high confidence in these projections. The majority of models simulate an increase of at least 20mm in the amount of rain received on the 1-in-20-year wet day by 2055 under a low emission scenario, with an increase of at least 35mm by 2090 under the high emission scenario. The majority of models also predict that the 1-in-20 year extreme rainfall event will occur, on average, four to five times per 20-year period by 2055 under the low emission scenario and six to seven times per 20-year period by 2090 under the high emission scenario.

The incidence of drought is expected to decrease over the 21st century. It is predicted that mild drought will occur approximately eight to nine times every 20 years by 2030 under all emission scenarios, decreasing to six to seven times per 20 years by 2090. The frequency of moderate to severe drought is projected to remain approximately stable from 2030 through the 21st century at once or twice and once every 20 years, respectively.

Tropical cyclone predictions indicate a decrease in the frequency of cyclone events in the southeast basin of the Pacific. Having said this, there is very little consistency between the six models used for the spatial patterns of the predicated change in wind hazard. There were some common trends shown in each model, with most models indicating a reduction in cyclonic wind hazard north of 20°S and some regions of increased wind hazard south of 20°S. Although it is still difficult to detect clear trends in Tuvalu specifically, recent observational assessments align with international climate simulations and indicate that the number and relative intensity of tropical storms is increasing in the tropical Pacific.[41,42]

Mean sea level is projected to continue to rise over the course of the 21st century with a very high confidence (Figure 26). The models predict a rise of approximately 5-15cm by 2030, with increases of 20-60cm indicated by 2090 under high and medium emission scenarios.

Table 2: Projected change in the annual and seasons mean climate for Tuvalu, under low (blue), medium (green) and high (purple) emission scenarios [43]

[41] Global increase in major tropical cyclone exceedance probability over the past four decades. 2020 PNAS. James P. Kossina,1, Kenneth R. Knappb, Timothy L. Olanderc, and Christopher S. Veldenc

[42] Changes in Tropical Cyclone Number, Duration, and Intensity in a Warming Environment 2019 Science Vol309 P. J. Webster,1 G. J. Holland,2 J. A. Curry,1 H.-R. Chang1

[43] Tuvalu Country Report, Pacific Climate Change Science Program, 2013

Variable	Season	2030	2055	2090	Confidence
Surface air temperature (°C)	Annual	+0.7 ± 0.4 +0.8 ± 0.4 +0.7 ± 0.3	+1.1 ± 0.4 +1.5 ± 0.5 +1.4 ± 0.4	+1.5 ± 0.6 +2.3 ± 0.8 +2.7 ± 0.6	High
Maximum temperature (°C)	1-in-20-year event	N/A	+1.0 ± 0.6 +1.5 ± 0.6 +1.5 ± 0.5	+1.4 ± 0.7 +2.1 ± 1.1 +2.7 ± 1.3	Low
Minimum temperature (°C)	1-in-20-year event	N/A	+1.2 ± 1.8 +1.5 ± 2.0 +1.5 ± 1.8	+1.6 ± 1.8 +2.2 ± 2.0 +2.4 ± 1.9	Low
Total rainfall (%)*	Annual	+3 ± 8 +3 ± 8 +4 ± 8	+7 ± 11 +7 ± 10 +7 ± 12	+7 ± 12 +12 ± 14 +11 ± 18	Moderate
Wet season rainfall (%)*	November-April	+3 ± 10 +3 ± 9 +4 ± 8	+7 ± 9 +6 ± 11 +6 ± 10	+7 ± 11 +11 ± 14 +11 ± 16	Moderate
Dry season rainfall (%)*	May-October	+3 ± 10 +4 ± 11 +5 ± 13	+7 ± 16 +7 ± 16 +8 ± 19	+8 ± 18 +12 ± 23 +12 ± 26	Moderate
Sea-surface temperature (°C)	Annual	+0.6 ± 0.4 +0.7 ± 0.3 +0.7 ± 0.4	+1.0 ± 0.3 +1.3 ± 0.4 +1.3 ± 0.5	+1.3 ± 0.5 +2.1 ± 0.6 +2.5 ± 0.6	High
Aragonite saturation state (Ωar)	Annual maximum	+3.6 ± 0.1 +3.5 ± 0.2 +3.5 ± 0.2	+3.3 ± 0.1 +3.2 ± 0.2 +3.2 ± 0.1	+3.2 ± 0.2 +2.8 ± 0.2 +2.6 ± 0.2	Moderate
Mean sea level (cm)	Annual	+9 (4–14) +9 (5–14) +9 (4–14)	+17 (9–25) +19 (10–29) +19 (9–28)	+31 (16–45) +37 (19–56) +39 (19–58)	Moderate

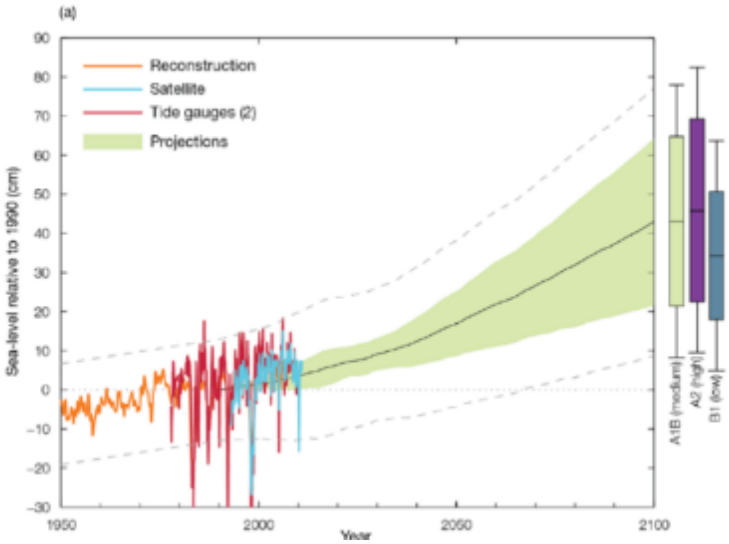

Figure 26: Observed and project relative sea-level change near Tuvalu[21]

6.4 BIOLOGICAL ENVIRONMENT

6.4.1 Terrestrial Ecology

The indigenous vegetation of Funafuti is highly disturbed and now dominated by introduced exotic species.[44] There are no endemic plant species unique to Tuvalu, and almost all of the indigenous plants are widespread, easily dispersed pantropical, Indo-Pacific, or pan-Pacific coastal species that are adaptable to environments with loose shifting sands, high salinity, strong sunlight, periods of drought, and poor soil development.

[44] Kaly, U & Peacock, C. 2014. Tuvalu Borrow Pits Project Phase II Design: Environmental and Social Impact Assessment (ESIA)

The total recorded flora of Funafuti is about 349 species, only 16% of which are indigenous. Introductions of new species to the islets has been ongoing since original settlement of the islands 2,000 years ago. Introductions increased with European contact during WWII, and later after independence through population expansion, shipping, and introductions of crops by FAO and others since the 1970s.[45] The post-independence era also saw the selective removal of indigenous species for growth of settlements, construction and use for firewood, medicines and handicrafts. Further damage to the native flora resulted from the introduction of invasive weeds.

The most common trees found on all islands are coconut (*Cocos nucifera*) stands, hibiscus (*Hibiscus tiliaceus*), papaya (*Carica papaya*), pandanus (*Pandanus tectorius*), salt bush (*Scaevola sericea*), *Premna serratofolia*, *Tournefortia samoensis*, zebra wood (*Guettarda speciosa*), kanava (*Cordia subcordata*) and terminalia (*Terminalia samoensis*). Indigenous broadleaf species, including *Calophyllum inophyllum*, make up single trees or small stands around the coastal margin.

No birds or terrestrial species found on Funafuti are considered endangered or critically endangered.

6.4.2 Marine Environment

An ecological assessment of the impacts of a previous dredging operation in Funafuti lagoon undertaken between 1991 and 1994 found that the area of reef close to the main settlement was already heavily impacted, with higher levels of algal cover and higher number of invertebrates and fish associated with algae or sediments than in other areas of the lagoon which were more dominated by live corals.[46]

A 2010 study showed that cover by corals in Funafuti Lagoon is highly site-specific, with very low cover adjacent to Fogafale and around offshore reefs[47] (Figure 27). On islets to the south, coral cover is zoned with cover greater than 50% on the reef slope. Adjacent to Fogafale, 96% of the area has coral cover of <1%, and 3.7% has 1-5% cover. There are no areas with >20% cover. The offshore reefs have 5% of the area with 1-5% cover by corals and 4% with 5-20% cover, but most of the area (91%) is with <1%cover.

[45] Kaly, U & Peacock, C. 2014. Tuvalu Borrow Pits Project Phase II Design: Environmental and Social Impact Assessment (ESIA)
[46] Kaly, U & Peacock, C. 2014. Tuvalu Borrow Pits Project Phase II Design: Environmental and Social Impact Assessment (ESIA)
[47] JICA, 2011, Study for Assessment of Ecosystem, Coastal Erosion and Protection/Rehabilitation of Damaged Area in Tuvalu: Vol III. Rep Volume III: Supporting Report, 1-412, Kokusai Kogyo Co. Ltd & Fisheries Engineering Co. Ltd.

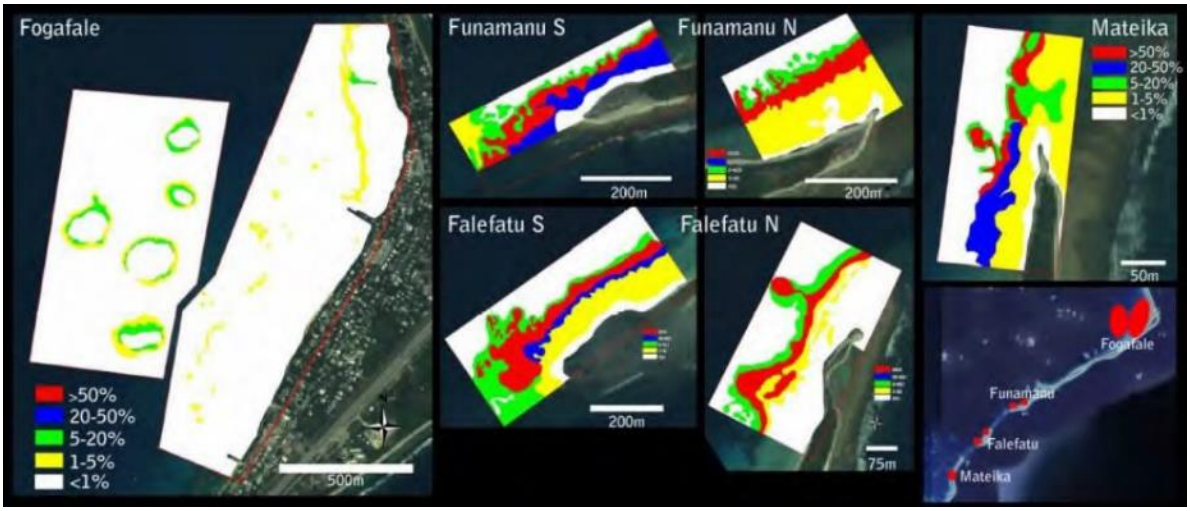

Figure 27: Maps show the percent cover by corals in 5 categories ranging from <1% up to >50% in the lagoon adjacent to Fogafale and 3 of the islets to the south. Source: JICA 2011

The locations for dredging are significant in terms of the severity of potential impacts on reef communities in Fogafale. Within the area surveyed by JICA in 2010[48], which encompasses the TCAP target dredge areas and out into the lagoon, encompassing the patch reefs within the 25m contour, the coral communities have largely died off, and the reefs are dominated by algae, particularly *Sargassum polycystum*.

Ground-truthing in 2014[49] in the southern end of Fogafale showed that the area of dead corals extends down to that part of the lagoon. Observations in 1999/2000 recorded that cover was in the order of 50+% live corals on the reef slope, with *Acropora nobilis* the dominant form. In June 2014, cover was around 1% with just a few colonies of *Pocillopora damicornis*, *Acropora hyacinthus*, *A. cytherea*, *A. florida* and a few fragments of *A. nobilis*. Most of the area was covered in turfing algae, with a mixture of *Dictyota, Hypnea, Halimeda* and other algae normally found on reef assemblages, but at lower cover[50]. In shallower waters, between 1m and the toe of the beach, cover was dominated by either *Turbinaria* or a turfing form of the *Sargassum,* which forms forests in the central nearshore lagoon near Vaiaku. On offshore reefs, coral cover has also dropped over the past 15 years, and the reefs up to 2km offshore become dominated by a wide range of turfing algae.[51]

Water pollution is affecting the ecology of Funafuti lagoon close to the densely populated areas of Fogafale. The pollution is chronic and is resulting from domestic wastewater, particularly from septic tanks and pit toilets[52]. Production of corals and forams (that create sand) has been greatly reduced in the vicinity of Fogafale, with a related reduction in natural breakwater functions and transportation of sand from the ocean to the lagoon[53]. This has also resulted in the loss of beach-building mechanisms along the lagoon side Fogafale coast.

[48] JICA, 2011, Study for Assessment of Ecosystem, Coastal Erosion and Protection/Rehabilitation of Damaged Area in Tuvalu: Vol III. Rep Volume III: Supporting Report, 1-412, Kokusai Kogyo Co. Ltd & Fisheries Engineering Co. Ltd.
[49] Kaly, U & Peacock, C. 2014. Tuvalu Borrow Pits Project Phase II Design: Environmental and Social Impact Assessment (ESIA)
[50] Kaly, U & Peacock, C. 2014. Tuvalu Borrow Pits Project Phase II Design: Environmental and Social Impact Assessment (ESIA)
[51] Kaly, U & Peacock, C. 2014. Tuvalu Borrow Pits Project Phase II Design: Environmental and Social Impact Assessment (ESIA)
[52] JICA, 2011. Study for Assessment of Ecosystem, Coastal Erosion and Protection/Rehabilitation of Damaged Area in Tuvalu: Vol II. Rep Volume II: Main Report, 1-412, Kokusai Kogyo Co. Ltd & Fisheries Engineer Co. Ltd.
[53] JICA, 2013. The Project for Pilot Gravel Beach Nourishment Against Coastal Disaster on Fogafale Island in Tuvalu. Rep Interim Report 1, 1-251.

The lagoon floor in the target sand resource area is predominantly simple sandy substratum with patches of *Halimeda* algae (Figure 28).[54] These habitat types are very well represented throughout the broader Funafuti lagoon and, along with simple bioturbating organisms and epifauna (e.g. sea cucumbers), typically recover quickly following physical disturbance.

Figure 28: Lagoon substratum and common benthos. Source: TCAP Funafuti Preliminary Environmental Assessment

6.4.3 Protected Areas

A single large, protected area – the Funafuti Conservation Area (FCA) – was established in Funafuti in mid-1997. The conservation area was the first of its kind to be established in Tuvalu and covers a total area of approximately 33km^2 of the western reef margin, accounting for 20% of the reef area of the atoll, encompassing marine and terrestrial habitats (including 6 islets). In the north–south direction, the FCA extends from just north of Tepuka Vilivili to just south of Tefala islets (Figure 29). The marine habitats incorporated in the conservation area include channels from lagoon to ocean, ocean-side and lagoon-side reef crests, reef slopes, back reef areas, and the sandy lagoon floor.[55] All the living and non-living natural resources located within these boundaries are protected as 'no-take area'. The FCA is at least 10km away from the TCAP proposed dredging site and therefore is not considered at risk from the project.

[54] Hawes, P and Webb, A. 2019. TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment
[55] Tuvalu Marine Life Scientific Report, Alofa Tuvalu & Department of Fisheries, 2012

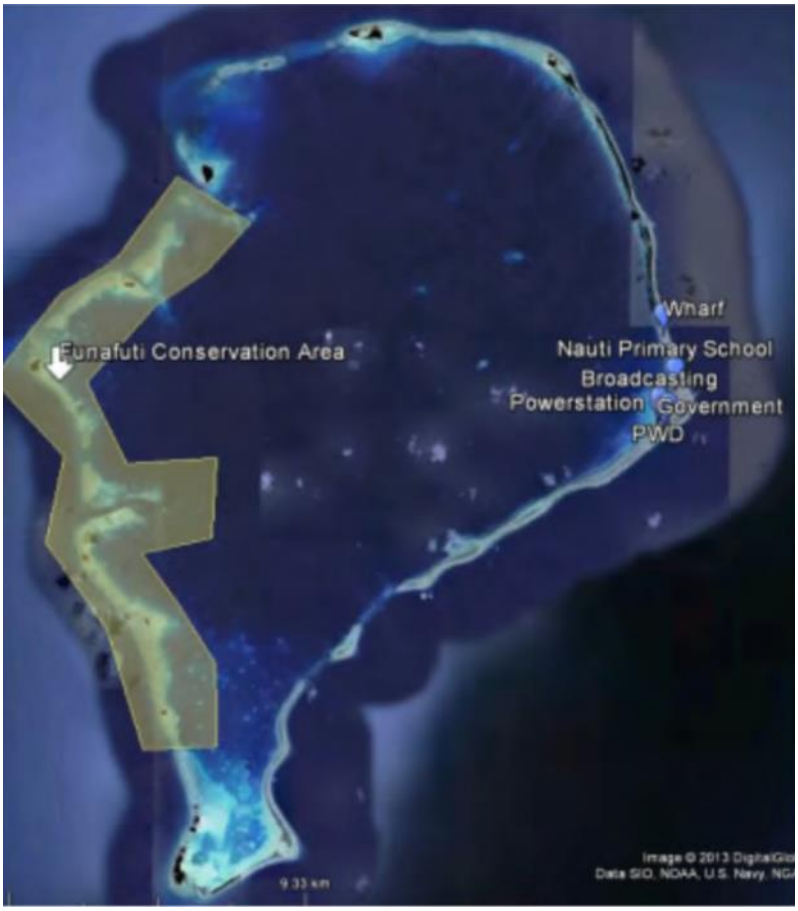

Figure 29: Funafuti atoll and the location of the Funafuti Conservation Area

6.4.4 Vulnerable and Endangered Species

The current IUCN Red List database provides summary information regarding the number of threatened and protected species by country (Table 6). This indicates that for Tuvalu, there are a total number of 1023 of animal species listed, including those that are endangered, vulnerable, and near threatened. A large proportion of those species are lower risk/least concern and/or data deficient. These include several species of sharks and rays, sea snakes, whales, marine turtles and corals from at least 12 families. Green turtles (*Chelonia mydas*) are the most common threatened species seen in Tuvaluan waters, however neither they, nor any other Red List turtle species, nest on the beaches within the TCAP areas.

Table 3: IUCN Red List categories: EX - Extinct, EW - Extinct in the Wild, CR - Critically Endangered, VU - Vulnerable, LR/cd - Lower Risk/conservation dependent, DD - Data Deficient, LC - Least Concern

Category	EX	EW	CR	EN	VU	NT	LR/cd	DD	LC	Total
#Species	0	0	0	8	87	118	3	56	751	1023

Due to the highly degraded nature of the proposed reclamation site and dredging site, it is not expected that any of these vulnerable or endangered species will be encountered.

6.4.5 Invasive and Alien Species

As the proposed project may be importing machinery and equipment into Tuvalu, it is important to have an understanding of the current threats and impacts from invasive species both on the native biodiversity and the economy.

The NBSAP highlights the following[56], which are of relevance to the proposed project:

Agricultural Pests: The coconut scale insect (*Aspidiotus destructor*) has severely infested the coconut palms, breadfruit, papaya, bananas, and pandanus and slightly affects the principle root crops (giant swamp taro and taro) and other cultural trees such as frangipani and *Premna serratofolia*. Chemical control, through spraying of soap, kerosene, and malathion, and the cutting and burning of infested plant materials, has been unsuccessful.

Other notable agricultural pests include pink mealybug, black mirid garden fleahoppers, aphids, and the delphacid planthopper, all of which cause leaf deformation and yellowing due directly to the pests or pest acting as vectors of plant viruses.

Of recent concern is the threat posed by fruit flies of the genus *Bactrocera* that have cost millions of dollars in the Pacific region in lost fruit export income and control costs. The neighbouring islands of Fiji, Wallis and Futuna, Niue, Tonga, Rotuma, Samoa, Cook Islands, Nauru, American Samoa, French Polynesia and the Queensland region of Australia are all home to economically damaging *Bactrocera* spp.

Invasive plants: Wedelia or trailing daisy (*Sphagneticola tribolata*), a plant native to the Caribbean, has spread throughout villages, along roadsides, and into open lots. It has also colonized outer beach vegetation, where it outcompetes important medicinal plants and other native species of cultural importance. It is considered one of the world's 100 worst invasive species. Once established, it is almost impossible to eradicate, and it is slowly replacing many of Tuvalu's most important low-growing herbaceous species along beaches and roadsides, and it inhibits the growth of seedlings of threatened trees and plants.

Yellow Crazy Ant: Alien ants are considered one of the greatest threats to biodiversity, and the yellow crazy ant (YCA) (*Anoplolepis gracilipes*), which was probably introduced with infested timber or sea cargo, was reported present in the early 2000s and is now causing serious problems in Tuvalu. The YCA, which forms dense, multi-queen super-colonies and releases an acid that burns on contact, preys on a wide range of plants and invertebrate and vertebrate animals, including birds, crabs, and insects. YCAs have wiped out crabs in infested areas and affected birds, geckos, plants, and organisms on many islands, such as Christmas Island in the Indian Ocean. On Funafuti, the YCA has destroyed crops and attacked animals such as chickens, land crabs, hermit crabs, and coconut crabs, and it threatens seabird populations.

Invasive seaweeds: The rapid spread of a non-native brown seaweed (*Sargassum polycystum*) in Funafuti lagoon especially adjacent to Fogafale, began in 2011, and is now a major concern with its dense coverage reducing sunlight, outcompeting corals, and making fishing difficult. It is suspected that the seaweed was introduced via international shipping (through ballast waters, hulls, or anchors), possibly from Wallis and Futuna, where it is present. It seems to have become established following the prolonged drought of 2011 and has responded to localised nutrient enrichment in Funafuti lagoon.

[56] Tuvalu 5th National Biodiversity Strategy and Action Plan, Ministry of Foreign Affairs, Trade, Tourism, Environment and Labour, 2016

7 SOCIAL & BUILT ENVIRONMENT BASELINE

This section describes the baseline situation of Funafuti's social and built environment pre-intervention. The section is largely informed by the 2012 Funafuti Island Profile, which was developed in conjunction with the NZ Aid and the UNDP as a tool to be utilised by leaders when it comes to planning and decision making and as a reference material for education and research.[57]

7.1 LAND USE

Funafuti has 33 islets surrounding the lagoon [58]. Fogafale islet holds the main village settlements of Lofeagai, Teone, Fakaifou, Senala, Alapi, Vaiaku and Kavatoetoe, from the northern to the southern point of the islet respectively. Amatuku and Funafala are the two other islets that have established village settlements. As shown in Figure 30, Funafuti has a total land area of 2.8km^2, and 82.1% of the land is covered by coconut woodland and other common atoll vegetation. This characterized the entire island before it was rapidly and dramatically disturbed in the 1940's to make way for the World War II engineering and infrastructure including the airstrip, foreshore reclamation and navigation channels. There are also patches of mangrove forest in Funafala and to the eastern side of Fongafale surrounding the brackish Tafua Pond. A large portion of the land is covered by the country's only airstrip and expanding residential and commercial buildings, roads, and other infrastructure.

Figure 30: Land use map of Funafuti. Source: Lands Department Maps (Mapinfo), Funafuti Island Profile

[57] Government of Tuvalu, 2010, Funafuti Island Profile, Prepared by the Department of Rural Development, Ministry of Home Affairs

[58] Kaupule Funafuti, 2016, Moeakiga o Malefatuga II: Funafuti Strategic Plan 2016-2020.

7.2 DEMOGRAPHICS

Fogafale, as the capital and Tuvalu's main business center has seen outer island populations steadily migrating to Funafuti for economic and education prospects. In 1979, Funafuti's population size was 2120 and had increased to 5274 by 2011. The highest proportion change, from 1979 to 1991, was due to Tuvalu becoming independent from the UK administered Gilbert (now Kiribati) and Ellice Islands colony. At this time people moved back to settle in Funafuti, where the required infrastructure (airport and deep water anchorage) existed and subsequent housing, etc. was being developed.

Table 4: Funafuti population from 1979 to 2011

Year	Population size	Sex Ratios	Population Change		Average annual rate of growth (%)
			Number	%	
1979	2120	-	-	-	-
1991	3,839	105.9	1,719	81.1	4.9
2002	4,492	103.2	653	17.0	1.4
2011	5274	104.5	782	17.4	1.8

Funafuti's population structure and composition in 2011 indicated a growing population, with 32% of the population made up of the lower age group of 0 to 14 year old's. When this age group reaches reproductive age, there is likely to be an increase in population. The non-systematic age distribution is indicative of migration, with 15 to 19 year old students leaving Funafuti to attend boarding school in Vaitupu for their secondary education. The relatively higher number of 20 to 29 year old's represents boarding school returnees and labour-driven migration from the outer islands.

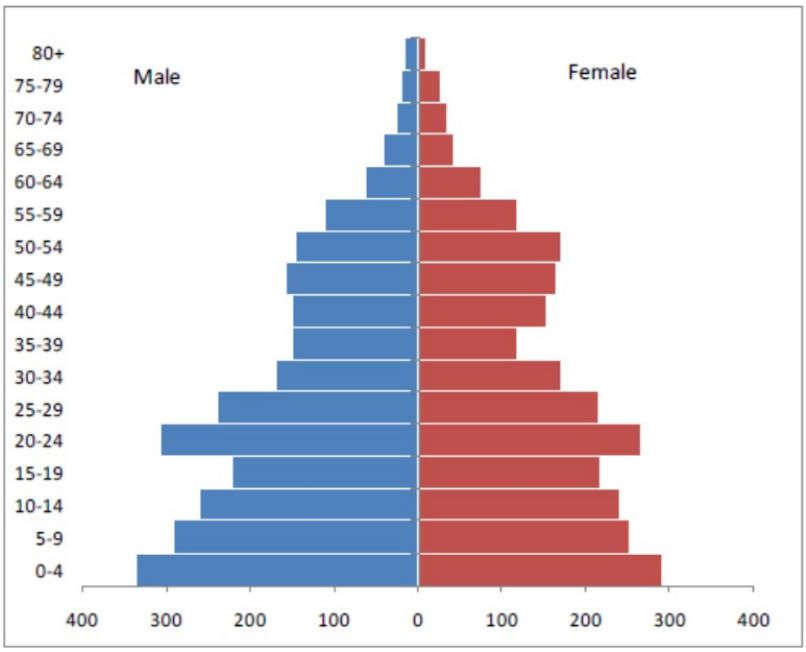

Figure 31: 2011 Funafuti population structure by age and gender

Population density has equally increased from 1,610 people per km^2 in 2002, to 2,220 in 2012, to 2,257 in 2017. Funafuti total population influx, as well as increased density, is a result of high inflow of residents from other outer islands being pulled in by the 'bright lights' of ongoing developments, better education and health, more employment opportunities, and so forth. The population of indigenous Funafuti people (1309 people) is 19.5% of the total population of Funafuti. Funafuti is home to 63.1% of Tuvalu's total population (10,645) and is also home to 118 non-Tuvaluan residents.[59]

[59] Government of Tuvalu 2017 Tuvalu Population & Housing Mini Census 2017

Table 5: Population change in Funafuti and outer islands in 2012 and 2017

ISLAND	Area (Km2)	RESIDENT POPULATION		CHANGE 2012-2017			DENSITY (Person per km2)	
		2012	2017	Total	%	r*	2012	2017
FUNAFUTI	**2.8**	**5436**	**6320**	**884**	**16.3**	**3.0**	**1941**	**2257**
OUT-ISLANDS	**22.8**	**5204**	**4187**	**-1017**	**-19.5**	**-4.3**	**228**	**184**
Nanumea	3.9	612	512	-100	-16.3	-3.6	157	131
Nanumaga	2.8	551	491	-60	-10.9	-2.3	197	175
Niutao	2.5	694	582	-112	-16.1	-3.5	278	233
Nui	2.8	729	610	-119	-16.3	-3.6	260	218
Vaitupu	5.6	1542	1061	-481	-31.2	-7.5	275	189
Nukufetau	3.0	666	597	-69	-10.4	-2.2	222	199
Nukulaelae	1.8	364	300	-64	-17.6	-3.9	202	167
Niulakita	0.4	46	34	-12	-26.1	-6.0	115	85
TUVALU	**25.6**	**10640**	**10507**	**-133**	**-1.3**	**-0.3**	**416**	**410**

In 2011, about 75% of households were headed by males and 25% were headed by females. For households headed by females, 60% were married and the female was the breadwinner, while 29% were widows, 5% were single, 4% were divorced or separated, and 4% were never married.

The elderly population is defined as those aged 60 years and above and it has continued to increase over the years. In 1991 there were 249 elderly; then, in 2002 it increased to 289 (13.8%); and in 2011, it further increased to 352 people (17.9%). The sex ratio shows that there are more females then males from 1991, 2002 and 2012 (Figure 31).

Up to 127 disabled people were recorded for Funafuti in 2011. Disabilities included speech and hearing (13%), vision (12%), hearing (11%), mobility (10%), mental (18%), physical (18%) and others (18%).

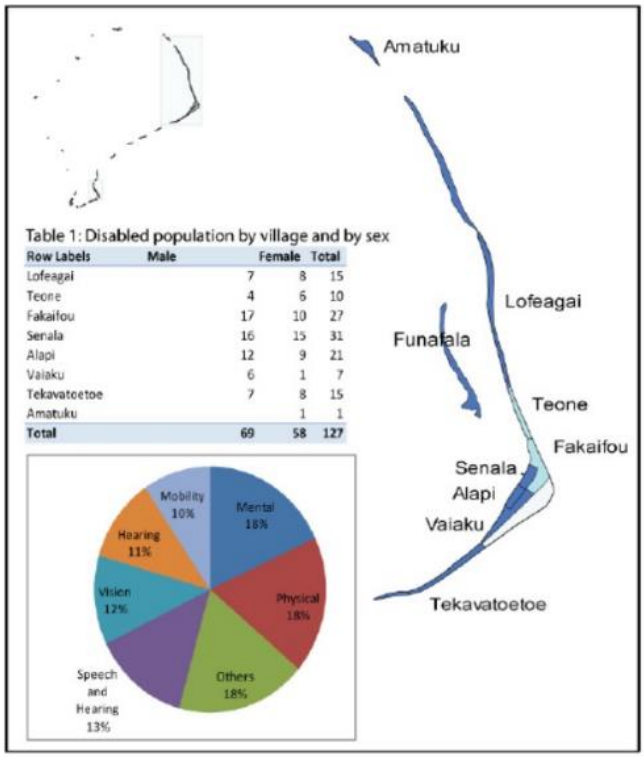

Figure 32: Funafuti disabled population (2011)

7.3 EDUCATION

As an atoll island with limited resources, capacity, and options, the GoT has prioritized education to enable its citizens to acquire knowledge and skills that may make them employable to international and

regional labor markets. The country allocates about a fifth of its national annual budget to the education sector.

There are two primary schools; one is administered by the government and the other by the Seventh Day Adventist Church. A total of 925 were enrolled at primary school level in Funafuti, of which 474 were male and 451 female (2012 Census). Compared to the rest of the group, Funafuti has the highest teacher–pupil ratio at 1:27 and also recorded a 95% average student attendance.

Funafuti hosts one of Tuvalu's two secondary schools, and this is operated by the Ekalesia Tuvalu, Church of Tuvalu (EKT) as well as being subsidized by the Government of Tuvalu. From 2004–2014, an Augmented Foundation Program was operated from the University of the South Pacific (USP) Tuvalu Campus, bridging sixth form students to enter tertiary education outside Tuvalu. In 2014, this special education project was discontinued and relocated to Motufoua Secondary School on the Island of Vaitupu.

The University of the South Pacific is the only regional institute for tertiary education that is accessible and available to the public. The institute provides education for Form 7, Foundation, Certificate, Diploma, and Degree level. The 2010 and 2011 school years showed a marked increase in enrollment, whereby there were more than 240 students enrolled, compared to previous years, when there were always fewer than 200 students enrolled.

Since independence from the Gilbert and Ellice Islands colony, Tuvalu has strived to maintain and develop seafaring opportunities by setting up the Tuvalu Maritime Training Institute (TMTI). The TMTI is located on Amatuku – an islet to the northwest of Fogafale. Each year, approximately 120 maritime trainees graduate with International Maritime standards to work on merchant foreign vessels, a process facilitated by the Tuvalu government.

7.4 HEALTH

The Princess Margaret Hospital in Funafuti is the country's only hospital and is the primary provider of medical services for all islands of Tuvalu. The hospital is located about 1.3km north from the center of Fogafale. The hospital has 50 beds and offers basic routine medical, surgical, obstetric and gynecological services.

There are no private formal medical services on Funafuti. NGOs such as the Tuvalu Red Cross Society, Fusi Alofa (for the care and rehabilitation of disabled children), the Tuvalu Family Health Association, and the Tuvalu Diabetics Association all have offices in Funafuti.

Non-Communicable Diseases (NCDs)[60] are a common and major health issue in Tuvalu. In the 2012 census, Funafuti recorded 15.5% NCD cases across all islands, higher than the national average of 11.1%. Lifestyle was the most common link to NCDs (24.1%) . Injuries and accidents also made up 15.8% of illnesses. Funafuti also has the highest percentage of communicable disease (CD) cases nationally, making up 19.4%. Most CD cases (76.9%) were skin diseases, with the majority being septic sores, skin rash or abscess.

7.5 GENDER EQUALITY AND EMPOWERMENT OF WOMEN

Tuvalu has been progressive in its efforts to improve gender equality by ratifying the Convention on Elimination of all Forms of Discrimination against Women in 1999. Immediately after ratification the GoT developed its first National Women Policy in 1999, reviewed in 2005 and 2011. In 2014, and in

[60] Common types of NCD are body aches and pains which relates to headache, backache, toothache, unspecified abdominal pain, lifestyle diseases (diabetes, hypertension, arthritis/gout, obesity and heart disease)

response to the trend at that time, the policy was updated with a change to the title to read Tuvalu National Gender Policy. A Strategic Action Plan with five key areas was also developed to support the implementation of the policy and climate change and environmental issues – gender was one of them. Integration of gender into budgets and annual plans is mandatory across all ministries. (Oxfam in the Pacific, 2020).

Within the Tuvalu National Gender Policy, Policy Outcome 1 is the most relevant to TCAP and this ESIA, specific the environment aspect which sets out to:

- Ensure women's equitable access to capacity building initiatives in disaster risk management and adaptation to climate change and natural resources management.
- Support equitable participation of women, together with men, in decision-making in relation to disaster risk management, climate change adaptation and natural resources management at the community and national levels.

The project will achieve this through:

- Creating opportunities to ensure decision-making related to the development of the BTB incorporates the views of women, youth and disabled
- Identifying the different ways in which the vulnerability of women and men to a changing climate is affected by the project
- Incorporating gender-sensitive protective measures in response to the identified climate risks as well as the risk stemming from the implementation of this particular adaptation project

Tuvalu, although primarily a patriarchal and patrilineal society, has evidence of matrilineal practices. A traditional society is under the leadership of the *ulu aliki* (chief) supported by the *matai,* which are the heads of family units (Oxfam in the Pacific, 2020). Traditionally, women are responsible for domestic duties and child rearing, while men tend to work outside the home in areas such as fishing and subsistence farming. Traditionally, it is not common for women to hold positions of *ulu aliki* or *matai*; however, with recent developments in gender empowerment, women have taken up leadership roles as *matai*, Kaupule members, and Kaupule presidents or Pule Kaupule(s) (OIP,2020).

In terms of population proportions, women have been under-represented in parliament since independence in 1978. In the 2017 Mini Census Preliminary Report, 48.6% of the total population were women and, so far, there have only been three female parliamentarians at different periods, with very low numbers of electoral candidacies. In the 2010 elections, no women were elected, but following a bi-election due to the death of a member of parliament, Hon Pelenika Isaia was elected.

The Government of Tuvalu continues to support women's empowerment and seeks to increase levels of participation of women in all aspects of community life. Culturally, Tuvaluans continue to fall in line with traditional family systems, with the mother responsible for caring for the children and domestic duties and the father tending to the subsistence farm or other types of work outside the home.

In the 2015 elections, 3 of the 29 candidates who stood for elections were women. There were only three women candidates (10%) – Dr Puakena Boreham and Pelenike Tekinene Isaia, who were both vying for the two seats of the Nui Electoral District, and Hilia Vavae from the Nanumea Electoral District. Dr Puakene Boreham was the only woman who won her seat, being the one woman in a 15-member parliament. Dr. Boreham was again the only woman MP following the most recent 2019 elections, where 3 of the 29 candidates that ran were women.

Funafuti has a women's association known as "Malosiga" for 18 to 60 year-olds. There were 284 registered members in the 2012 census, as shown in Table 6. The Malosiga supports community development under the leadership of a President (Pelesitene), Secretary (Failautusi), and Treasurer

(Teu Tupe). Apart from the normal domestic duties, members of the association execute decisions made by the Fale Kaupule that concern women's roles and division of labor in society. Their roles revolve around cleaning and preparing the meeting hall, catering for community functions, weaving mats to floor the Maneapa, and preparing meals for community builders and workers tasked with maintaining the water cistern, maneapa, and multi-purpose court. Women of Funafuti and all women from other islands are known for leading community fundraising drives.[61]

Table 6: Malosiga Women Employment Profile 2012. Source: Funafuti Island Profile Survey, 2011

Home Island	Employed	Womens Activity for those unemployed			Total
		With Disability	No Disability)	Subsistence Activity	
Funafuti	99	**2**	0	183	284
Outer Islands	501	7	244	462	1214
Others countries	15	0	1	9	25
Total	**615**	**9**	**312**	**577**	**1523**

Of the 284 women in the Malosiga Association, 99 are employed, and 183 are engaged in subsistence activities. Women on Funafuti, including those that have migrated from the outer islands, glean the reefs for shellfish (seashells) for handicraft[62] as well as weave mats for commercial purposes. Making of garlands and selling food are other common subsistence activities. The Malosiga Association is central to community development in Funafuti.

7.5.1 Gender Based Violence

Like many patriarchal societies, domestic violence is common to everyday life in Tuvalu. Forty percent of women have experienced physical and/or sexual violence in their lifetime (Pacific Women 2017). Eight percent of women experienced physical violence during their pregnancy. The majority of cases of violence towards women reported are caused by a current spouse or intimate partner (90%), and others are due to sibling hostility (8%). Almost one in five women (21%) have experienced sexual violence, with 13% of women attesting that their first sexual encounter was involuntary.

7.5.1.1 Sex Work and Trafficking

There is currently limited documentation on sex work and none on trafficking on Tuvalu. However, anecdotal and documented evidence suggest that sex work, driven by poverty, may be occurring, especially among foreign as well as local seafarers who reside on Funafuti and while trans-shipping. Associated risks to sex work may be emotional and/or physical violence, sexually transmitted diseases (STDs), unwanted pregnancies and associated unsafe abortion, and social stigmatization, although there is currently no documented evidence of such phenomena in Tuvalu.

Although there is no evidence of human trafficking in Tuvalu, the Attorney General's office is in the process of signing an international convention on human trafficking to address this issue 'in theory' and ensure that legal frameworks would cover this case if there are issues.

7.6 ECONOMY AND EMPLOYMENT

Tuvalu's economy is highly dependent on foreign earnings and official aid. Foreign earnings include interest received from the Tuvalu Trust Fund (TTF) and the Falekaupule Trust Fund (FTF), fisheries licensing, .tv, remittances from migrant labour and Tuvaluans residing abroad. Official aid is from

[61] Kofe, S, and Taomia, F. 2007. Advancing Women's Political Participation in Tuvalu. A Research Project Commissioned by the Pacific Islands Forum Secretariat (PIFS). Accessed 20 August 2019 from https://bit.ly/2NnDLEs

[62] Government of Tuvalu, 2017, Te Palani Tuatua mo Mea Ola ite Papa o Funafuti: Funafuti Reef Fisheries Stewardship Plan Accessed on 10th August from https://www.tuvalufisheries.tv/wp-content/uploads/2017/12/FRFSP-231117-web.pdf

Australia, China, EU, Japan, New Zealand, World Bank, ADB, UN agencies, Pacific regional development agencies, and others. Gross National Income (GNI) is considered to be a more useful measure to economic activity in Tuvalu compared with gross domestic product due to this high dependence on foreign earnings. GNI per capita averaged A$4,970 annually in 2015, making Tuvalu ready for Least Developed Country (LDC) graduation, although the Government resists such graduation due to the country's environmental and economic fragility. There are few career-oriented opportunities outside the government with slow growth in the private sector.

Within the monetary-based economy a significant portion is from public sector employment, although other sources of cash income are sourced from rent, land lease, and pensions as well as remittances, self-employment or ad-hoc businesses. Statistical analysis for employment used in the 2012 census constitute working age of 15 years and above, although this may not be compatible with international conventions. Funafuti's employable population is 3601; 46% (1651) of that are employed or earning cash income, while 54% (1950) are not employed. The total number of females employed is 626 (38%), suggesting that there's higher employability rate for males than females.

Of the employable population, 80% are from the outer islands, 16% are native to Funafuti and 4% foreigners. Of the unemployed, 78% (1516) are from the outer islands and 21% (410 people) are Funafuti natives, while others make up 1% (61 people). Gender differentiated employment status by island is such that 63% (171) of the Funafuti Island employed population are males, while 59% (244) are females with a 61% and 39% for men and women from the outer islands respectively. This means that the group with the highest employment deficit (or most underemployed) are women from the outer islands.

Production workers, the most significant portion of the employed population, increased by 69% from 2002 to 2011, while professional worker numbers (second highest) remained largely unchanged. Service and sales workers, the third highest proportion of employed, increased by 30% with 234 in 2002 and 304 in 2011. The next most common form of employment, after service and sales, are clerical related professions and the least common occupation is in the area of Agriculture and Fisheries, although this also increased by 36 people from 2002 to 2011.

The government is the main employment provider in Funafuti employing 44% of the employed population. The businesses in the private sectors employs 20% of the employed, followed by public corporations and NGOs at 10% and 9.8% respectively. Seafarers make up 9.3% of the employed, while self-employed people and the Kaupule makes us 3.8% and 2.8% respectively. Females are consistently represented in most fields of employment, except in the seafaring industry.

There is a growing interest in self-employment (3.8% of employment population), with many having graduated into successful entrepreneurs. These ventures, including canteens, bike hire, shops, printing, fuel, construction and other, total 27% of self-employed. Other self-employment schemes include handicraft designers 19%, followed by freelance workers (consultants, agents, media) with 12.9%. Self-employment in food and textiles are also at 12.9%, mechanic and carpenters make up 11.3% and 8% are commercial fishers.

Up to 150 individuals received money from land leases and 116 individuals received cash income from the pension scheme (ESS). Eighteen percent (64 people) received income from residential rents, while the rest earned income through two sources: either land leases and rent or land lease and pension.

7.7 SUBSISTENCE

Traditional subsistence activities on Fogafale are very limited, mainly because it is largely an urban settlement with a relatively high population, most of whom have migrated from the outer islands.

Therefore, access to land for agricultural purposes and other subsistence activities is very limited. Most of the relatively limited subsistence activities related to livestock rearing (mainly piggeries), fishing, vegetable or crop gardening, toddy cutting and handicraft making.

Of the 54% (1950) that are unemployed, about 45% (873) are not involved in any subsistence activities while 42% (827) confirmed their involvement in one or more activities. Just over two percent live with a disability or are too elderly to engage in economic activities. As expressed earlier, there's a trend of females unemployed or not engaging in subsistence activities. Women make up the majority (73% of the 873) of the unemployed that are not engaged in subsistence work. This means they are most likely engaged in domestic work, which usually covers caring for children, the elderly, disabled and sick as well as being responsible for the cooking and cleaning for the household.

Farming or home gardening for subsistence purposes is being practiced at a minimal rate due to the shortage of available land. Livestock farming (pigs, chicken, ducks) is a more common subsistence activity with an increase in the number of engaged households in that activity from 441 households in 2002 to 563 in 2011.

7.8 ISLAND STRUCTURE AND GOVERNANCE

Decision-making structure and governance is uniform across the islands of Tuvalu. The structure shown in Figure 34 was enacted in 1997 through the Falekaupule Act. The Act constitutes the "Falekaupule," a traditional assembly, as the ultimate decision-maker. It is defined as the "traditional assembly that is composed according to the local customs of each island." The local government structures consist of three main bodies: the Falekaupule, the Kaupule that is the executive arm of the Falekaupule, and the Falekaupule Assembly.

All island affairs are discussed and debated at the Falekaupule Assembly, a consultative forum which includes everyone above the age of 18. The assembly is operated under the leadership of the "aliki" or "pule fenua" and the "matai(s)" of the island. The Falekaupule normally holds its meetings monthly, where they are briefed on minutes of the Island Kaupule meetings and also on issues that concern the community.

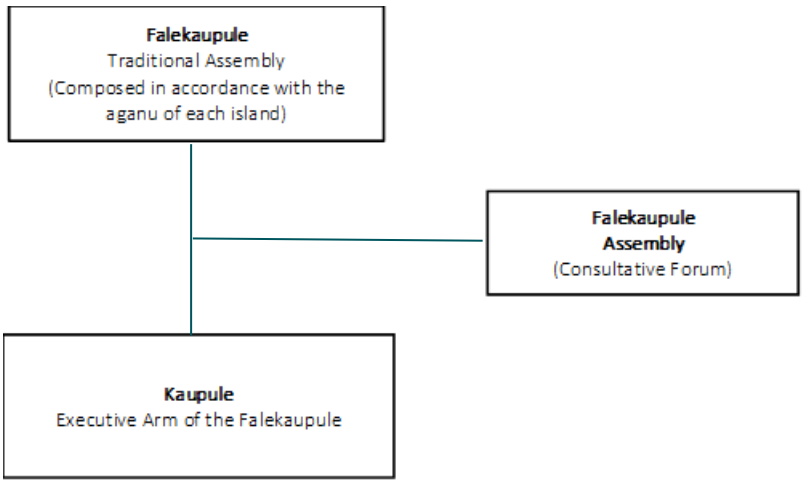

Figure 33: Local decision-making structure on Funafuti

In accordance with the Act, the Falekaupule assembly is obliged to convene a meeting once every three months to discuss traditional and development matters. The current practice is that meetings are conducted monthly and whenever there is an urgent matter to discuss before the monthly meeting. From the meeting minutes, all the motions agreed upon will be executed by the Kaupule.

The Kaupule is operated with the support of staff and executives or Kaupule members remunerated by the Government under the MHARD. Funafuti Kaupule, the executive arm, is the mediator between the traditional Falekaupule and the government through Ministry of Home Affairs, Rural and Urban Development (MHARD) for all development initiatives on the island. The operation of the executive arm and Funafuti's developments are also supported by their Falekaupule Trust Fund.

Funafuti's Kaupule arrangement is unique from the rest of the islands. The members of the Kaupule are selected not only by the registered Funafuti people, but by all the people residing on Funafuti. There are six members altogether, including the Pule Kaupule, Chief Executive.[63] Each Kaupule is assigned to look after the different developmental sectors. Since the government's main infrastructure and ministries are located on Fogafale, the Funafuti Kaupule and Falekaupule are privileged to information, projects, and other aid assistances. At times, the jurisdictions of the two, Funafuti Kaupule and government, clash, creating confusions amongst the residents. A classic example is the collection of solid waste – organic and non-organic. Residents are supposed to pay levies to Funafuti Kaupule for waste collection; however, some residents ignore this and rely on the Department of Waste to collect their rubbish. This can be an issue in governing and managing developments on Funafuti.

According to the 2012 survey, there are 623 members of the Funafuti Falekaupule with 50 heads of clans or matais and, as recorded, 49% usually attend the monthly Falekaupule Assembly and 59% of them are males. Those who rarely attend the assembly are mostly females. Those who rarely or never attend meetings in the 2012 census stated that someone is attending on their family's behalf (35%) or they have competing priorities (36%), and the rest have no interest or are unaware (24%). Women are encouraged to attend all assemblies, including consultations for projects and other development programs. According to an Oxfam study (2020), women expressed that they are included in most of the meetings; however, they have other domestic obligations to fulfill.

7.9 LAND TENURE AND RIGHTS

Land tenure and rights within modern and customary laws will need to be considered and carefully navigated for the success and sustainability of this project in the longer term. The project's footprint will be on the lagoon floor (for dredging) and on the foreshore and areas seaward of the foreshore (for the reclamation). The GoT does not own land other than that as defined as 'foreshore,' although it leases land from the native owners, usually via the Kaupule.

Section 2 of the Tuvalu Land Reclamation Act defines the foreshore as "the shore of the sea or of channels or creeks that is alternately covered and uncovered by the sea at the highest and lowest tides". Land beyond the foreshore is either held as *kaitasi*, land that is used and controlled for, and on behalf of, the extended family or *vaevae*, which is a division of lands amongst the *kaitasi* – generally smaller sub-units of the extended family.

The land on which a village sits is regarded as communal land. Section 15 (a) of the Tuvalu Lands code states that the land on which villages now stand (for all islands with the exception of Funafuti) "shall be used for the village in the same way as though it were communal land. If and when the village is moved elsewhere, the lands shall revert to their owners". This distinction is important, as the decision to undertake the reclamation within the communal boundary of each village may be determined via consultations with the Kaupule and the community. If the reclamation extends beyond the village communal land, that consultation should be sought with the relevant landowning unit (LOU).

Government and other corporate companies like the Tuvalu Electric Corporation have acquired lands through lease tenancy agreements with the respective land owning units. Recently, a Native Lands Trust

[63] Corbett, J & Fraenkel, J, 2015, Tuvalu.

Board has been established to oversee the leasing of native lands as in the case of Funafuti, where majority of the lands on Fongafale are under lease.

The Government leased the majority of the lands on Fogafale for infrastructure, schools, and housing for civil servants. The lease contract had expired, and a tenure leasing agreement was renewed in 2019 with the revised conditions that there was an increase in leasing fees. Based on the 2012 census, 57% of the households in Funafuti owned the land they were living on, while 38% are leasing from government or renting from private individuals or public corporations.

The Kaupule and LOU adjacent to the proposed TCAP foreshore reclamation area have given their approval for this development to go ahead, although the finer details of access and the spatial plan are still being finalised.

7.10 COMMUNITY SERVICES

7.10.1 Solid Waste Management

The Tuvalu Department of Environment advocates good waste management practices. The preferred hierarchy and principles for achieving this are: (i) waste avoidance (avoiding using unnecessary material on the project); (ii) waste re-use (re-use material and reduce disposing); (iii) waste recycling (recycling materials such as cans, bottles, etc.); and (iv) waste disposal (all other waste to be dumped at approved landfills).

In Funafuti, 73% of households (576 households) have their waste collected by the Island Kaupule. Out of the 27% of households who don't use the collection service, about 16% of households dispose their waste in their own backyards/sea/dump; 5% (24) of households burn their waste; 3% of households bury their waste, and 6% (27) of households recycles or compost their waste.

Figure 34 shows that households located within the main village area such as Tekavatoetoe, Vaiaku, Alapi, Senala, and Fakaifou have the majority of households with waste collected by the Island Kaupule. However, households that are located at the far end of the island and outside the main village mostly dispose of their waste in the vicinity of their homes.

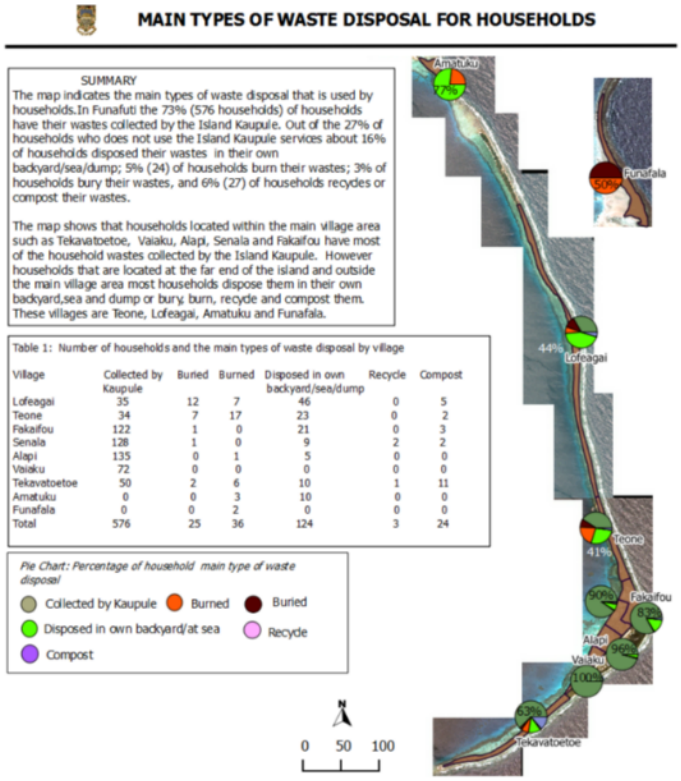

Figure 34: Main types of waste disposal by household in each village

7.10.2 Water

As identified in their Island Strategic Plan 2016-2020[64], accessing and having sufficient safe clean water is a priority for Funafuti and demand has increased with population expansion. Prior to the 2011 severe drought, the Australian Aid Agency, in collaboration with the European Union, funded the distribution of one 10,000L water tank to each household on Funafuti. This did not meet the demand of the residents during the drought era and, under a state of emergency, the government rationed each household with 20 liters of water per day.[65] Consequently, other projects such as Tuvalu Waste, Water and Sanitation supplied second water tanks to each household. The PACC and PACC+ projects also built communal cisterns for communities in Kavatoetoe and Lofeagai as adaptation initiatives.

Apart from the household water storage facilities, there are a few communal water cisterns built and managed by the Falekaupule, churches and government. Total storage capacity amounted to 1,254,387 gallons according to the 2012 census. During the drought events and particularly the 2011 catastrophe, the Funafuti Kaupule has been effective in rationing from its reserves to meet community needs.

According to the 2012 census, there are 788 households in total, 66% of which have water tanks, 28% have both a water tank and a water cistern, 2% just have a water cistern and the other 2% have neither. A contributing factor to shortage of safe clean drinking water is due to a significant proportion of households having inadequate rainfall catchment systems or lack proper maintained guttering and down pipes. Of the 788 households, 235 reported catchment/guttering problems.

The TCAP reclamation has the potential to generate new freshwater resources via: i) the collection and storage of rainwater from the roofs of buildings constructed on the reclamation; and, ii) the potential

[64] Kaupule Funafuti, 2016, Moeakiga o Malefatuga II: Funafuti Strategic Plan 2016-2020
[65] Kaupule Funafuti, 2016, Moeakiga o Malefatuga II: Funafuti Strategic Plan 2016-2020

development of a new freshwater lens in the area of the reclamation. TCAP intends to install piezometers within the reclamation area to enable monitoring of groundwater development.

7.10.3 Energy Sources

Tuvalu aims to achieve 100% renewable energy by 2025.[66] The government-owned Tuvalu Electricity Corporation installed a solar PV (about 500kw peak) and plans to install and additional 100kw capacity via wind power generation (up to 100kw) on Fogafale to bring the renewable energy fraction in the Funafuti grid system to at least 30% from the current 18%.[67] The main source of energy for Funafuti is via a diesel generator that requires 110, 400 liters monthly, equating to 1,324,800 annually.

Electricity is accessible 24 hours to all subscribed households. In 2011, it was recorded in 771 households out of 788 – an increase of 65 households from the 2002 records. Seven households use solar energy, and 10 depend on kerosene or oil lamp.

7.10.4 Transportation

The amount of land transportations used on the island has increased considerably in 2011. Households with motorbikes have increased to 611 from 423 in 2002, while households with bicycles increased from 197 to 207(2011); cars increased to 101 from 61(2002), and households that have handcarts increased from 107 (2002) to 143 (2011). In most villages, the major means of transport is motorbikes.

[66] Tuvalu Climate Change Portal available at https://www.pacificclimatechange.net/country/tuvalu
[67] Tuvalu Electricity Corporation, 2015. Environmental and Social Management Framework: Tuvalu Energy Sector Development Project available at http://documents1.worldbank.org/curated/en/754771468119085000/pdf/E46800REVISED000Box385383B00PUBLIC0.pdf

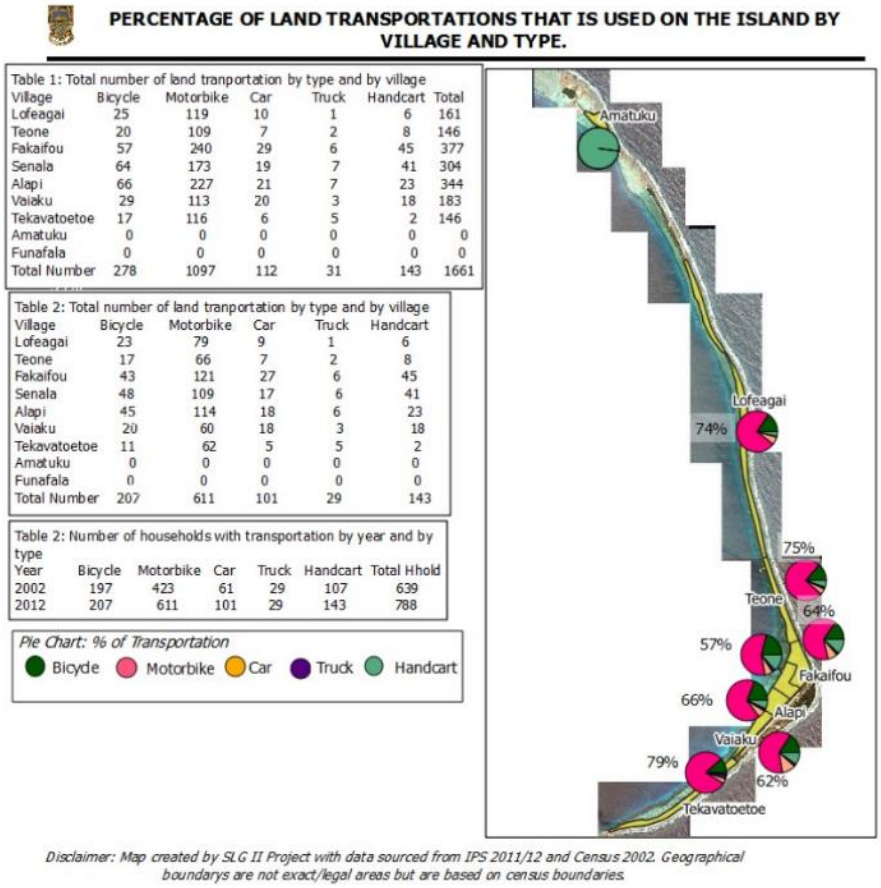

Figure 35: Percentage of land transport that is used on the island by village

Sea Transport: The map and date presented in Figure 36 indicates the types of sea transportation used in households. The highest is canoes, with a total of 147 households out of 788 (19%). There are households that have a boat and motor (138 or 16%) and some that have only boats, (32 households) or only the motor without a boat (33 households or 4%). There has been an increase in households that have a means of sea transportation since the 2002 census. The number of canoes has increased by 58 households for those that have canoes, and for those that own a boat, the number has increased from 106 (2002) to 170 households (2011), while for those that have an outboard motor, the number of households has increased from 104 to 171. This is significant, as sea transportation is used as a means of earning income or providing food for the family when people use it for fishing.

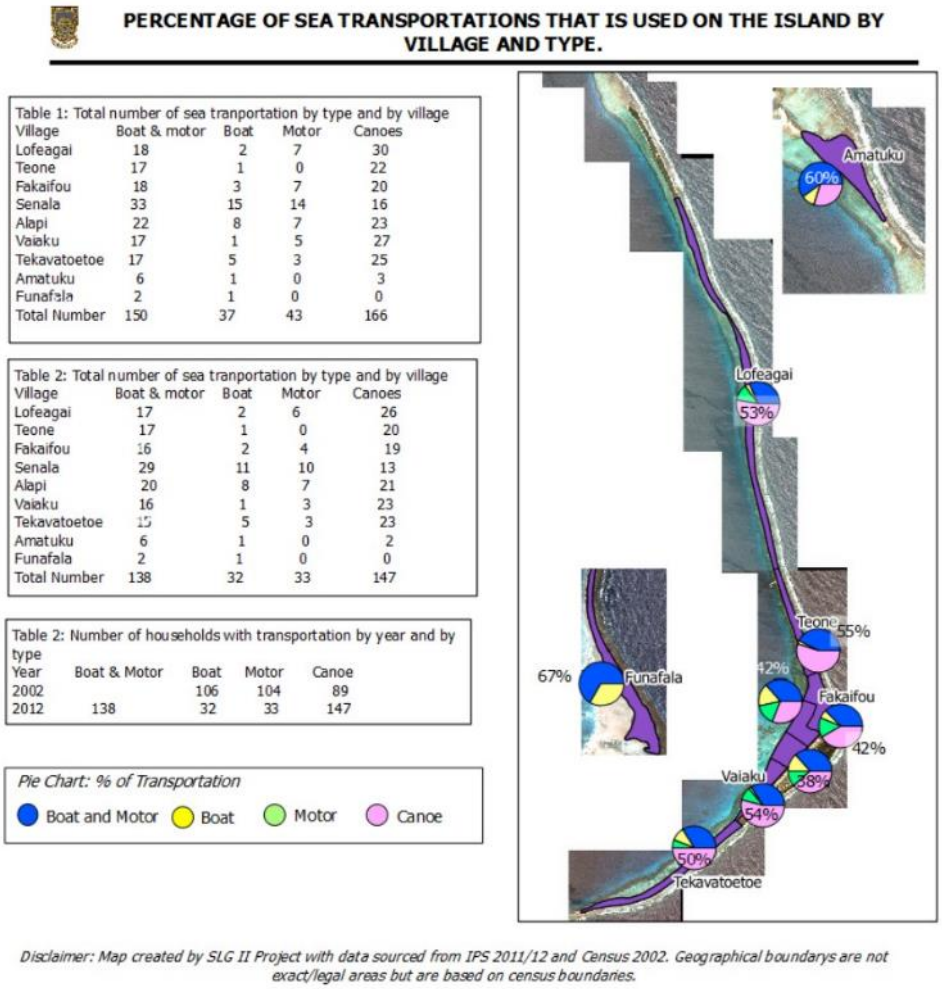

Figure 36: Percentage of sea transport that is use on the island by village

7.10.5 Communication

The communication industry in Tuvalu is a government-owned monopoly via the Tuvalu Telecommunication Corporation (TTC). Connectivity within Funafuti and with the outer islands has changed significantly since the TTC upgraded the country's internet infrastructure to fourth generation broadband cellular network technology (4G) in late 2018. Since the upgrade, mobile phones have become a key medium of communication and information access in Funafuti. TTC services include internet, fax, telephones, and emergency satellite phones. Recently, the Tuvalu government signed a contract with a satellite broadband internet provider called Kacific which has a geostationary satellite with the capability to improve speed and coverage in the near future.[68]

Communications and information sourcing has shifted significantly towards the use of mobile phones to access the internet and social media, particularly Facebook, with the use of Messenger, Viber and Skype increasingly used to communicate with relatives and friends within Funafuti, with the outer islands as well as with family, friends and business associates and networks overseas.

[68] https://kacific.com/news/tuvalu-government-signs-agreement-with-kacific-for-wide-ranging-suite-of-connectivity-services/

7.11 CULTURAL HERITAGE RESOURCES

Culture shapes the way people live and thrive in Tuvalu's atoll environment. Tuvalu's culture is generally characterized largely by communal values, whereby extended family and kinship networks channel the flow of knowledge and resources within and between islands as well extending to relatives abroad. Shaped largely by a history of atoll life and journeys, Tuvalu's communal culture has been a source of community resilience in times of pressure stemming from disasters, climate change, and other pressures.

Tuvalu is rich in tangible cultural and natural heritage (e.g. monuments, artistic creations) and intangible (practices, stories, dances, expressions, knowledge, and skills) cultural heritage. The 2003 Convention for the Safeguarding of Intangible Cultural Heritage (ICH) specifies the interdependencies between the types of cultural heritage and the importance of the latter to cultural diversity and driving sustainable development[69]. Some of the more significant examples of ICH are the fatele (traditional song and dance performance), alofa (presentation of performing arts and gifts such as mats and handicrafts to conclude visitors' welcome events), and traditional craftsmanship such as mat-weaving, fan-making, and shell necklace-making[70]. Other key elements of ICH include pulaka (giant swamp taro) agriculture, traditional community fishing practices, canoe-building, and Te Ano games (cross between volleyball and murderball) played on communal malae (ground), all of which support wellbeing and livelihoods.[71] [72]

The outer island communities present in Funafuti each have their own mwaneaba and function as a cohesive social unit as such. The mwaneaba is where the respective fatele and alofa is performed and where communal decisions and planning is done in a way that is supplementary to the functions of the Kaupule based in their home islands.

Traditional canoes and fishing are still evident in Tuvalu, although not as visible in Funafuti as in the outer islands. The outrigger canoes are made from local trees that are now hard to find in Funafuti. The fetau tree (*Calophyllum inophyllum*) is mostly used for the main hull (vaka) and outrigger beams (kiato), whereas the lighter-weight puka (*Hernandia nymphaeifolia*) is used for the outrigger (ama). The few traditional canoes present in Funafuti are sourced from the outer islands, Nanumea in particular. The declining number of fetau trees for canoe building in the outer islands may determine the continued transmission of this cultural heritage in Funafuti.

[69] https://resources.riches-project.eu/glossary/tangible-and-intangible-cultural-heritage/#:~:text='Tangible%20Cultural%20Heritage'%20refers%20to,transmitted%20intergenerationally%20in%20a%20society.

[70] Government of Tuvalu, 2018, Tuvalu National Culture Policy Strategic Plan 2018-2024, Published by the Government of Tuvalu (http://www.unesco.org/new/fileadmin/MULTIMEDIA/FIELD/Apia/pdf/265528e_compressed.pdf)

[71] https://blog.tepapa.govt.nz/2013/10/01/a-cross-between-volleyball-and-murderball-te-ano-national-game-of-tuvalu/

[72] file:///D:/Users/dumaru_p.LAUCALA/Downloads/TRAD8_20_Passfield.pdf

8 STAKEHOLDER ENGAGEMENT AND CONSULTATION

This section describes the stakeholder consultations implemented and planned, by the GoT, through the TCAP PMU, associated with the proposed TCAP infrastructure on each of the islands. A Stakeholder Engagement Consultation Program (SECP) has been developed (refer Section 8.2) and initiated and this document will guide the ongoing engagement of stakeholders.

The ESIA team initiated regular ongoing consultations with the TCAP design engineer and project management team as well as the SPC project team to ensure that the assessment was based on the latest available data and is well informed by the experts. Building on the community consultations already undertaken by the TCAP and SPC teams, the ESIA team also communicated with the Funafuti based project team to engage with the outer island representative communities that are based on Funafuti.

Consultations with the community have shown broad levels of support for the proposed works. Due to COVID-19 travel restrictions, follow up meetings by the ESIA team with community members have been constrained although attempts were made to engage with key Tuvaluan informants who lived and worked on a professional basis in climate and disaster reduction and management on Funafuti. Further, Tuvalu based members of the TCAP have continued to engage with members of the community during the ESIA process.

8.1 STAKEHOLDER GROUPS

Stakeholder groups applicable to TCAP are described below.

8.1.1 National Government Authorities

National authorities are defined as those agencies of the GoT who have the power to regulate or influence the Project in terms of granting permits or other approvals for the Project, and monitoring and enforcing compliance with GoT law throughout the project implementation cycle. Productive ongoing dialogue with these national authorities will be had throughout project implementation.

Ministry of Public Utilities and Environment (MPUE): This Ministry is responsible for the formulation and implementation of environmental policies with the aim of ensuring ecologically sustainable development in Tuvalu. The MEFLT will also oversee the environmental permitting assessment and approval process for TCAP. The ministry oversees permitting and approval processes related to infrastructure and public works, environment, labour, and disasters.

Ministry of Finance and Economic Planning (MFEP): The Ministry of Finance and Economic Development is responsible for supporting the Government in pursuing a sound economic policy, enhance growth and productivity and ensure efficiency in the public sector. Through eight program areas, the Ministry provides fiscal discipline and a balanced budget; is responsible for clear budget expenditure priorities that offer high rates of return, structural change, innovation and economic reform, increase private sector share of GDP, minimize external debt and lower subsidies to public enterprise. The MFED is the executing agency for TCAP. The Minister of MFED is the Chair of the Board of TCAP.

Ministry of Natural Resources, Energy and Environment (MNREE): The Ministry of Natural Resources is responsible for ensuring that sustainability is safeguarded in the utilization of Tuvalu's natural resources through informed Government policies and public practices. Through three program areas, the Ministry has to maximize social and economic returns through the sustainable management and harvesting of all agricultural resources in Tuvalu; also, to maximize social and economic returns through the sustainable management and harvesting of marine resources; and to facilitate maximum land usage in

Tuvalu by maintaining a systematic register of all available land resources. Any land issues associated with TCAP will be managed through the Department of Lands and Survey which sits under the MNR.

Ministry of Home Affairs and Rural Development (MHARD): The Ministry of Home Affairs and Rural Development is responsible for all economic and social policies as development, for the betterment of all Tuvaluans on each island. Through five program areas, the Ministry provides and ensures a distributive growth of Tuvalu's economy by providing policy direction and coordinating implementations; enhanced economic and social development in the outer islands through their Kaupule empowerment and community participants; promotes the social well-being for individuals; to facilitate, preserve and protect valuable cultural heritage in Tuvalu through systematic recording and documentations; minimizing the negative effects of solid waste on Tuvalu's environment through prudent policy, legislation and sustainable systems.

The Kaupule Island Administration: The governing bodies of each island, as described in Section 7.8, have a significant role on the TCAP project. The Funafuti Kaupule will be vital partners on the design, development, and implementation of TCAP. The Kaupule will be particularly critical for mediating local issues and consultations with the wider community. Their involvement will be particularly critical to securing long-term and unhindered access to the new Catalina Harbour area for all community members, whether from Funafuti or from one of the outer islands.

Tuvalu Family Health Association (TFHA): As a primary contact with supporting services from the *Gender Affairs Department (GAD)* and the Tuvalu National Council of Women (TNCW) may provide advice and support towards addressing any issue associated with gender-based violence that may arise from the planning, implementation and evaluation of this project.

8.1.2 Project Affected Communities and Individuals

This group includes all people who may be directly or indirectly affected by the TCAP, especially households, fisher folk and boat owners that live adjacent to the proposed reclamation area. This community comprises both Funafuti landowners and settlers from the outer islands.

Women's Groups: The Tuvalu National Council of Women (TNCW) is an NGO that was set up in the late 1970's to direct and manage women's affairs and their issues. The council consists of elected women and are the formal link between Government and women's communities. TNCW has provided support in the area of women's political participation, women's handicrafts, legal literacy and trainings on gender-based violence and child abuse and exploitation.

All women above the age of 18 years become part of their respective island's women's organization, which has office bearers consisting of the president, treasurer and secretary who serves a 2-year term before there is an election for the next office bearers. The women are presented at the Kaupule via the women's community officer, whose role is to ensure development activities and funding is channeled to support women's needs and interests.

Churches, Schools, and Health Clinics: The majority of church members on Funafuti are members of the Christian Church of Tuvalu, with smaller numbers of the Seventh Day Adventist, Jehovah's Witnesses, and Baha'i faiths. Like many Pacific Island societies, churches are a central part of communal and cultural life, with most community members attending Sunday services as well as weekday prayer and fellowship group activities. It will be important for the TCAP to initiate engagement with the main faith-based institutions of each island as they will provide opportunities to effectively communicate and disseminate information about the TCAP activities in a way that is sensitive to community beliefs and worldviews.

8.1.3 Civil Society and NGOs

This group includes smaller groups in society who may have an interest in the TCAP and its social and environmental aspects. On Funafuti, there exists an umbrella organisation of NGO's called the Tuvalu Association of NGOs (TANGO).

TANGO was established in 1986 and has a membership of approximately 48 members. TANGO's core role is to provide a policy voice within government and provide information and communication to its members and the local community. Other activities include capacity building, project and program coordination, and fundraising and resource mobilization.

As mentioned above, the Tuvalu National Council of Women (TNCW) is a Non-Governmental Organisation (NGO) set up to manage women's affairs and their issues. TNCW continues to provide support in the area of women's political participation, women's handicrafts, legal literacy and training on gender-based violence and child abuse and exploitation.

Disability Persons Organisations (DPOs) will be consulted throughout the TCAP lifecycle. Fusi Alofa is the only DPO currently located in Tuvalu. The estimated number of persons with disabilities with significant difficulties functioning in Tuvalu is 444.

8.2 THE STAKEHOLDER ENGAGEMENT AND CONSULTATION PROGRAM

The SECP maps out the stakeholders to be consulted over the duration of the project and the mechanisms/mediums to be employed to engage with them. This ESIA builds upon previous consultations by the TCAP and SPC teams, the SECP incorporates activities already undertaken as well as planned future consultations. The SECP will be updated and refined throughout the lifecycle of the Project. During this process, the focus and scope of the SECP will change to reflect the varying stages of project implementation and to encompass any changes to project design.

8.2.1 Engagement Mediums

Table 7 below lists the recommended engagement mediums that are appropriate for SECP activities proposed as part of the implementation plan components in Table 10.

The mode of consultation will vary according to the sub-project and the participants, but in all cases will promote participation by ensuring that the venue is accessible, the timing convenient and the manner of conduct of the consultation is socially and culturally appropriate. Consultations will be announced to give sufficient notice for participants to prepare and provide input to project design.

Table 7: Recommended Engagement Mediums for TCAP Project Stakeholders

Medium	Description
Stakeholder Meetings	
Focus Group Meetings	The aim of a focus group is to pull together stakeholders with the same interest into a single meeting to discuss issues. Meetings usually have a very specific objective which is aligned with the expectations and interest of the stakeholders' present.
Community based consultations	These consultations are focused to identify and discuss stakeholder concerns or to provide feedback using detailed information. These consultations should, wherever feasible, be held within the community environment.
Written / visual communications	
Project Information Bulletin	This needs to be a short and concise document provided in jargon-free information describing the project actions, the potential social and environmental impacts, the need for the project and the contact details for the project team.
Notice boards	Notice boards (community and work site entrances) are a good tool to use for communication of up-to-date project information such as timing and duration of works, upcoming consultations, project progress and other relevant project information.
Letters	Formal method of communication usually intended to convey very specific messages. Alternatively, it is used as a formal method for request of information.
Emails	Using emails for in-country stakeholders can pose a challenge because of limited internet access due to insufficient telecommunications and/or supporting IT infrastructure. NGOs and most of the Government Ministries do have access to email which can be utilised for communications but arranging of formal community consultations is best arranged through other methods of communication.
Media	
Internet	With 4G internet access, the public may have better access to knowledge and information about the project via the TCAP website, Facebook page and Twitter account. The website and social media accounts may be used to update the public on implemented and planned activities as well as announcements.
Radio	In Tuvalu, radio is the primary medium for raising awareness and prepare stakeholders for larger events or refined communication to take place.
Other	
PMU	PMUs will be the 'familiar faces' of the project and will, for many stakeholders at the community level, represent the most direct channel to the project.
Telephone	Use of the telephone / mobile phone is still regarded as the preferred method for communication because of accessibility and speed. Having a discussion over a phone in order to ensure mutual understanding between two parties is quicker and easier compared to sending an email, waiting for reply.

8.2.2 Implementation Plan

The Implementation Plan (Table 8) for the TCAP Project lifecycle constitutes the following components:

- **Activity**: the various operational consultation activities that will be undertaken as part of the SECP
- **Objective:** the target that each activity needs to reach
- **Stakeholder:** the various stakeholders to be targeted during implementation of the SECP activity; and
- **Medium:** the method by which the engagement or consultation will be done.

Some elements of the implementation plan have yet to be confirmed. As project details develop, this SECP and implementation plan shall be updated by the PMU Project Manager to reflect the current project status and timeframes. In practice, the PMU will notify stakeholders, the Kaupule, and the

Funafuti communities at least 7 days prior to community consultations. Updates of project activities will be presented at this time as outlined in Table 8.

Table 8: Stakeholder Engagement and Consultation Implementation Plan

No	TCAP Project Activity	Timetable	Objective	Stakeholders	Medium
A: Physical Investments (Funafuti)					
A1	Feasibility, decision on the sites / technologies and preliminary designs	From Project initiation through to tendering.	Bring stakeholders into the decision making around the site and type of investments. Discuss potential impacts and mitigation measures.	All identified	Community Consultations Focused group meetings Public meetings Website and social media Emails and letters
A2	Disclosure of updates to the ESIA	Prior to tendering (ESIA) Prior to works starting (development of C-ESMP)	To disclose ESIA	All identified	Newspaper Website and social media Hardcopy on public display
			Advise stakeholders of final design, construction methods and updated mitigation and management plan. Stakeholder awareness of GRM Advise stakeholders of GBV prevention strategies and management of labour influx	Communities Site occupants (State owned enterprises. Government agencies) Site users with focus on boatowners (if different from above)	One-on-one meetings Community consultations Executive Summary

No	TCAP Project Activity	Timetable	Objective	Stakeholders	Medium
A3	Detailed design	Once Contractor is onboard and prior to works starting	Keep stakeholders involved in any design updates. Public announcements	Government agencies, site occupants, site users	Emails, One-on-one consultations Radio and websites Noticeboards
A5	Commencement of Works	Week before commencement of works.	To advise all stakeholders of commencement of civil works.	All identified stakeholders Site occupants (State owned enterprises. Government agencies)	Newspaper Email One on one meetings
			To reconfirm ongoing consultation, feedback and complaints processes	Community Site occupants (State owned enterprises. Government agencies)	Community Notice Boards Community workshops and consultations Website Community Liaison Officer

8.3 RESOURCES AND RESPONSIBILITIES

The TCAP PMU will take the lead role in the implementation of the SECP and will be responsible for arranging and facilitating the meetings as appropriate with their in-depth knowledge of the natural, social and traditional environments within Nanumaga, Nanumea and Funafuti. The PMU will also be the focal point for all stakeholder queries and contacts in relation to the implementation of the SECP.

8.4 PUBLIC CONSULTATIONS TO DATE

Consultation commenced during the early design phase of project development. Multi-stakeholder consultations, including with government agencies, NGOs, DSOs, and partners were conducted during June 2015 culminating in a GCF Concept that was then developed into the Funding Proposal that was submitted to GCF in June 2016. As previously noted, the original concept was revisited in 2018 due to significant shoreline changes and the development of a Foreshore Master Plan. In September 2018, TCAP took its revised conceptual plans to Funafuti and held multi-stakeholder meetings with Government, Council and Community as well as key individuals. The revised design was supported and a Preliminary Environmental Assessment prepared on that basis.

A further series of public consultations and stakeholder meetings were held in 2019 and 2020 with the aim of having meaningful consultation with affected communities and to provide an opportunity for all parties to provide input into the Project. Consultations also combined with the SPC field work conducted in 2019 [73]. The meetings primarily targeted the Funafuti Falekaupule, Kaupule and community members, although Government agencies, authorities and development partners in

[73] TCAP Project: 1st Preliminary Report- Period 19th December 2018 to 31st December 2019, SPC, 2020.

Funafuti were also consulted. The community consultation also included a project management training event with the Kaupule and Department of Local Government staff in Funafuti. The consultation for the various groups took place according to the schedule in Table 9.

Table 9: Funafuti Stakeholder Consultations

	Location	Stakeholder Meetings
8th October 2019	Funafuti	Funafuti Kaupule and community consultation to inform participants of TCAP project scope and gather initial views: 54 community members attended (20 females and 34 males)
6th November 2019	Funafuti	Funafuti Kaupule and community consultation to discuss the TCAP project design and implementation process: 47 participants (32 males and 15 females)
7th to 8th November 2019	Funafuti	Project management capacity development training for Funafuti Falekaupule staff: 26 participants (10 females and 16 males)
9th December	Funafuti	Consultations of residents of community located adjacent to proposed TCAP reclamation area for initial discussions about project concept and design:26 participants (12 male and 12 females)
29 June, 2020	Funafuti	National Disaster Management Office
Aug/Sept 2020	Funafuti	Focus group discussions and interview with fishers and boat owners of community adjacent to proposed TCAP reclamation area (number of participants to be determined)
Nov/Dec	Funafuti	Consultation and action planning workshop with affected communities on potential impacts of the project and potential mitigation measures (number of participants to de determined

Information gathered during the consultation process on the social, economic or environmental situation of Funafuti has been included in the baseline description (Section 7). Wherever possible, the remaining concerns have been addressed either through design solutions or mitigation measures and included in this document. Full minutes of the SPC led stakeholder meetings can be found in Appendix 7 and 8 of the SPC TCAP Preliminary Report (2020).

8.5 COMPLAINTS REGISTER

A complaints register will be established to record any concerns raised by the community during construction. Any complaint will be advised to the UNDP and DoE promptly upon receiving the complaint. The complaint will be investigated and following the investigation, if it relates to a significant incident, the matter will be referred to the UNDP for commentary and/or advice.

8.6 GRIEVANCE REDRESS MECHANISM

During the construction and implementation phases of any project, a person or group of people can be adversely affected, directly or indirectly due to the project activities. The grievances that may arise can be related to social issues such as eligibility criteria and entitlements, disruption of services, temporary or permanent loss of livelihoods and other social and cultural issues. Grievances may also be related to environmental issues such as excessive dust generation, damages to infrastructure due to construction related vibrations or transportation of raw material, noise, traffic congestions, decrease in quality or

quantity of private/ public surface/ ground water resources during irrigation rehabilitation, damage to home gardens and agricultural lands etc.

Should such a situation arise, there must be a mechanism through which affected parties can resolve such issues in a cordial manner with the project personnel in an efficient, unbiased, transparent, timely and cost-effective manner. To achieve this objective, a grievance redress mechanism has been developed and is being implemented as part of the project.

A Grievance Redress Mechanism (GRM) has been developed and is designed to be problem-solving mechanism with voluntary good-faith efforts. The GRM has been available to the community during the project development phase. It is in the process of being updated to better meet the needs of the project/community as implementation progresses and the updated GRM will be in place by the time the ESIA is disclosed. The GRM is a living system and will be reviewed and revised as required throughout the life cycle of the project.

The Grievance Redress Mechanism is not a substitute for the legal process. The Grievance Redress Mechanism will as far as practicable, try to resolve complaints and/or grievances on terms that are mutually acceptable to all parties. When making a complaint and/or grievance, all parties must act at all times, in good faith and should not attempt to delay and or hinder any mutually acceptable resolution.

All complaints and/or grievances regarding social and environmental issues are able to be received either orally (to the field staff), by phone, in the complaints box or in writing to the TCAP project team, UNDP, DoE or the Construction Contractor. A key part of the grievance redress mechanism is the requirement to maintain a register of complaints and/or grievances received at the respective project site offices. All complainants shall be treated respectfully, politely and with sensitivity.

9 DETERMINATION OF POTENTIAL IMPACTS

9.1 INTRODUCTION

The planned works on Funafuti have the potential to create a variety of impacts through their implementation. These impacts can be either positive (e.g. improved coastal protection for community members) or negative (e.g. loss of beach access for recreation and fishing) depending on the activity and receptors involved. The impact of this project on the physical, biological and social environment has been assessed using methodology described in this chapter.

9.1.1 Environmental and Social Receptors

The ESIA focuses on environmental and social components that could be most affected by the Project and those that are a concern to governments, community members and stakeholders. The components are called Environmental and Social Indicators (ESI). Below are the identified ESI for this Project, and the specific factors that were considered for each in order to undertake the impact assessment.

Table 10: Environmental and Social Indicators and parameter considered under each indicator during the impact assessment

Environmental and Social Indicator	Factors to be considered
Water Quality	• Water quality of coastal marine environment • Management of surface water • Turbidity in marine environment
Erosion, Drainage and Sediment Control	• Sedimentation build up in coastal marine environment • Management of surface water run off
Coastal Hydrodynamics	• Changes in current regime • Changes in littoral drift • Changes in wave regimes
Air Quality	• Dust generation • Air pollution
Noise and Vibration	• Noise nuisance in sensitive areas • Vulnerability of property to damage from vibration • Noise impacts in marine environment
Flora and Fauna	• Loss of vegetation within the direct project footprint • Degradation of marine habitats • Introduction of new invasive marine or terrestrial species
Waste Management	• Waste production and minimisation • Disposal arrangements of solid project and construction waste • Management of hazardous waste • Treatment and disposal of wastewater (black and grey) • UXO/ERW
Chemical and Fuel Management	• Storage and handling of hazardous substances • Contamination of soils and water from spills
Community Services and Infrastructure	• Access to Catalina boat ramp during construction • Fishing boat mooring availability • Solid and hazardous waste generation

	• Vehicles and machinery • Labour influx • Health and other service requirements/demands
Land and Resource Use	• Access to coastal resources • Landscape and land use change • Transboundary considerations
Social Environment	• Gender and social inclusion • Community perceptions and expectations • Employment
Community Health and Safety	• Gender based violence • Human trafficking • Worker and community safety

9.1.2 Impact Identification Methods

In assessing the potential impacts, a series of methodologies have been used. These include consultations with relevant stakeholders, scoping of the ESIs, development of baseline data sets, scaled checklists, review of project documentation and expert opinion. A precautionary approach was taken with any interactions with a meaningful degree of uncertainty.

The impact assessment methods address both project related and cumulative environmental and social effects. Project related impacts are changes to the biological, physical or social environment that will be caused solely by a physical work or activity of TCAP. Cumulative impacts are changes to the biological, physical or social environment that are caused by an action associated with TCAP in combination with other projects or activities that have or will be carried out.

Using a list of all relevant ESIs identified during initial TCAP scoping, each project impact is evaluated against a scaled checklist (Table 11) and assessed under the defined parameters.

For identified adverse impacts, effective mitigations are needed to eliminate or reduce them to an acceptable level. Mitigation measures are developed for each impact according to the hierarchical preference in Table 12.

Defined Parameters:

- *Activity* – phase of the development that the action takes place in.
- *Environmental and Social Indicator* – sensitive component of the ecosystem that demonstrates a reaction to or is influenced by environmental stressors.

Table 11: Scaled Checklist for Impact Assessment

Rank	Description
Low	No substantive interaction. The impacts are rated not significant and not considered further in the ESIA. The environmental and social impacts of these activities are rated not significant with a high level of confidence
Moderate	If a potential interaction between an activity and an environmental or social component is identified but not likely to be substantive, long term or irreversible in light of planned mitigation.

Major	If an interaction between a planned activity and the environmental or social component is identified that may result in more substantive, long term or irreversible impacts despite the planned mitigations, or if there is less certainty regarding the effectiveness of mitigation

Table 12: Preferred mitigation hierarchy for addressing TCAP impacts.

Measure	Description
Prevent	The most effective way to eliminate any adverse impact is to prevent the creation of the impact at the source.
Reduce	If prevention is not possible then mitigation measures will attempt to minimise impacts at their source
Rectify	Restoring temporary impacts to pre-construction or a better state
Precautionary	Measures to reduce construction impacts
Compensatory	Provide suitable, replacement or substitute resources of greater or equivalent value

9.2 IDENTIFIED IMPACTS & MITIGATION

9.2.1 Overview of Impacts

While the TCAP coastal reclamation project will undoubted enhance a key dimension of climate resilience for Funafuti in general, other dimensions of resilience that are more localized (within islet) and potentially transboundary (outside national borders) in scale, may need to be addressed in relation to the principles of the GCF's Environmental and Social Policy. Additionally, due to the Covid19 travel restrictions, not all the stakeholder engagement and data needed to completely assess the potential social impacts of the project on resilience have been undertaken. As such, some of the identified social impacts and mitigation measures, particularly those which relates to the loss of beach access for boat mooring, proposed will need to be incorporated into the project implementation phase via an iterative learning process whereby improved knowledge about social concerns raised by stakeholders is allowed to influence decisions and actions. To prepare for this a precautionary approach has been adopted in the impact assessment, the SECP incorporates ongoing community consultation and the GRM is being updated.

The following potential environmental and social impacts have been identified in relation to the proposed activities on Funafuti as described in Section 3 of this ESIA.

In the following subsections, those impacts assessed to be moderate or major negative (against the scaled checklist) prior to the application of mitigation measures are detailed. The impacts are presented according to their ESI.

Each subsection below also lists some of the key protective measures that have been designed to mitigate or avoid environmental and social impacts. A full list of all protective measures for all identified impacts is included in the mitigation table in Appendix B.

9.2.2 Water Quality

Dredging activities may create plumes of suspended sediments in the dredge location that could travel and create increased turbidity in the nearshore areas of the lagoon. However, as described in Section 6.3.2.1 sediments within the identified sand resource area have low amounts of clays and other fines that cause turbidity when disturbed. Furthermore, current velocities within the immediate area of dredging and the Fogafale foreshore are very low (as discussed in Section 6.3.5) so the spread of any turbid water is not expected to be significant. Turbid waters are only expected to be spread by tidal flows across the areas shown in (Figure 37). The extent of potential dredge plume impact was determined by a hydrodynamic model that considered potential impacts associated with resuspension and sedimentation resulting from dredging in the resource area[74]. It is important to note that model assessed the impacts of sediment pumping to a floating barge with dewatering happening at sea with direct release of wastewater 2m above the substratum. The proposed dredging methodology for the TCAP works calls for pumping the dredge material directly to the project site, with dewatering happening within the footprint of the reclaimed area, allowing sediments to be settle and be contained. Even considering this model for a higher impact dredge methodology, the Damlamian (2008) study did not find any significant impacts.

The dredging methodology proposed by TCAP was used by the Borrow Pit Filling Project[75] which pumped 600,000m^3 of sand from the same resource area onto the island, which resulted in no significant environmental impact.[76]

Figure 37: Impact zone expected from dredging. Red line is limit of impact area; shaded area is extraction zone examined. Light blue patches and lines are coral reefs. Blue lines are depth contours 10, 15 and 25m. Source: Hydrodynamic Model of Funafuti: Water Circulation and Applications, SOPAC Technical Report 133

[74] Damlamian, H (2008) Hydrodynamic Model of Funafuti: Water Circulation and Applications. SOPAC Technical Report 133.
[75] Kaly, U & Peacock, C. 2014. Tuvalu Borrow Pits Project Phase II Design: Environmental and Social Impact Assessment (ESIA)
[76] Hawes, P and Webb, A. 2019. TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment

Past dredging efforts in the Fogafale sediment resource area have graphically shown these sediments are deficient in labile carbon and lack any visible horizontal zoning where greater interstitial concentration of nutrients or harmful compounds (e.g. hydrogen sulphide) associated with anoxic layers persist.[77] As is commonly found in oceanic atolls, shallow open lagoon systems are naturally nutrient poor with low productivity (compared to continental shallows with terrestrial runoff). As a result, no significant water quality risk is expected from dredging these sediments beyond the potential for increased sediment resuspension and turbidity discussed above.

Outside of the dredging activities, the works along the coastline may result in the movement of sediment during construction into the marine environment. However, as discussed above, the nearshore environment of the project area is already heavily degraded, has no live coral and high eutrophication so no additional damage to the marine environment would be expected.

There are also potential impacts to ground and coastal marine water quality from the introduction of hazardous substances (fuels, oils, etc.) that will be used or generated during construction. While this risk does exist, it is considered to be low risk considering the construction works will not require large quantities of fuel which can be easily managed with standards best practices (see Section 9.2.8).

Due to the already degraded nature of the marine environment in the nearshore, the uncharismatic substratum, the lack of living corals and high eutrophication[78] and the level of engineering and development already undertaken with the area, there is little risk of further damage to the marine environment during the relatively short term construction phase.

9.2.2.1 Protective Measures

Protective measures will include:

- Develop and implement a site-specific Erosion, Drainage and Sediment Control Plan to address drainage control, sediment and erosion controls and stockpiling of materials including soil during construction.
- Develop and implement a site-specific Dredge Management Plan to address water turbidity and water quality management.
- Develop and implement a site-specific dredge Sampling and Analysis Plan
- Dredge method will be via a pipeline for conveying slurry to fill sites on-land and minimise losses to lagoon waters.
- Dredge plume to be monitored and dredge works halted if plume extends over an area greater than 3km.
- Dredge waters will be discharged within the revetment bund to allow filtering and control of dredge wastewater.
- Strict control on de-watering release by pumping to a contained area, using sediment curtains and route monitoring of turbidity will be required in the C-ESMP. Care will be taken to ensure de-watering does not occur towards the island.
- Storage areas for all hazardous substances will have compacted impermeable bases and be bunded to contain any spillage.
- Schedule works in stages to ensure that exposed soils are revegetated or stabilized progressively.
- Longer term stockpiles of construction materials will not be within 50m of the coastal marine environment.

[77] Hawes, P and Webb, A. 2019. TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment
[78] Kaly, U & Peacock, C. 2014. Tuvalu Borrow Pits Project Phase II Design: Environmental and Social Impact Assessment (ESIA)

- Construction equipment will be stored away from the coastal marine environment.
- Machinery on the beach will work in clearly defined and minimal areas
- Refueling will occur in designated bunded areas away from the coastal marine environment.
- Disturbance of vegetation to be limited to that required and approved for construction works.
- Check all vehicles and machinery daily to detect any spills or leaks.
- Rubbish and waste material must be stored in such a way that no leachate can enter the ground water.
- Metocean forecasts on each island will be used to plan works, construction footprints and will be used to determine the location and covering of stockpiles
- Any vessels chartered for shipping shall be compliant with the International Maritime Organisations conventions of which Tuvalu is a signatory and have a contingency plan for cyclonic events (such as cyclone mooring).

9.2.3 Coastal Hydrodynamics

The reclamation will remove the stress of wave action from the current dysfunctional shoreline and transfer that point of contact to the seaward margin of the reclamation. Water depth is around 1.5 m at this location, meaning slightly larger waves can be expected to break on the reclamation foreshore.[79] The proposed design will include a sloping revetment of geotextile structures to armor the seaward margin of the reclamation. This will be designed to prevent overtopping and marine flooding during stormy conditions.

It has been established that tides are the dominant influence over water movement in this area of the lagoon, but this is too slow to contribute to sediment transport. Additionally, this very sluggish rate of movement goes some way to explaining the damage that eutrophication has at this site. Water exchange rates are naturally low at this location and thus the site is more sensitive to heating, nutrient inputs and contemporary issues like nighttime anoxia. The reclamation will not influence these dynamics negatively.

The regional geoscience agency (Geoscience, Energy and Marine Division of SPC) reran their existing hydrodynamic model[80] of Funafuti. This was undertaken to investigate the question of possible changes to water movement with and without the proposed reclamation. This model is informed by in situ current, wave data and a complete bathymetric model of Funafuti lagoon.

Six locations were considered in the models, two of the locations were immediately offshore from the proposed reclamation area (Figure 38). The model conclusively shows no significant difference in hydrodynamic conditions could be detected in neighbouring areas off-shore from the proposed reclamation (the outputs shown in Figure 38 demonstrate this quite clearly where the blue (without reclamation) and red (with reclamation) plots are almost identical). This is unsurprising given the naturally protected, low energy nature of this environment.

[79] Hawes, P and Webb, A. 2019. TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment
[80] Damlamian, H (2008) Hydrodynamic Model of Funafuti: Water Circulation and Applications. SOPAC Technical Report 133.

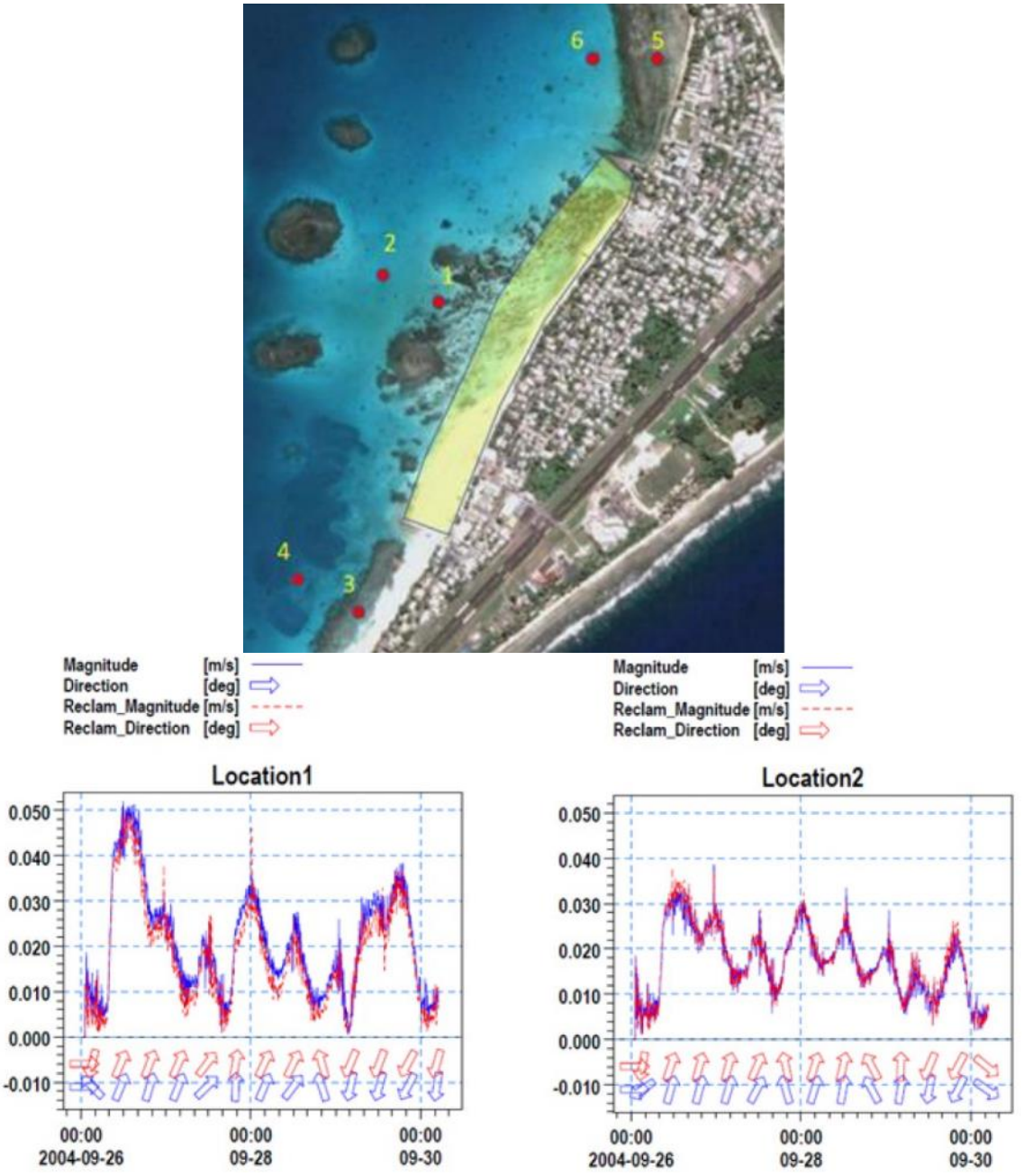

Figure 38: Results of hydrodynamic modelling undertaken by SPC's GEM Division in 2018. Source: TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment

9.2.3.1 Protective Measures

Protective measures will include:

- The retaining geotextile structure will be designed to absorb and reduce wave energy, prevent overtopping and minimise any wave reflection issues.
- To ensure post construction resilience of the geotextile containers, local construction workers will be trained on how to repair the geotextile and appropriate stockpiles of repair materials will be handed over to the public works department once construction is completed.

- To help avoiding damage to the geotextile containers the communities will be educated on best practices to use such as advise around not fixing anchors to the containers and to contact public works department if damage is observed.
- A rock breakwater will be constructed at the northern extent of the reclamation bund to protect the Catalina Harbour. Rock for the breakwater will be sourced from two groynes located along the reclamation footprint. The core of the structure will consist of a geotextile mega container

9.2.4 Erosion, Drainage and Sediment Control

As the project will be creating a new area of land, it is also increasing the volume of rainwater run off that will be generated post-construction. This runoff will drain into stormwater drains at the border between the existing QEP reclamation, the Catalina Harbour as well as a percentage as sheet flow over the seaward edge of the reclamation bund (as described in Section 3.2). This will result in an increased volume of storm water entering the foreshore environment. The drains will be designed to retain sediments, which will minimise any increased sedimentation of the marine environment. This is not expected to create any additional damage to the marine environment, as it is already highly degraded and already receives storm water runoff from unformalized existing drains. In addition to this, early observations from the neighboring QEP reclamation and subsequent excavation at this site since its completion has found the water table to be quite fresh, suggesting that, within the finer grade sands dredged to build the QEP reclamation, conditions for the formation of a freshwater lens may be favorable. The TCAP design will seek to capitalise on the freshwater lens formation potential and intends to install piezometers to facilitate monitoring of groundwater development within the reclamation.[81]

The excavation of the foreshore for seating the mega bags and the clearance of vegetation in the project site will expose bare soils and sands. Additionally, there may be the need to clear area(s) for access tracks, construction camps and laydown or stockpile sites. This clearance could lead to the erosion of surface soils.

Run off from any stockpile sites could also lead to localised erosion around the site and potentially into the coastal beach environment. However, the low topography of the islands reduces the runoff velocities thereby minimising erosion forces. The porous nature of the substrate also helps to reduce runoff and surface water flow on atolls is generally absent (i.e. stream, creeks). Construction may form preferential stormwater flow paths, although these would generally be relatively short and defined in their nature, therefore readily managed.

During heavy rain events, there is the possibility for storm water runoff to flow from construction sites carrying potential pollutants with them into the surrounding environments. In addition to this, for any areas where concrete is produced or machinery is washed down, there is the potential for contaminated wastewater to drain into the surrounding environment in normal conditions.

9.2.4.1 Protective Measures

Protective measures will include:

- The contractor is to develop and implement an Erosion, Drainage and Sediment Control Plan for any surface works, dredging, excavation work and storm water pathways.
- Dredging will be limited to the sand excavation area identified in Section 5.3.2.1. Final location of the dredging will be identified in the C-ESMP through consultation with the TCAP expert.

[81] Hawes, P and Webb, A. 2019. TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment

Considerations for identification of exact dredge locations within the characterised sediment resource area would include water depth/dredge capacity; sediment thickness, composition and grain size; magnetic anomaly locations (UXO risk); distance from reclamation site, community consultation feedback and distance from any live coral outcrops.

- Any machinery washdown or concrete production areas will be bunded and all water will be collected and treated before being discharged.
- Designated areas of storage of hazardous substances will be on impermeable bunded surfaces with drainage filters and will be protected from the wind and rain.
- Ensure that any erosion and sediment control devices are installed, inspected and maintained as required.
- Schedule/stage works to ensure that major vegetation disturbance and earthworks are carried out during period of lower rainfall and windspeeds.
- Machinery on the beaches will work within clearly defined and minimal areas.
- Design stormwater management measures to reduce flow velocities and avoid concentrating runoff.
- Vegetated buffer strips shall be retained during construction to reduce water velocity and retain low levels of uncontaminated sediment.

9.2.5 Noise and Vibration

All construction activities have the potential to cause noise nuisance on Funafuti. Vibration disturbance to nearby residents and sensitive habitats is likely to be caused through the use of excavation equipment, haulage trucks, the onshore dredging works, pumping to fill the mega bags and final forming compacting and grading works of the reclaimed area. Effective communication of working hours will go towards alleviating any impacts during the construction phase.

There are sensitive receptors such as schools, mwaneaba, residential homes and churches near the project sites that will experience increased noise and vibration; however, these impacts will be short-term and affect different people at different times.

9.2.5.1 Protective measures will include:

- Minimise nuisance from noise, especially closer to residential areas and sensitive receptors, through establishment and communication to affected parties of working hours, including night works and avoid increase of noise and amount of work equipment at outside of advertised hours. Advertise working hours at the site entrance.
- Equipment should be in good repair and fitted with appropriate noise attenuation e.g. mufflers on engines
- Where stationary machinery or generators are required, they should be sited such that noise emissions are aware from sensitive receptors.
- Workers in the vicinity of sources of high noise shall wear necessary protection gear rated for the situation they are being used.
- Provide temporary construction noise barriers in the form of solid hoardings where there may be an impact on specific residents.
- Signage to outline complaints procedure and contact details of recipient of complaints.
- Hours of operation restricted to daytime (7am-7pm) unless otherwise agreed by the Kaupule and PMU.
- The Contractor should conduct employee and operator training to improve awareness of the need to minimise excessive noise in work practices through implementation measures.

- Identify properties and structures that may be sensitive to vibration impacts resulting from construction.

9.2.6 Air Quality

Air pollution can arise due to improper maintenance of equipment, dust generation and emissions from equipment. No significant sources of air pollution are likely as a result of the TCAP, the primary sources will be related to the operation of machinery (vehicle emissions), operation of dredge vessel and stabilisation/preparation of the final reclaimed surface, which may cause nuisance dust. Impacts are expected to be localised and short term with only minor negative impact on the ambient air quality in the vicinity of the construction areas.

No ongoing impact to air quality is expected after completion of works.

9.2.6.1 Protective measures

Protective measures will include:

- Implement effective dust management measures in all areas during design, construction and operation.
- Manage dust/particulate matter generating activities to ensure that emissions do not cause an environmental nuisance at any sensitive areas.
- Implement scheduling/staging of proposed works to ensure major vegetation disturbance and earthworks are minimised.
- Locate material stockpile sites as far as practicable from sensitive receptors. Cover if necessary.
- Waste storage areas and receptable should be covered and located as far as possible from sensitive locations.
- Ensure all equipment and machinery is in good working order and regularly maintained.
- Turn off or shut down all machinery or vehicles when not in immediate use. No idling of unattended vehicles is permitted.

9.2.7 Flora and Fauna

The TCAP project site lies within areas that are already extensively disturbed by human activity and island development; however, some vegetation does exist at the project site foreshore and access to and from the beach will be required.

There are no important marine habitats within the project footprint.

9.2.7.1 Terrestrial

The proposed reclamation has limited direct interaction with the terrestrial environment or resources of Fogafale beyond the immediate shoreline. The reclamation would overlap with the existing lagoon shore over a length of 750m. It is likely that along this overlap zone a small amount of sand may spill over (perhaps 2 or 3m landward) over the existing shoreline environments. As most of the reclamation material will be pumped directly into place, sand spills should be minimal, temporary, and easy to clean up if do occur. It is not expected that this would result in any medium- or long-term damage to the vegetation along the upper shoreline. Given that the existing shoreline is heavily developed and degraded no negative terrestrial impacts are expected from these works.

The risk does exist that accidental damage might be caused to mature tree specimens from the operation of machinery, however this risk is slight and can be further reduced with effective mitigation measures and best practice management of the site.

It is expected that materials and equipment will be imported for the TCAP works. If imported consignments are not properly treated and/or washed before shipping, there is the risk of introducing non-native and potentially invasive plants, animals and disease. Tuvalu already has an ongoing problem with invasive species. The introduction of additional harmful species to small island nations such as Tuvalu, who have a naturally low level of biodiversity, can be devastating to the local ecosystems, flora and fauna. It is also possible to import diseases such as foot and mouth disease and invasive marine algae in ships ballast water.

9.2.7.2 Marine

The marine environment, described in Section 6.4.2, is heavily degraded. The loss of the corals particularly has occurred over a long period of time and is related to pollution seeping through the island into the nearshore waters, oversupplying them with nutrients from sewage and other domestic sources. Given the damage done to this area, there is little risk of further damage to reefs during the relatively short duration of dredging, even though suspension of sediments is also likely to released nutrients trapped within them. The direct impacts likely to be experienced from dredging will be a loss of habitat and loss of some organisms (such as polychaetes and crustaceans), however the impacts will be far less than for an undisturbed environment. Furthermore, the sand resource proposed has been utilised on three occasions since 1995 for similar dredging projects and in all cases, no significant environmental impacts were observed or reported. Most recently in 2016, the Tuvalu Borrow Pit Project saw 0.6 million m^3 dredged with follow up monitoring showing no significant impacts.[82] Therefore the mapped sediment resources (Figure 10) are also identified as being located in a favourable area for dredging in terms of mitigating potential adverse impacts from a marine biology perspective.

While not expected, if widespread sediment plumes start to develop, the Contractor will reactively monitor them for stress using the techniques employed on the previously successful Borrow Pit Filling Project. If necessary, sediment curtains or similar devices will be deployed to ensure harm to living corals in the wider area are minimised.

In terms of the reclamation area itself, impacts would be the physical burial of the already disturbed and low ecological value substratum (namely bare sand and invasive macroalgae thickets) within the footprint of the reclamation. As over 50% of that footprint is already subject to the previously described physical disturbance impacts (dredging, reclamation, groins, seawalls, etc) it is expected that the works would have little ecological impact.

The dredging contractor will be required to prepare a specific sub-plan within their C-ESMP for the dredge operations. In particular, the management of plumes and dewatering will require detailed documentation. Although unlikely to be a significant issue given the nature of the sand resource and the low current velocities in the Fogafale part of the lagoon, physical barriers such as silt curtains may be required if sediment plumes are found to be problematic.

There is the potential for hydrocarbon spills from the machinery or vessels into the marine environment. Given that the largest potential volume of the fuel or oil spill is limited to the contents of the fuel and oil tanks, the potential impact will be limited in magnitude and short term in duration and can be managed with good environmental controls and by ensuring any vessels chartered by the Contractor is operating to IMO standards for training, maintenance, safety and pollution management. This is therefore considered to be an important mitigation factor, but not considered to be a significant impact.

[82]Hawes, P and Webb, A. 2019. TCAP Fogafale Lagoon Shore Reclamation, Tuvalu: Preliminary Environmental Assessment

9.2.7.3 Protective Measures

Protective Measures will include:

- No ecologically significant areas are included in the design. Dredging and reclamation concentrates on damaged parts of the lagoon.
- Dredging will seek to minimise the disturbance area and be targeted not to remove all the sand in the area that is dredged.
- Dredging within 100m of live corals will be proactively monitoring by the Contractor for stress and works suspended if necessary.
- Dredge plume extent will be monitored and if excessive in extent works will cease until either conditions are more favourable or appropriate plume management measures (e.g. silt curtains) have been implemented.
- Reclamation works will not extend to existing terrestrial vegetation line, except in areas where fill is required to maintain suitable drainage as marked on the plan.
- Contractor will undertake a detailed survey of vegetation along shoreline to identify vegetation of significance (if any). Any significant vegetation along the shoreline will be identified and flagged to minimise potential for inadvertent sand 'spill' or damage from machinery. Any trees at risk of machine strike may be protected using temporary tree guards. Any sand spills that do occur will be cleaned up by hand or with light machinery.
- Areas accidentally damaged during works are restored by clean up, re-contouring and planting.
- The removal and transfer to safer ground of epifaunal species such as sea cucumbers will be carried out by the Contractor to avoid burial.
- Clear boundaries will be set during construction to protect the vegetation line. Boundaries will be physically marked with temporary construction fencing.
- Limit vegetation clearing and minimise habitat disturbance through adequate protection and management of retained vegetation.
- Ensure all site personnel are trained on the requirements to protect all vegetation outside the construction area.
- When clearing any areas, topsoil shall be set aside and saved for rehabilitation and revegetation.
- Rehabilitation of construction areas will include scoring compacted surfaces, replacing the previous excavated topsoil and replanting with species already present on the island.
- All imported materials, equipment and aggregate will be subject to importation under the quarantine and biosecurity regulations of Tuvalu.
- Any chartered shipping vessels from offshore will change their ballast water no closer than 5nm from Tuvalu's coastline.
- All vessels will be equipped with spill kits and will be compliant with the IMO conventions of which Tuvalu is a signatory.

9.2.8 Community Services and Infrastructure

The project could potentially affect existing and planned basic utilities that support community livelihoods and well-being, such as boat mooring, drainage, and recreational facilities.

9.2.8.1 Solid and Hazardous Waste Generation

The quantity of waste, including hazardous waste, anticipated to be generated by TCAP is relatively small. The key waste streams that are likely to be generated through the project works on Funafuti include excavation wastes that were unsuitable for use in the project or surplus to requirements during the works, waste from construction equipment use and maintenance (including liquid hazardous

waste), waste water from general project works and workers, and general waste, such as scrap materials (including biodegradable materials).

Biodegradable wastes can be managed through local composting schemes. For any non-organic, non-reusable, and non-recyclable materials, there is a significant potential for overburdening the public landfills if they are used for disposal of the refuse. The public landfill on Funafuti is small and already operates at capacity in a sensitive coastal location. Overburdening of landfills in small islands can lead to leachate pollution of groundwater and the marine environment, disbursement of solid wastes into the marine environment due to over filling of landfill, and a human health hazard due to inappropriate dumping of hazardous materials.

Additionally, poor management of solid waste at work and accommodation sites can lead to a number of impacts, such as pollution of local environments, community and worker health hazards, and increases in pests such as rats, flies, and YCA.

9.2.8.2 Use of Vehicles and Machinery

Scooters are extensively used in Funafuti, and the reclamation will occur alongside one of the island's main roads. Pedestrians also use the roads as the main walking paths. There are also cars, trucks, and several small tractors which use the roads along with a few small pieces of construction machinery. Any increase in traffic in the form of motorbikes or construction equipment will create a significant safety risk to the community and increase the pressure on the road network. It is likely that ancillary project sites (laydown, stockpile, workers accommodation) will be scattered around the village, therefore increasing the pressure on the road network and increasing hazards to the community. Careful management of vehicle movements and consultation with the community will be required to ensure that any impact is minimized. The Contractor will be required to develop and implement a small-scale Traffic Management Plan as part of their C-ESMP.

9.2.8.3 Influx of Labour

The total number of workers that will be required for the TCAP project is not high, however even small influxes of foreign workers can put additional strain on Tuvalu's infrastructure. For example, accidents may occur both in the workplace and outside of it and any injury or accident requiring medical attention from the island's hospital would result in an increased demand on the already vulnerable resources of the island.

There is currently no formal documentation on sex work and trafficking on Tuvalu, however, anecdotal evidence suggests that sex work, driven by poverty, may be occurring, especially to 'serve' the foreign seafarers who reside on Funafuti while trans-shipping. The possibilities of such risks arising from TCAP is considered to be very low because use of local labour will be maximised and ongoing involvement of communities will be supported. To ensure that messaging for workers and community is strong, the SECP includes prevention of GBV and risks associated with influx of labour. Moreover, the TCAP will be playing an active role in ensuring screening and monitoring overseas workers in relation to the requirements of the Tuvalu Immigration Act prior to arrival and during their time in country.

9.2.8.4 Water Supply Facilities

The existing water supply on Funafuti is limited and severe shortages may be experienced during extended periods of no rain (1 to 3 months). There is little in the way of long-term water security with often only day, or at best weeks, storage available to most homes. There is a desalination plant, but this has been problematic because of costs and maintenance issues. Additional burden from the TCAP works on the freshwater supply will be avoided through water conservation practices and the use of portable desalination plants or dedicated water harvesting systems.

The main cistern is about 35m from the crest of the existing shoreline so there should be little to no disturbance from the coastal reclamation works.

Households located close to the reclamation construction site may have minor short term negative impact on the quality of household water supplies from wind-blown sand disturbances to nearby house rooftops, where water is harvested during stockpiling or handling of sand within the settlement areas. It is expected that this would be low risk and will be easily mitigated through stockpile management measures.

9.2.8.5 Protective Measures

Protective measures will include:

- The use of construction materials shall be optimised and where possible a recycling policy adopted.
- Separate waste streams shall always be maintained i.e. general domestic waste, construction waste and contaminated waste. Specific areas on site shall be designated for the temporary management of the various waste streams. Adequate signage and colour coded bins will be used for each waste streams.
- Recyclable waste shall be collected separately and disposed of correctly.
- Food wastes will be separated and stored securely to avoid YCA and other wildlife.
- All hazardous or contaminated waste will be exported from Tuvalu under the conditions of the Waigani Treaty and will be coordinated through the WMD
- Disposal of waste shall be carried out in accordance with the Government of Tuvalu requirements. For waste which cannot be disposed of in Tuvalu, recycled, reused or composted will be exported and disposed of offshore in a licensed facility.
- Concrete slurry will be allowed to harden and disposed of as clean fill.
- Disposal of trees shall be undertaken in the accordance with one or more of the following methods: (i) left in place at the request of the owner; (ii) chipped and mulched; or provided to the community for reuse.
- Hydrocarbon wastes shall be stored in colour coded and labelled drums placed in secure, covered and bunded locations until their disposal.
- Any waste oils and lubricants are to be collected and transported to recyclers or designated disposal entities as soon as possible.
- Any dangerous goods (including batteries) stored on site shall be stored in accordance with Tuvalu regulations and international best practice
- Traffic management measures to protect all road users in Funafuti will be described in the C-ESMP.
- The Contractor will be responsible for repairing any damage to the existing road network caused by construction works.
- Contractor will supply all required food for workers to the community to enable community members to be appointed to cook and prepare food for a fee.
- Additional burden from the TCAP works on the freshwater supply will be avoided through water conservation practices and the use of portable desalination plants or dedicated water harvesting systems.
- Contractor will provide first aid facilities and trained first aiders on Funafuti for all workers
- Ensure opportunities to incorporate men and women's views and interests into project decision and implementation are purposefully created and enabled in the stakeholder engagement processes throughout the project left.

- Ensure comprehensive consultations are held with the boatowners along the shoreline and their views incorporated into the design process where possible.
- Incorporation of GBV prevention into the SECP.
- Code of conduct will be signed by all workers (including project management) to demonstrate commitment to prevention of GBV and the prevention of the spread of STDs such as HIV/AIDs.

9.2.9 Hazardous Substances Management

The key types of chemicals and fuels likely to be stored at the laydown site during construction include, but are not limited, to diesel and unleaded petrol for the refueling of plant equipment and small portable generators. It is expected that the fuel will be delivered to the island in 44-gallon drums and that there would be several drums needed.

If not handled, stored or used appropriately, contamination of land and the coastal marine environment and groundwater systems could occur. The accidental discharge of hazardous materials during construction activities is a potential risk to the local environment. Accordingly, all oil, grease, diesel, petrol and chemicals should be stored at the laydown site within a bunded area. In addition, the dredge vessel and dredge could also be a potential source for spills in the marine environment. The vessel will be required to have a well-stocked spill kit on board and crew will need to be trained in its use.

Potential activities which could result in spills are:

a. use of machinery and vehicles – potential for fuels, oils and lubricant spills
b. operation of vessel and dredge
c. transport, storage and handling of fuels, machinery oils, grease
d. Impacts associated with hazardous materials will primarily be associated with the storage and handling during the construction and operation phase.

9.2.9.1 Unexploded Ordinance

Tuvalu was used as an important staging base for US aerial attacks in the Battle of Tarawa in Kiribati during WWII. Bomber bases were established on Funafuti and the island was bombed during this operation. Funafuti was occupied by US forces between 1942 and 1946 during which time the Funafuti airbase housed a number of USN and USAAF bomber and fighter squadrons while the lagoon hosted a variety of US warships. Funafuti was subject to nine air raids, dropping 63kg and 100kg bombs over 6 months in 1943.[83]

The risks of this to the dredging operations include the possibility that an item of Explosive Remnants of War (ERW) is dredged up and while inside the dredging head, the ship or transportation pipelines, detonating and damaging the dredging equipment. Secondly there is the risk that the dredging could dredge up and item on ERW and deposit it, unknowingly, into the newly reclaimed area undetonated. In 2014, an independent UXO assessment was conducted on Funafuti for the Borrow Pit project.[84] It was assessed in the UXO report for the Borrow Pit Project that there is a high potential to encounter ERW during dredging operations and, unless suitable mitigation measures are put in place, there is potential for: damage to equipment; injury to personnel, and; transportation of ERW to previously uncontaminated areas.[85]

[83] ERW Risk Assessment: Tuvalu Borrow Pit Project Funafuti, Tuvalu, CSG Demining Consultants, 2014
[84] ERW Risk Assessment: Tuvalu Borrow Pit Project Funafuti, Tuvalu, CSG Demining Consultants, 2014
[85] ERW Risk Assessment: Tuvalu Borrow Pit Project Funafuti, Tuvalu, CSG Demining Consultants, 2014

9.2.9.2 Protective Measures

Protective measures will include:

- Prepare spill management plan addressing measures
- Store and handle all chemicals, fuels, oils and potentially hazardous materials as specific in relevant standards and guidelines. All hazardous materials and construction fuel will be stored in appropriate storage facilities (e.g. fuel and chemical will be stored in a bunded area).
- Hydrocarbon wastes shall be stored colour coded and labelled drums (following standard World Health Organisation conventions) placed in secure storage areas on site.
- Where possible, fuel and chemical storage and handling shall be undertaken at designated petrol stations on the island, or at the project site on impermeable bunded surfaces (preferably over drip trays). Ensure onsite refueling activities occur in designated areas of the site where appropriate temporary protection measures have been designed/located and are no less than 20 meters from surface waters and drainage lines.
- Onsite storage of fuel and chemicals shall be kept to a minimum.
- Emergency clean up kits for oil and chemical spills will be available onsite and in all large vehicles.
- Contractor will have an ERW/UXO Plan to be approved by TCAP prior to engagement.
- Contractor will undertake an updated magnetometry survey of the proposed dredge area to identify presence and location of UXO.
- The dredge will be fitted with a suitable screen to exclude ERW at the cutter head and a beach-screening cage to capture ERW at the discharge end of the dredge pipe as was used in the Tuvalu Borrow Pit Project.
- The Contractor will ensure all project staff and visitor, including all contractor personnel, to the project site receive a suitable ERW awareness briefing before being permitted to commence work or visit the site.
- The discovery of any UXO must immediately be reported to the Supervision Engineer and TCAP National Project Manager.
- The Contractor's C-ESMP will detail the way in which they will safely handle and dispose of UXO.

9.2.10 Land and Resource Use

9.2.10.1 Coastal Resource Area

There will be changed beach access along 800 meters of shoreline where the proposed reclamation is sited (see **Error! Reference source not found.**). An estimated 24 households are located on the beachfront and these include government-leased housing, houses occupied by owners as well as those occupied by tenants. To date, the Funafuti Community outreach meetings have not elicited any negative comment regarding this proposal and the Funafuti Kaupule (Funafuti Council) and Funafuti Traditional Chiefs are fully briefed and supportive of the proposal which has been presented to them in detail in 2018 and 2019 by TCAP. In November 2019 the TCAP PMU held a specific outreach event for those landowners / tenants on this shoreline to again explain the planned changes. This meeting was delivered in Tuvaluan and elicited good discussion which ultimately also found no strong objections to the proposal.

In effect, the shoreline at this location will be moved approximately 100m seaward and what was a water side property will become part of the island interior. As such, direct access to the lagoon foreshore from these properties will change as a result of the reclamation proposal. The changes will primarily be limited to:

a) property owners and tenants of the adjoining affected beach; and
b) owners and users of boats stored along the affected beach who will need to relocate their boats to an upgraded Catalina Harbour.

There seems to be sufficient gathered evidence to conclude that the potential negative impacts of loss of beach access to property owners and tenants would be minimal and would very likely be outweighed by its positive resilience outcomes. However, it is recommended that during ongoing Project consultations specific discussion with boat owners and shoreline users is included to ensure any negative impacts of the project are mitigated.

Figure 39: Proposed reclamation area and breakwater

BEACHFRONT PROPERTY OWNERS AND TENANTS: Prior to artificial nourishment along this shore during the construction of QEP in 2017 using dredged lagoon basin sands, this shore was a dysfunctional and erosive shoreline. A legacy of extensive WWII engineering and local residents viewed this shoreline as requiring inter-generational effort to "hold the line" and clean up after overtopping events. The result of this prior to 2017 was a steep rubble and strewn shoreline that was unsuitable for landing small boats. It follows the residents have a longer term vested interest to see the chronic issues of shoreline instability addressed and it is recognized sea level rise and increasing incidence of storms is exacerbating exposure and instability along this shoreline. The TCAP reclamation works aims to effectively respond to this need as well as provide safe raised land. Local stakeholders were also reported to have been dissatisfied with previous coastal protection efforts on this shore which sought to reinstate a functional sandy beach but did not include reclamation (e.g. Tausua Beach Rehabilitation Project, JICA and the Fogafale Shoreline Master Plan Project, Govt of Korea). Residents preferred an option which would secure the shore and provide additional safe land.

The priority in Fogafale is for this shoreline to be secured from current and future storm wave attack and sea level rise and such effort should incorporate well planned and implemented reclamation to provide safe higher ground for community use. These messages have been the consistent central

message from the Government, Funafuti Council and Funafuti Community. While the risk of objections from neighboring properties cannot be ruled out as the project gets underway, based on TCAP consultations and experience to date, it is considered highly unlikely and manageable.

Community consultation meetings to date, as well as advice from local Project staff, indicate that there is no contemporary sensitivity regarding access to the nearshore lagoon environment, so long as the Catalina Ramp small boat harbor is included in TCAP's reclamation plan. The area is no longer a useful fishing ground and the pre 2017 shoreline has been a rubble strewn hazard for many years.

BOAT OWNERS AND USERS: Men and women in Funafuti communities have their own distinctive ways in which they rely on coastal resources for food, income, and recreation and boats are an essential to securing these livelihoods. Local fisher folk own boats and equipment that are often stored along the beachfront. Generally, the boat owners are also the property owners and tenants discussed above. However, as some boat owners hire fishermen to use their boats for fishing, there are boat users that are not necessarily the boat owners.

In the latter part of 2019, the SPC technical team observed between 20 and 40 boats hauled up along the stretch of nourished beach that will be lost following reclamation. It is important to keep in mind that this beach has only existed since 2017 due to the beach nourishment carried out under QEP. Prior to this the beach area was rubble strewn and unsuitable for hauling vessels out. The new, nourished beach is rapidly eroding and without ongoing nourishment will return to its former state, ie unsuitable for boat landing.

As per feedback from past community consultations, boat access has been considered in the reclamation design. The reclamation foreshore and geotextile bag revetment will not provide the same amenity for small water craft as the current beach nourishment. Therefore, based on feedback from the community, TCAP has added redevelopment of Catalina Ramp Harbour to the project scope to help offset impacts on boat users caused by the reclamation. The TCAP reclamation works include an upgrade and development of the Catalina Ramp harbour as a more formal and better-equipped and publicly accessible area that boat owners along the affected beach can relocate their boats to. The new Catalina Harbor is also expected to be better protected from more extreme wind and wave action than the current mooring arrangements, making it safer than the current situation. Furthermore, upon completion of the reclamation the area immediately off the revetment will be permanently sub-tidal and therefore suitable for the installation of fair-weather moorings. Similar moorings used to exist prior to the QEB beach nourishment, so reinstatement of similar moorings would also help to offset changes in boat access to the beach.

There has been numerous community meetings and a specific foreshore residents meeting in November 2019 to discuss the development, along with a large 3m x 2m billboard containing details about the project placed on public display on a prominent nearshore road in Fogafale. As shown in Table 9, additional consultations were planned for in August to September 2020 by the TCAP team as the ESIA assessors were not able to travel to Tuvalu to conduct fieldwork due to the COVID19 travel restriction. However, due to competing demands the TCAP team were unable conduct the survey as they were on Nanumaga and Nanumea islands during the drafting and review of the Funafuti ESIA report. It is clear that as part of implementation, ongoing consultation is required, particularly with boat owner/users who may be affected.

While past consultations with the Funafuti Kaupule, Falekaupule and community have indicated wide support for the reclamation, it is recommended that there is ongoing consultation with boat owners and users to discuss the proposed development, the use of the Catalina Ramp harbour, and the option to install new moorings offshore from the reclamation. Specifically, it is important that outer island migrant boat owners and users are targeted in ongoing consultations as 78% of Funafuti's residents

identify as being from the other islands. It is recommended that specific consolations are arranged to ensure this group is fully informed about the Project and able to utilize the alternative boat facilities. Consultations with boat owners/users should include the following:

- The Catalina Ramp Harbour sits in the front of the Funafuti pastor's residence, and whilst the Pastor and Community have attended TCAP outreach efforts without raising negative concerns, the increased use of this area may ultimately cause sensitivities and should be considered.
- The relocation of boats to the Catalina Ramp may incur some costs related to moving fishing equipment as some affected houses are located at a range of 100 to 700 meters from the former sites. Otherwise, large catches are usually distributed and sold across Fogafale Village.
- The opportunity to install moorings off the reclaimed area revetment requires further exploration to determine level of interest and likely demand from boat users.
- The boats based at Catalina Harbour will not be visible from the owners and/or users house and there may be a sense of risk to theft.

As a potentially affected group, boat owners and users will need to be specifically targeted in the Stakeholder Engagement Plan and consultation during implementation. This will ensure that their views and needs are captured, considered and incorporated into the final design and implementation of the project. As boats will require relocating prior to commencement of any on-ground works, the consultation should focus on providing all relevant information and confirming:

i. *Boat numbers, ownership and level of reliance*:
   a. The number of boats that will require relocating.
   b. Who owns and who uses the boats that will be affected, particularly if there are any female boat owner/users.
   c. How many of the boat owners and users come from the outer islands and if any of the boats are used for subsistence and/or commercial purposes.

ii. Suitability of alternatives for boat owners and user:
   a. Feasibility and timing of relocating boat to the Catalina Ramp Harbour or using moorings off the new revetment? Any additional assistance that might be required from TCAP to facilitate the move.
   b. Any potential issues that would prevent them from using the Harbour. If there are women boat owners or users, would the issues with relocating to the Harbour differ?
   c. Other facilities that might be required at the Harbour to improve its safety or usability.

9.2.10.2 Changing Landscape and Land Use

The TCAP reclamation activity will create two inter-related levels of change – landscape and land use – which may impact different groups in specific ways. The proposed reclamation will not be privately owned land but rather it will become crown land as stipulated by the Tuvalu Foreshore Act and there is currently no proposed land use plan for this 'additional' land. There is, however, a strong consensus in discussions with the Government and Funafuti Kaupule and Falekaupule that the land is intended for communal uses and to house community facilities. Uses discussed to date include the retention of an open space for recreation (currently the runway and apron area are used for this purpose as no other land exists on Funafuti) and the development of a foreshore buffer zone – a seaside park which can be planted and grassed and act as a recreation / urban park area. Currently, no equivalent currently exists in Funafuti.

The development of a dual-purpose cyclone shelter capable of safely sheltering several thousand people has also been agreed as a priority investment for the area. The reclamation will become the

safest, flood free land on Funafuti as there is currently no safer location for a large community shelter facility on the atoll. If the shelter is built to be a dual-purpose facility (for example a sports facility) and incorporates inground rainwater catchments and secure emergency supplies storage, it would represent a pragmatic and tangible contribution to community protection from cyclone-driven wave overtopping.

TCAP has been very careful to communicate that it does not have the resources nor mandate to implement these subsequent development options. It can only deliver the graded reclamation and foreshore protection. Stakeholders have requested that TCAP undertake to produce a land use plan for the proposed reclamation which might subsequently be used to attract funding to complete such work and act as an agreed blueprint to prevent any ad hoc development.

This request is very complementary to broader aspects of TCAP to improve coastal management and planning. Furthermore, the Tuvalu Government has expressed their desire to retain the TCAP Country Office after TCAP has been completed and wishes to see the office transition into a branch of the Tuvalu Government – the Tuvalu Coastal Management Authority. This is an excellent outcome as it builds sustainability into TCAP's work and ultimately sustained improvement in coastal management and planning in Tuvalu and will bring about "transformational change" in the context of this Project.

In any case, as is appropriate for a project that affects the landscape and its use, TCAP has engaged with Funafuti landowners and the broader community. Consultation has sought to be culturally appropriate and gender responsive, as required by both GCF and UNDPs environmental and social policies. Further, engagement has included the use of local formal and traditional mechanisms eg the Falekaupule.

Ongoing consultation will continue to seek to engage the entire community such that the views of all, particularly the Funafuti landowners, women, youth and disabled are considered in any decision making and that the project meets both community needs and expectations and therefore is accepted by them.

9.2.10.3 Transboundary Considerations

The proposed reclamation will require various types of aggregates (general fill for the bulk reclamation, clean sand for the geotextile containers and recycled rocks for the breakwater) which will be dredged from the Funafuti Lagoon and recycled from the two existing rock groynes (located within the reclamation footprint) respectively. The details of the reclamation plan will need to disclose information related to the various other types of aggregates needed to construct the reclamation, where these will be sourced from, and the impacts of aggregate sourcing on the local environment and people.

The transboundary risk and impact approach of GCF Environment and Social Policy states that:

> *"The GCF shall ensure that in case of potential transboundary impacts of GCF-funded projects all necessary consultations and due diligence processes, including prior notification and consultations with the relevant stakeholders, including addressing their comments".*

Additionally, the disclosure of information stemming from such an assessment is required under Section 7.1 of the GCF Social and Environment Policy.

9.2.10.4 Protective Measures

Protective measures will include the following:

- Ensure comprehensive consultations are held with the boat users and owners along the shoreline and their views incorporated into the design process where possible, practical and feasible.
- Facilitate the development of a community-based local planning and M&E process

- As per the initial discussions TCAP is having with Government and the Community the Project should continue to encourage the GoT to incorporate designated areas for social activities, exercise, public benches, etc. These protective measures may also serve to compensate for any potential negative impacts on coastal amenity identified above.

9.2.11 Social Environment

9.2.11.1 Gender and Social Inclusion

The TC Tino Recovery and Vulnerability Reduction Plan 2020 states (page 13):

> *"The knowledge men and women brought to their households made it possible for communities to survive the challenges of TC TINO.*
> *Women in the family setting have a deeper insight into the welfare of the children and elders, and men have a deeper insight into the operational reliability of their family and possessions.* ***Planning for disasters needs to value and bring to light the respective intelligence of both men and women****.*
> *However, in most circumstances there are gender-based differences and inequalities, which tend to favour men or men in leadership roles. Attitudes that in turn looks condescendingly at views/perspectives of women and other vulnerable groups, disregarding potentially innovative solutions to existing problems. If gender-based inequalities are eliminated, it caters for more productive and efficient use of available resources. The case of young men putting themselves in danger to protect their families is not a light matter of say "that is a job for a man." Such attitudes are dangerous and especially so in disasters such as cyclones.*
> *Therefore, the vulnerable members of the community are of great importance to the capacity of any community to plan and reach every member of the community.* ***Any decision set forth by those in power/authority is unequivocally felt by those most vulnerable in our society, whether good or bad."***

As shown earlier, the changes brought on by the coastal reclamation on Funafuti's physical landscape have the potential to positively and negatively influence the island community's social environment in varied ways at different times. These changes will occur in a cultural context where traditional and modern values are interacting and where men dominate decision-making spaces, including those pertaining to this project.

Care will need to be taken to ensure the way decisions are made and implemented with regard to the project does not contribute to deepening existing gender inequities or contribute to existing limitations for inclusive (gender and age-inclusive) problem-solving processes. For example, the wider community with equal participation from men, women, youth, and disabled people, should take part collectively in discussing and considering the social benefits and costs of the reclamation development and future use of reclaimed land. Similarly, discussions related to mitigating the potential negative impacts of the project should be inclusive.

9.2.11.2 Community Perceptions and Expectations

The effective management of community expectations, perceptions, and understanding regarding the project will be critical to its timely and successful implementation. For example, stakeholders consulted (Table 9) who sought clarification and communicated concerns will need to be managed in future SECP-related activities. Some of the key perceived risks and response measures identified include the following:

- Project spending and budget relative to the coastal protection technology to be adopted and comparison of allocations with Nanumaga and Nanumea

- The need and significance of the ESIA process and possibility that the process will be donor driven
- Comparison was made to the limitations and lessons of the implementation process and outcomes of the QEP reclamation works – especially given that the TCAP reclamation works extends from the QEP.
- There is hope that the project might be able to provide a dredging machine and have locals trained on how to use it for future beach nourishment and maintenance in future.
- Although voted down, some stakeholders raised the need for a channel so that beach users adjacent to proposed reclamation site will still be able to access the sea for fisheries and recreation.

While the TCAP and SPC team members effectively responded to community questions with evidence-based reasoning, the nature of questions suggests the need to facilitate a deeper engagement with the community. A comprehensive stakeholder analysis to better identify how different groups in society might be impacted will provide the community with better reasoning for project decisions, approaches, and activities. The use of culturally appropriate media such as church and culture-based events as well as audio, audiovisual, and written communication products could prove effective. The importance of participatory planning, decision-making, and implementation processes to facilitating community ownership and cooperation towards the project may also facilitate trust in its process.

9.2.11.3 Employment

There are gender gaps in the engagement of women and men in paid work in Funafuti, with women from the outer islands most disadvantaged. The COVID-19 pandemic restrictions on international travel has enhanced this disadvantage with loss of demand for shell jewelry and handicrafts.

Income generating opportunities for community members will arise in the design, construction, and operational phases of the coastal reclamation. Labour for the construction will be mostly sourced from within the island and time compensated via monetary payment. Measures will need to be put in place to ensure equitable sharing of responsibilities and income between the different island communities, as well as between men and women in the design, construction, and operational phases.

It is important to note that the dredging work for the QEP reclamation provided an abundance of fine quality shells and created unintended opportunities for women producers of jewelry and handicrafts. This may be used as a means to facilitate equitable benefit sharing from the project. The TCAP project team will ensure that the contractor allows the space, time and equipment needed to fossick for shells over subsequent levels of dredged sand.

9.2.11.4 Protective Measures

Protective measures will include the following:

- Ensure that opportunities to incorporate men and women's views and interests into project decisions and implementation are purposefully created and enabled in the stakeholder engagement processes throughout the project life.
- Develop and implement a communication plan for the project and in particular the messaging around the public nature of the new Catalina Harbour.
- Develop and implement a community-based coastal protection plan and monitoring and evaluation system that engages a wide cross-section of the community in practical adaptive learning and resilience-building.
- The design of the coastal protections calls for more community gender disaggregated consultations in Funafuti by the TCAP and SPC teams' safeguard specialists and the design

engineers. For any consultations undertaken with the Kaupule or Falekaupule, the women of the community will provide trays of food sufficient for the number of participants and paid for as part of the project costs. Each tray of food costs approximately AUD$60 and is sufficient to feed 6 people. The money paid for these food trays goes directly to the women involved in the cooking. It is therefore important for all site visits during the design phase to allow a budget for consultation catering. Site visits may also call for overnight accommodation for the project team. In this case, guesthouses are used, catering is needed, and cleaning/laundry services are used – all of which generate income for the community.

- A number of income-generating activities will stem from the construction works. These range from direct employment of local labour through to provision of cooking and housekeeping services provided at the workers' accommodation. The islands have a cultural arrangement whereby any employment generated from projects such as this is shared fairly throughout the community on a rotational basis. It is a requirement for all projects to adhere to this cultural practice. To facilitate this effectively, the Contractor will be required to undertake training for all nominated workers at the start of works to avoid delays linked to the need for additional training as the workers rotate.
- The communities, in coordination with their Kaupule, will provide the contractor with a list of skilled and unskilled laborers. The Kaupule will also coordinate with the villages to ensure that job opportunities are fairly disseminated. Women are encouraged to participate in the workforce and job opportunities. Persons with disabilities are also encouraged to participate in the workforce and with jobs that are appropriate and significant.
- The community will have the opportunity to provide food, beverage, and housekeeping services for incoming workers to the islands for up to 18 months. Income-generating activities may include provision of lunch and dinner; provision of fresh water or coconuts; sale of food items such as local fruits, root crops, vegetables, etc.; sale of handicrafts; and laundry services.
- Additionally, there may be other opportunities such as scooter rental, boat rental for excursions, sales of luxury items imported from Funafuti, etc.
- The Kaupules will provide a list of skilled and non-skilled members of the community will form the islands labour pool for the construction works. The number of workers available will be confirmed once the Kaupule's inventory is complete. The Contractor will provide the local workers with training to ensure that they are able to, among other things, satisfy the necessary requirements for OHS and environmental compliance as well as understand correct construction techniques. The long-term impact of this is an upskilled workforce on the island who will be able to bring these training and experience benefits to other construction works on the island. It is recommended that these "short courses" provided by the Contractor/PWD/GoT result in an appropriate accredited certification and a digital resume for each worker that may be used in the future.
- The TCAP project team will ensure that the contractor allows the space, time and equipment needed to fossick for shells over subsequent levels of dredged sand.
- All workers to have undertaken approved HIV/AIDS and GBV prevention training in Tuvalu and to have signed code of conducts as included in the contract.
- All foreign workers must have valid visas.
- Workers to respect village and landowner boundaries, observe codes of conduct and avoid damage to properties and resources.

9.2.12 Community Health and Safety

9.2.12.1 Gender Based Violence

The perpetrators of GBV can be anyone associated with the Project and may include not only construction workers, but also consultants and project staff supervising the works or undertaking technical assistance activities or studies hired to protect a project site. There has been a reported increase in GBV in the neighboring country of Fiji during the COVID-19 pandemic domestic travel restriction and associated job losses.

The TCAP project will likely be of low risk in relation to project related GBV due to the minimal level of labour sourced from outside, the fair and equitable approach to recruitment of local workers, the strong role the Kaupule and women's group plays on the island, and the proposed approach to engaging the community in a participatory way in the construction and operationalization of the project.

Instances of GBV within Tuvalu usually come to the attention of the Tuvalu Family Health Association (TFHA) as a primary contact, with supporting services from the Gender Affairs Department (GAD) and the Tuvalu National Council of Women (TNCW). Gaps identified in these three survivor support services were identified through GBV work under the Tuvalu Aviation Investment Project, and training was given to these three agencies and several other Tuvaluan NGOs and civil societies by the Fiji Women's Crisis Center, with the result that there are now many qualified councilors within these organisations train in GBV and SAE psychosocial counseling.

9.2.12.2 Protective Measures

Protective measures will include but are not limited to the following:

- Incorporation of GBV into the Stakeholder Engagement and Consultation Plan
- Code of conduct that includes a drug and alcohol policy will be signed by all workers (including project management) to demonstrate commitment to prevention of GBV and the prevention of the spread of STDs such as HIV/AIDs. Code of Conduct and training requirements are included in the Contract.
- Create opportunities for women to participate in decision-making for the project as well as to benefit economically via employment through this project.

9.3 UNCERTAINTIES IN IDENTIFYING IMPACTS

Despite the measures that will be taken to mitigate or avoid the foreseeable impacts of the project works, there is always the possibility of impacts that have not been accounted for or were not anticipated, or the extent of predicted impacts can turn out to be greater than predicted, or the mitigation measures may not be as effective as expected. To ensure that such incremental impacts do not suddenly appear without warning, the project will monitor key parameters in the vicinity of the development that can serve as environmental indicators. The project sites and surroundings have been surveyed and a baseline has been established. As per the ESIA, these areas will be monitored during all phases of the project, to provide an indication of impacts before they become too advanced for corrective action.

10 CONCLUSION AND RECOMMENDATIONS

10.1 CONCLUSION

The TCAP works will provide the community of Funafuti additional safe raised land and improved coastal protection for community members. Environmental and social considerations have been given to the proposed works and the impacts arising due to the construction and operation of the project have, on the whole, been identified, adequately addressed, and mitigated in a comprehensive manner. The issue of managing the impacts of dredging, changes the land use of the area and maintaining the integrity of the vegetation line have been fully incorporated into the design of the project. There may still be potential impacts to the boat owners along the project foreshore area which will require further community consultation in order to fully assess and address them during the detailed design phase. The SECP and the recommendation of this ESIA provide the tools to facilitate this.

In the view of this report, and taking into account the ongoing consultations needed, it is anticipated that there are no significant adverse impacts on the physical, ecological or social environment as adequate mitigation and monitoring measures have been suggested in this section and in the Appendix B and C, the SECP has been developed and the updated GRM will be available (together forming an Environmental and Social Management Plan). With these measures effectively introduced, the predicted impacts will be minimised or avoided.

The assessment and proposed mitigation measures contained in this ESIA meets the requirements of the Government of Tuvalu and the UNDP SES for each of the Standards which have been triggered.

10.2 RECOMMENDATIONS

Appendix B contains the recommended mitigation measures for the Funafuti investments during the pre-construction, construction, and operational phases. The tables for each phase include details of the mitigation measures required, the cost allocation, responsible entity and the applicable project phase.

Monitoring measures are also provided for each project phase. The tables are divided into two sections: (i) one-off preconstruction checklist; and (ii) weekly checklist for the construction phase.

The TCAP PMU carries overall responsibility for safeguards supervision. The Tuvalu government and the Funafuti Kaupule are responsible for incorporating the operational phase maintenance needs into their annual work plans.

10.2.1 Contractors Environmental and Social Management Plan

The Contractor for the TCAP works will be required to produce a Contractors Environmental and Social Management Plan (C-ESMP). The C-ESMP will be the Contractors governing document for the implementation of this ESIA during works. The C-ESMP will contain the contractor's methodology and planning for adhering to their safeguard requirements. Additionally, the C-ESMP will detail how the Contractor plans to resource their team with personnel and financial resources as per the Contract.

The C-ESMP and associated management Plan will be developed, reviewed and approved by the TCAP PMU or technical experts and disclosed prior to commencement of civil works. The Contractor is required to produce the following management plans as part of their C-ESMP. These management plans are referred to throughout the ESIA. In addition to these management plans being a requirement for the C-ESMP, a demonstration of the contractors experience in developing similar plans will be required as part of the tendering process to demonstrate that the Contractor has the capacity within their team to plan their safeguard management strategies.

Spill Response Plan: The Contractor will have a spill response plan in place to account for all potential instances. A Spill response plan will be developed to ensure that all fuels and lubricants used during the construction phase in machinery, equipment, generators and also on marine vessels are contained, collected, treated and disposed of. The spill response plan will: (i) identify areas within the project sites and nearby vicinity that are sensitive to spills and releases of hazardous materials and locations of any water intakes; (ii) outline responsibilities for managing spills, releases, and other pollution incidents, including reporting and alerting mechanisms to ensure any spillage is reported promptly to the Kaupule; (iii) Include provision of specialized oil spill response equipment (e.g. containment booms, recovery devices, and oil recovery or dispersant application vessels, etc.), and; (iv) include regular training schedules and simulated spill incident and response exercise for response personnel in spill alert and reporting procedures, the deployment of spill control equipment, and the emergency care/treatment of people or wildlife impacted by the spill.

Erosion, Drainage and Sediment Control Plan (EDSCP): This plan will address the drainage control, sediment and erosion controls and stockpiling of materials including soil during construction of all works. The plan will include measures to be inspected regularly to ensure all devices are functioning effectively. Specifically, the plan will be designed to ensure that: (i) there is no buildup of sediment in the coastal marine environment and/or groundwater as a result of the construction activities; (ii) there is no degradation of water quality on or off project sites; (iii) all water exiting the project area and/or into the groundwater systems is to have passed through best practice erosion, drainage and sediment controls; (iv) there are no changes to existing erosion or sediment deposition regimes form taking of sediment from the coastal zone; (v) ensure effective implementation of site specific EDSCP.

Dredge Management Plan (DMP): The standard of this plan and detail will be elaborated during the tendering stage. The plan will address the management controls that the Contractor will put in place for all dredging and filling works. The objective of the plan is to ensure the dredging and disposal activities associated with the project meeting the conditions of development consents and this ESIA. The plan should encompass vessel control and management; processes for selecting dredge site under advisement from TCAP experts; water quality controls; environmental and social controls for dredging and filling; and, UXO/ERW survey and disposal processes.

Sampling and Analysis Plan (SAP): The overall objectives of the SAP are: provide a description of the proposed dredging and spoil disposal activities for the project; provide methodology for collecting regular samples of sediment to keep a spatial distribution record of grain size and composition to build up improved knowledge of the resource; identify areas with high silt content which could create increased turbidity so these areas can be avoided; provide a summary of the catchment and land-use activities with the potential to impact on the quality of the dredge material; identify the list of likely contaminants present, based on review of surrounding uses and historic sediment quality data; identify the number of samples required to provide adequate representation of the average and upper 95% confidence interval for the contaminants tested; identify rigorous sample handling, storage and transport processes, to ensure sample integrity; establish data quality objectives, related to quality assurance and quality control standards; provide a description of the statistical analysis procedures, for determining the contamination status of the sediments; identify the appropriate sediment quality guidelines, (e.g. National Assessment Guidelines for Dredging, Commonwealth of Australia, 2009)

11 ESIA IMPLEMENTATION

11.1 INTEGRATION OF ESIA INTO PROJECT PROCUREMENT

This ESIA should be included in the bid document package.

The safeguard requirements of this ESIA will be referenced in appropriate parts of the technical specifications, the contractors contract and any TORs for supervision or issued under the TCAP. The TCAP Project Manager will be required to review all bid documents prior to approval.

11.2 ROLES AND RESPONSIBILITIES

The TCAP GCF Project Proposal Document ESMP outlines the implementation responsibilities for the environmental and social management, which also applies to this ESIA

11.2.1 General Management Structure and Responsibilities

The UNDP and DoE are accountable for the provision of specialist advice on environmental issues to the contractor and for environmental monitoring and reporting. The DoE will assess the environmental performance of the contractor in charge of construction throughout the project and ensure compliance with the C-ESMP.

The DoE will be responsible for monitoring the implementation of the C-ESMP by relevant supervisory staff during construction. During operations, the contractor will be accountable for implementation of the C-ESMP. Contractors working on the projects have accountability for preventing or minimising environmental and social impacts.

11.2.2 Administration

The DoE will be responsible for the revision or updates of this document during the course of work. It is the responsibility of the person to whom the document is issued to ensure it is updated.

The site supervisor will be responsible for daily environmental inspections of the construction site. The DoE will cross check these inspections by undertaking monthly audits.

The contractor will maintain and keep all administrative and environmental records which would include a log of complaints together with records of any measures taken to mitigate the cause of the complaints.

The contractor will be responsible for the day to day compliance of the ESIA.

DoE will be the implementing agency and will be responsible for the implementation and compliance with the ESIA via the contractor. The ESIA will be part of any tender documentation.

The Supervising Engineer/Project Manager will supervise the contractor, while the DoE will be responsible for environment and social issues.

11.2.3 Design Consultants

It is the Design Engineers responsibility to:

- Comply with this ESIA in the final development of the concept designs, detailed design, procurement bid documents and other advice to the PMU.
- Avoid or minimise environmental and social impacts by design.

- Undertake meaningful consultation with stakeholders and communities to inform the design process.

11.2.4 Supervision Engineer

The Supervision Engineer is responsible for the day to day oversight of the construction works for the project, including safeguard compliance. The Supervision Engineer will work closely with the Contractor on a daily basis to ensure that the project is implemented in a compliant manner consistent with the detailed designs provided and the ESIA. They are responsible for:

- Daily monitoring of the Contractors works for compliance with the ESIA through their C-ESMP as per the measures detailed in Appendix B providing safeguard monitoring results in their monthly reporting to PMU
- Managing the review process of C-ESMPs for approval. The Supervision Engineer must ensure that all current safeguard instruments have been reviewed internally as well as by the PMU and UNDP.
- Updating the ESIA as necessary to reflect notable changes in the designs.
- Working with the Contractor and the PMU to provide meaningful input and direction into community consultations.
- Managing instances of non-compliance by the Contractor and reporting all instances to the PMU. They are also responsible for escalating recurring instances of non-compliance by the Contractor to the PMU for action.
- Managing and responding to all direct complaints/incidents received by their representatives reporting all instances to the PMU for inclusion into the Project database.

11.2.5 Contractors

It is the Contractors responsibility to:

- Ensure the Contractors project team includes experienced safeguard specialists with sufficient in-country time allocation and financial resources specified in the Contract
- Prepare and have cleared by the Supervision Engineer the C-ESMP in accordance with this ESIA prior to commencement of works
- Carry out the project implementation in accordance with the C-ESMP
- Not to undertake any works or changes to works unless first approved in an updated C-ESMP
- Conduct daily and weekly safeguard inspections of the works to ensure compliance and reporting the results of these inspections to the Supervision Engineer
- Undertake community consultations on the draft C-ESMP in coordination with the PMU
- Post all notifications specified in this ESIA at the site entrance
- Report all environmental and OHS incidents to the Supervision Engineer for any action
- Provide monthly reports of all safeguard monitoring, incidents, complaints and actions to the Supervision Engineer
- Maintain a database of all complaints, incidents or grievances received. Any issues which cannot be dealt with immediately should be reported to the Supervision Engineer.

11.3 INSTITUTIONAL CAPACITY

A Project Management Unit working under the National Project Manager has been tasked with the delivery and management of TCAP. The PMU has been resourced with support staff based in Funafuti and Fiji specifically tasked to manage project implementation across management, finance, procurement, communication and technical. As such, the PMU carries much of the institutional capacity to implement the Project and to monitor the works for technical compliance. The PMU has also recently recruited an in-house safeguard specialist to ensure that they are able to monitor for compliance with the requirements of the ESIA, UNDP Social and Environmental Standards and national legislation. While the UNDP is available to provide support and Project Assurance, this capacity is best delivered in the form of a dedicated safeguards specialist for the PMU with technical support from a part time international safeguards specialist when needed.

Other parties who have monitoring or implementation responsibilities during project implementation (Supervision Engineer, Contractor) will be required as part of the contract to be resourced with a suitably experienced and qualified safeguard specialist.

It is the responsibility of the Contractor and Supervision Engineer to ensure that they allocate budget lines to have the necessary specialist capacity, tools and equipment for the mitigation and monitoring measures as stipulated in the ESIA. Budget line items will be provided in the bid documents and Bill of Quantities (BoQ) to allow for the provision of adequate safeguards implementation, monitoring and training. This section will be updated prior to the release of the bid documents and once the BoQ has been prepared.

12 CONTINGENCY AND EMERGENCY RESPONSE

The TCAP National Project Manager (NPM) is the contact person for emergency situations that may arise during the implementation of the TCAP works on Funafuti. The NPM will be available 24 hours a day, seven days a week, and has delegated authority to stop or direct works. In the event of an environmental emergency, the procedures outlined below are recommended for TCAP to consider for implementation.

12.1 CONTINGENCY PLAN

As part of their C-ESMP, the Contractors are required to prepare a Contingency Plan encompassing the COVID-19 global pandemic, cyclone and storm events. The plan will include a COVID-19 Management Plan which will include quarantining provisions and will be approved by TCAP and the Tuvalu Department of Health. The purpose of the plan is to ensure all staff are fully aware of their responsibilities in respect to human safety and environmental risk reduction. Procedures should clearly delineate the roles and responsibilities of staff; define the functions to be performed by them, the process to be followed in the performance of these functions including tools and equipment to be kept in readiness, and an emergency medical plan. All the Contractor's staff should undergo training/induction to the plan.

While it is preferable to undertake construction works outside of the wet season, it is probable that storm and heavy rain events will occur while works are underway.

The Contractors are responsible for monitoring weather forecasts, inspecting all erosion and sediment control measures and undertaking any remedial works required prior to the forecast rain or storm event.

In general, the Contractors will:

- Inspect daily weather patterns to anticipate periods of risk and be prepared to undertake remedial works on erosion and sediment control measures to suit the climatic conditions.
- Monitor the effectiveness of such measures after storms and incorporate improvements where possible in accordance with best management practice.
- Ensure appropriate resources are available to deal with the installation of additional controls as and when needed.
- Inform the Supervising Engineer if there are any concerns associated with the measures in place.

12.2 EMERGENCY RESPONSE PLAN

In the event of actions occurring, which may result in serious health (including pandemic), safety and environmental (catastrophic) damage, emergency response or contingency actions will be implemented as soon as possible to limit the extent of environmental damage.

It is assumed that there are residences located near the construction activities.

The contractor will need to incorporate construction emergency responses into the projects complying with the requirements under the Occupational, Health and Safety Policy of the contractor or the work-related Government of Tuvalu legislation.

The DoE and UNDP staff must be notified immediately in the event of any emergency, including fire or health related matter including those that have resulted in serious environmental harm. The Contractor

will be required to develop an Emergency Response Plan as part of their C-ESMP and they are required to ensure that the following health and safety measures are included:

- Flammable and combustible liquids bunding/storage areas to be designed in accordance with appropriate international standards.
- Fire extinguishers are to be available within all site vehicles.
- No open fires are permitted within the project area
- No cigarette butts are to be disposed of onto the ground throughout the project areas, all smokers must carry a portable disposal bin to reduce the risk of a spot fire starting and general litter.
- Any stockpiles of mulch, sawdust or any other flammable materials are not to exceed two meters in height and width and must be turned regularly.
- Train all staff in emergency preparedness and response (cover health and safety at the work site)
- Check and replenish first aid kids and dedicated first aiders are within the project personnel on site
- Personal Protection Equipment is provided, and staff are trained on their correct use.

APPENDIX A: DESIGN PLANS

bluecoast
CONSULTING ENGINEERS

F-01-002 Rev C
24.06.2020

NOT FOR CONSTRUCTION

GREEN CLIMATE FUND

TUVALU COASTAL ADAPTATION PROJECT (TCAP),

FUNAFUTI
SITE PLAN

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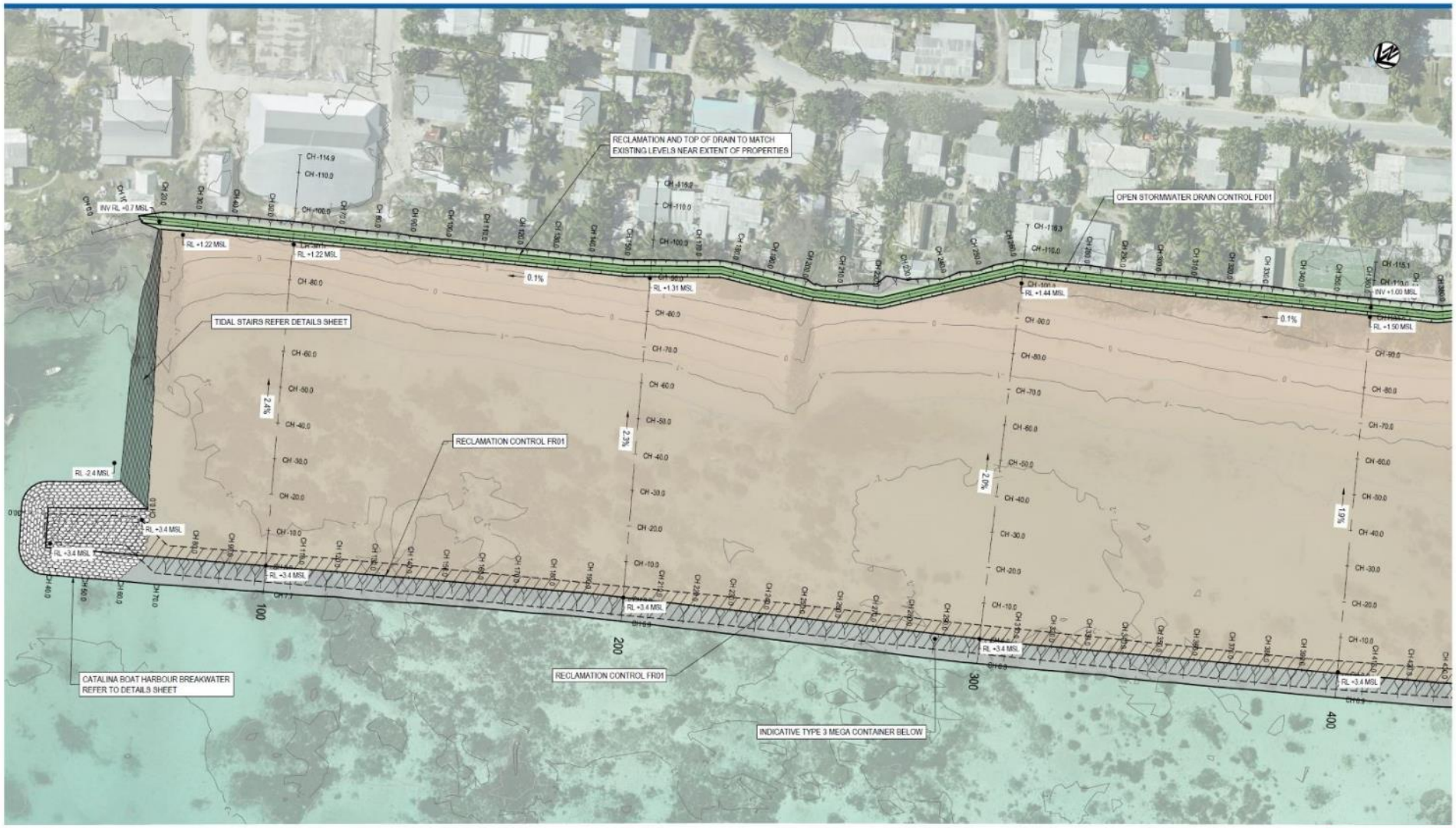
F-02-003 Rev C
24.06.2020



NOT FOR CONSTRUCTION

Empowered lives. Resilient nations.

GREEN CLIMATE FUND

TUVALU COASTAL ADAPTATION PROJECT (TCAP),
FUNAFUTI
GENERAL ARRANGEMENT PLAN
SHEET 1

TUVALU COASTAL ADAPTATION PROJECT TCAP

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CONSULTING ENGINEERS

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24.06.2020

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GREEN CLIMATE FUND

TUVALU COASTAL ADAPTATION PROJECT (TCAP),
FUNAFUTI
GENERAL ARRANGEMENT PLAN
SHEET 2

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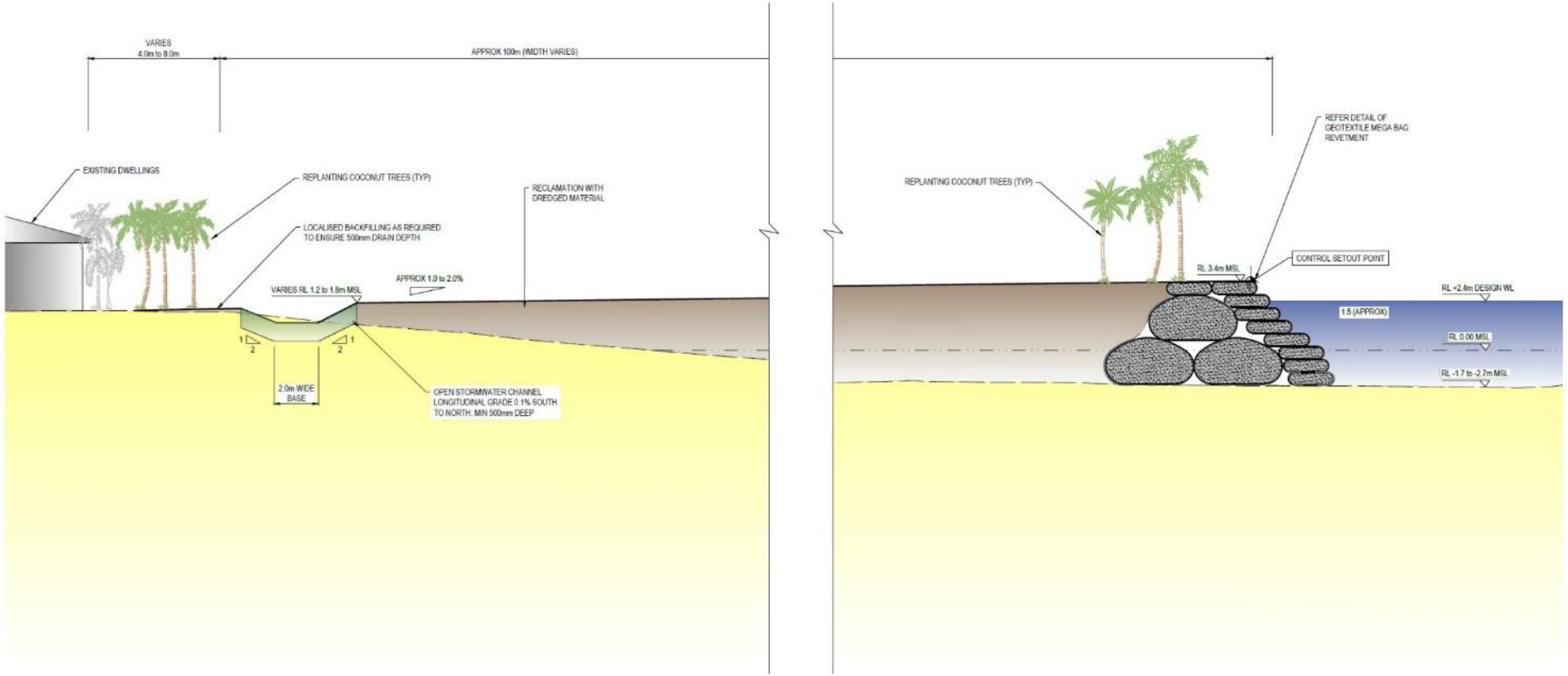

REVETMENT - GEOTEXTILE MEGA CONTAINER GSC SEWARD FACE (R2)
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TUVALU COASTAL ADAPTATION PROJECT (TCAP),
FUNAFUTI
TYPICAL SECTION SHEET 1
RECLAMATION

APPENDIX B: MITIGATION TABLE

TCAP PRE-CONSTRUCTION PHASE MITIGATION PLAN

Project Activities	Pre-Construction Mitigation Measures	Cost	Responsibility	Start	End
General	• The ESIA will be included in the Contractors and Supervision Engineers specification and contract • Specific mitigation measures for the contractor or Supervision Engineer shall be highlighted in the contract clauses	Minor, included in tendering costs	UNDP	Tender Preparation	Signing of contract
General	• Contractor and Supervision Engineer will include safeguards specialist within their key personnel. • Safeguards specialists will be adequately resourced to provide the necessary country support.	Minor, included in tendering costs	UNDP	Tender Preparation	Signing of contract
General	• Apply for and secure all permits and approvals under the appropriate national legislation. • Submit Development Consent application to DoE based on this ESIA	Minor	TCAP PMU	Pre-Construction phase	Prior to construction starting
General	• The Contractor shall develop a Contractors ESMP, including Dredge Management Plan, Sampling and Analysis Plan, Erosion, Drainage and Sediment Control Plan, ERW/UXO Plan and Spill Response Plan. The C-ESMP will be cleared by the Supervision Engineer prior to the commencement of civil works. • All relevant personnel will be trained on this plan and attendance will be recorded. • Contractor will maximise use of local labour to minimise need of foreign workers wherever practicable.	Included in Contract Costs	Contractor	Award of Contract	Prior to Construction Starting
Design of Retaining Structure	• Ensure comprehensive consultation are held with the boatowners along the shoreline and their views incorporated into the design process where possible (see Section 9.2.10.1) • The retaining geotextile structure will be designed to absorb and reduce wave energy, prevent overtopping and minimise any wave reflection issues • Reclamation works will not extend to existing terrestrial vegetation line other than fill place to ensure effective drainage as per design plans. • Reclaimed land will drain to storm water drain. • Set back area will be defined 20m from seaward edge of reclamation and TCAP to encourage the GoT to designate this area for recreational use. • A rock breakwater will be constructed at the northern extent of the reclamation bund to protect the Catalina Harbour. Rock for the breakwater will be sourced from two groynes located along the reclamation footprint. The core of the structure will consist of a geotextile mega container • Catalina harbour will be designed with safe loading of passengers and passengers in mind. • Design will be responsive to community feedback to the greatest feasible extent	Included in Contract Costs	Design Engineer	Development of concept designs	Approval of final detailed design

Dredging and Fill Works	• Develop and implement of a site-specific Dredge Management Plan to address water turbidity and water quality management. • Dredge method will be via a pipeline for conveying slurry to fill sites and minimise losses to lagoon waters. • Dredging will be limited to the sand excavation area identified in Section 5.3.2.1. Final location of the dredge will be identified in the C-ESMP through consultation with the TCAP expert. Considerations for identification of exact dredge locations within the characterised sediment resource area would include water depth/dredge capacity; sediment thickness, composition, and grain size; magnetic anomaly locations (UXO risk); distance from reclamation site, community consultation feedback and distance from any live coral outcrops. • No ecologically significant areas are included in the design. Dredging and reclamation concentrates on damaged parts of the lagoon. • Dredging will seek to minimise the disturbance area and be targeted not to remove all the sand in the area that is dredged. • Contractor will undertake an updated magnetometry survey of the proposed dredge area • Working area for machinery on beaches will be clearly marked before construction starts and will be kept to a minimum size.	Minor, part of standard practices	PMU and Contractor	Pre-Construction phase	Prior to Start of works
Solid Waste Management	• Preference shall be given to materials that can be used to construct the project that would reduce the direct and indirect waste generated and encourage recycling. • The use of construction materials shall be optimised and where possible a recycling policy adopted • All hazardous waste will be exported from Tuvalu under the conditions of the Waigani Treaty. Contractor will consult with GoT WMD on export of hazardous substances. • All Project staff will be trained on these requirements and attendance will be recorded.	Minor, part of standard practices	Contractor	Pre-Construction phase	Prior to start of works

Spill Response	• As part of the C-ESMP, the Contractor will have a spill response plan in place to account for all potential instances particular operation of dredge and dredge vessel. • Spill response plan will be developed to ensure that all fuels and lubricants used during the construction phase in machinery, equipment, generators and also on marine vessels are contained, collected, treated and disposed of. • Identify areas within the project site and nearby vicinity that are sensitive to spills and releases of hazardous materials and locations of any water intakes. • Outline responsibilities for managing spills, releases, and other pollution incidents, including reporting and alerting mechanisms to ensure any spillage is reported promptly to the port authority and Kaupule. • Include provision of specialized oil spill response equipment (e.g. containment booms, recovery devices, and oil recovery or dispersant application vessels, etc.) • Include regular training schedules and simulated spill incident and response exercise for response personnel in spill alert and reporting procedures, the deployment of spill control equipment, and the emergency care/treatment of people or wildlife impacted by the spill.	Minor, part of standard practices	Contractor	Pre-Construction phase	Prior to start of works
Mobilisation of machinery and equipment from source country	• Ensure all construction machinery and equipment is steam cleaned of all organic material in source country prior to deployment. • Provide an approved phytosanitary certificate and any other documentation required under Tuvalu legislation. • Ballast water of cargo vessels to be discharged no closer than 5nm from the shoreline. Confirm with ship captain and review of log. • Size of imported construction equipment (excavator, digger, etc) should be kept to a workable minimum. • Any vessels chartered for shipping shall be compliant with the International Maritime Organisations conventions of which Tuvalu is a signatory and have a contingency plan for cyclonic events (such as a cyclone mooring).	Included in Contract Costs	Contractor	Prior to mobilisation	Completion of all importing activities

Stockpile and Laydown sites	• The Contractor will have an EDSCP as part of their C-ESMP • Ensure any stockpile sites are appropriately bunded or fenced to prevent sediment runoff. • Vehicle washdown and concrete protection areas will be at the laydown site and will be bunded with all wastewater collected and treated prior to discharge. • Consultation with Kaupule undertaken in finalizing location of stockpile and laydown sites • Management and operations of site addressed in C-ESMP prepared by Contractor and cleared by Supervision Engineer. • Ensure no significant environmental, social or infrastructure impacts because of location and operation of laydown and stockpile areas. • Laydown and stockpile sites will be located away from bodies of water. • Any temporary lease agreements for sites will follow the requirements of this ESIA and national legislation. • Stormwater management measures will be designed to reduce flow velocities and avoid concentrating runoff. • Vegetated buffer strips around sites will be retained.	Included in Contract Costs	Contractor	Development of C-ESMP	Prior to start of works
Workers and Project Accommodation	• No new permanent accommodation for project office and project personnel • Minimise number of workers from off-island. • Contractor will supply all required food for workers to the community to enable community members to be appointed to cook and prepare food for a fee. • Contractor will provide first aid facilities and trained first aiders on Funafuti for all workers	Included in Contract Costs	Contractor and Supervision Engineer	Mobilisation	Prior to start of works
Recruitment of overseas workers	• All imported project staff will abide by Tuvalu immigration policy and provide all required documentation, including health checks. • Overseas workers will undergo cultural familiarisation induction upon arrival and sign a code of conduct applicable for the duration of their contract. • Requirement to maximise use of local and Public Works Department workforce will be included in tendering document • Overseas workers will have the technical skills and experience required for works under this component.	Minor, part of standard practices	Contractor	Upon recruitment	Prior to construction starting
Gender, Social Inclusion & GBV	• Ensure opportunities to incorporate men and women's views and interests into project decisions and implementation are purposefully created and enabled in the stakeholder engagement processes throughout the project life. • Incorporation of GBV into the Stakeholder Engagement and Consultation Plan • Code of conduct will be signed by all workers (including project management) to demonstrate commitment to prevention of GBV and the prevention of the spread of STDs such as HIV/AIDs. Code of Conduct and training requirements is included in the Contract.	Minor, part of standard practices	Contractor	Pre-Construction phase	Prior to construction starting

Community Engagement	• Implement the Stakeholder Engagement and Consultation Plan • Develop and implement communication plan for the project and in particular the shared public use and access to the Catalina Harbour for the Funafuti based communities, both local Funafuti residents and those from the outer islands, as well as other stakeholders. • Ensure opportunities (through implementation of the SECP) to incorporate men and women's views and interests into project decision and implementation are purposefully created and enabled in the stakeholder engagement processes throughout the project life. • For any consultations undertaken with the Kaupule or Falekaupule, the women of the community will provide trays of food sufficient for the number of participants and paid for as part of the project costs. • Communities will be educated on best practices to use such as advise around not fixing anchors to the containers and to contact public works department if damage is observed.	Minor, part of standard practices	Contractor and NPM	Project Design	Demobilisation
Hazardous Substances Management	• A Spill Response Plan will be developed as part of the Contractors C-ESMP • Designate an area for storage of all hazardous chemicals which is on impermeable surfaces, is bunded and is sheltered from the weather. • Emergency clean up kits for oil and chemical spills will be available onsite and in all large vehicles.	Included in Contract Costs	Contractor	Development of CESMP	Prior to start of works
UXO	• Updated magnetometry survey to confirm presence/absence of UXO/ERW • The dredge will be fitted with a suitable screen to exclude ERW at the cutter head and a beach-screening cage to capture ERW at the discharge end of the dredge pipe as was used in the Tuvalu Borrow Pit Project. • Contractor will undertake an updated magnetometry survey of the proposed dredge area and identified magnetic anomalies (potential ERW) will be avoided during dredging. • The Contractor's C-ESMP will detail the way in which they will safely handle and dispose of ERW in the event that any ERW are encountered during construction.	Included in Contract Costs	Contractor	Development of CESMP	Prior to commencement of finalised dredge planning
Community Services and Infrastructure	• Ensure comprehensive consultations are held with the boat users and owners along the shoreline and their views incorporated into the design process where possible, practical and feasible. • Explore additional and more culturally sensitive options for boat mooring for the adjacent community, other than the Catalina Harbour option. • Additional burden from the TCAP works on the freshwater supply will be avoided through water conservation practices and the use of portable desalination plants or dedicated water harvesting systems.	Minor, part of standard practices	Design Engineer	Start of Detailed Design	Before start of works

Land and Resource Use	• Conduct a stakeholder mapping and analysis of the landowners and non-landowning households in the adjacent community and other groups that the project may affect. Identifying the most vulnerable and disadvantaged group will be important for tailoring resilience-building mitigation measure to offset the negative impacts of the project. • Facilitate the development of a community-based local planning and M&E process	Minor	Design Engineer	Start of Detailed Design	Before start of works
Income generating activities	• A number of income-generating activities will stem from the construction works. These range from direct employment of local labour through to provision of cooking and housekeeping services provided at the workers' accommodation. The islands have a cultural arrangement whereby any employment generated from projects such as this is shared fairly throughout the community on a rotational basis. It is a requirement for all projects to adhere to this cultural practice. To facilitate this effectively, the Contractor will be required to undertake training for all nominated workers at the start of works to avoid delays linked to the need for additional training as the workers rotate. • The communities, in coordination with their Kaupule, will provide the contractor with a list of skilled and unskilled laborers. The Kaupule will also coordinate with the villages to ensure that job opportunities are fairly disseminated. Women are encouraged to participate in the workforce and job opportunities. Persons with disabilities are also encouraged to participate in the workforce and with jobs that are appropriate and significant.	Part of contracted costs	Contractor	Start of works	End of works

TCAP Construction Phase Mitigation Plan

Project Activities	Construction Mitigation Measures	Cost	Responsibility	Start	End
Transport and operation of construction machinery	• All machinery to be in sound condition and free from any leaks of lubricants and fuel. • Maintain construction equipment. • Any machinery generating visible smoke is not permitted for construction activities. • Define and clearly mark conservative working areas on the beach, berm crest and reef flat for all heavy plant and machinery. No machinery will be permitted to cross the beach crest outside of predetermined areas. • Construction machinery will be stored away from the coastal marine environment, at the laydown site. • Traffic management measure will be described in the C-ESMP • Contractor will be responsible for immediately repairing any damage to the existing road network or infrastructure caused by construction works. • Spill kits to be placed at all fueling locations and on construction equipment. • Refueling only to occur in designated area within laydown site on hardstand area or over drip trays. • Pay appropriate construction damage compensation to affected parties as determined by the approved Government compensation schedule. • Training for all machinery operators on ESHS risks to marine environment and vegetation line from accidental damage during construction. • Turn off or shut down all machinery or vehicles when not in immediate use. No engine idling of unattended vehicles is permitted.	Included in Contract Costs	Contractor	Pre-mobilisation	Demobilisation
Traffic (pedestrian and vehicle) Management	• Implement the traffic management measures to ensure smooth traffic flow and safety for workers, passing vehicles and pedestrian traffic. • Where appropriate, employ flag operators on the road to prevent traffic accidents. The workers shall have relevant safety equipment and training. • Contractor will be responsible for repairing any damage to the existing road network caused by construction works. • Restrict speed limits of vehicles on unsealed roads • Cover loads of haul and equipment when not in use and in transit.	Included in Contract Costs	Contractor	Prior to works	Demobilisation
Dredging and Fill Works	• Implement Dredge Management Plan • Dredge plume extent will be monitored and if excessive in extent, works will cease until either conditions are more favourable or appropriate plume management measures (e.g. silt curtains) have been implemented. • Dredging within 100m of live corals will be proactively monitored by the Contractor for stress and works suspended if necessary.	Included in Contract Costs	Contractor	Prior to start of work	Completion of Dredging Works

	• Dredge waters will be discharged within the revetment wall to allow filtering and control of dredge wastewater. • Strict control on de-watering release by pumping to a contained area, using sediment curtains and route monitoring of turbidity will be required in the C-ESMP. Care will be taken to ensure de-watering does not occur towards the island. • Construction materials will not be stockpiled within 50m of the coastal vegetation line unless bunded. • Machinery on the beach will work in clearly defined and minimal areas • Refueling will occur in designated bunded areas away from the coastal marine environment. • Any spills of hazardous substances onto the beach will immediately be cleaned as per the Contractors Spill Response Plan.				
Stockpile area	• Implement EDSCP • Bund the dredge spoil stockpile area to reduce sediment movement away from site. • Stripped topsoil will be kept in separate stockpiles. • Ensure that any erosion and sediment control devices are installed, inspected, and maintained as required. • Maintain vegetated buffer strips during construction to reduce water velocity and retain low levels of uncontaminated sediment.	Minor, part of standard practices	Contractor	Start Excavations	Completion of works
Construction of Retaining Structure	• The TCAP project team will ensure that the Contractor allows the space, time and equipment needed to fossick for shells over subsequent levels of dredged sand • Contractor will undertake a detailed survey of vegetation along shoreline to identify vegetation of significance (if any). Any significant vegetation along the shoreline will be identified and flagged to minimise potential for inadvertent sand 'spill' or damage from machinery. "At risk" trees may be protected with temporary tree guards. Any sand spills that do occur will be cleaned up by hand or with light machinery. • Areas accidentally damaged during works are to be restored by clean up, re-contouring and planting. • The removal and transfer to safer ground of epifaunal species such as sea cucumbers will be carried out by the Contractor to avoid burial. • Clear boundaries will be set during construction to protect the front of the berm and the vegetation line. Boundaries will be physically marked with temporary construction fencing. • Schedule works in stages to ensure that exposed soils are revegetated and stabilized progressively. • Machinery on the beach will work in clearly defined and minimal areas • Disturbance of vegetation to be limited to that required and approved for construction works	Included in Contract Costs	Contractor	Start of construction	Completion of works

	• Ensure that any erosion and sediment control devices are installed, inspected and maintained as required. • Schedule/stage works to ensure that major vegetation disturbance and earthworks are carried out during period of lower rainfall and windspeeds. • Design stormwater management measures to reduce flow velocities and avoid concentrating runoff. • No trees in the vegetation line will be removed or damaged during construction works				
Solid Waste Management	• Separate waste streams shall be maintained at all times i.e. general domestic waste, construction waste and contaminated waste. Specific areas on site shall be designated for the temporary management of the various waste streams. Adequate signage and colour coded bins will be used for each waste streams. • Recyclable waste shall be collected separately and disposed of correctly. • Disposal of waste shall be carried out in accordance with the Government of Tuvalu requirements. For waste which cannot be disposed of in Tuvalu, recycled, reused or composted will be exported and disposed of offshore in a licensed facility. • Concrete slurry will be allowed to harden and disposed of as clean fill. • Disposal of trees shall be undertaken in the accordance with one or more of the following methods: (i) left in place at the request of the owner; (ii) chipped and mulched; or provided to the community for reuse. • Hydrocarbon wastes shall be stored in colour coded (using WHO standard colour conventions) and labelled drums placed in secure, covered and bunded locations until their disposal. • Any waste oils and lubricants are to be collected and transported to recyclers or designated disposal entities as soon as possible. • Any dangerous goods stored on site shall be stored in accordance with Tuvalu regulations and international best practice • All construction workers will be trained on the correct and expected management measures for solid waste as part of the induction process. • Remove all inorganic, non-reusable and solid waste from the island generated as a result of the project. • Implement waste management in order to avoid, reduce, reuse, recycle. • No solid waste to be dumped in sea or lagoon waters. • Burning of solid waste is not permitted. • Compost all green and organic waste to assist soil improvement for the production of communal food crops or use as pig food. • Food wastes will be separated separately and disposed of correctly. • Export of all hazardous waste will be subject to the measures in this ESIA and in coordination with the Waste Management Department.	Minor, part of standard practices	Contractor	Prior to commencement of works	Demobilisation

Hazardous Substance Management	• Store and handle all chemicals, fuels, oils and potentially hazardous materials as specified in relevant standards and guidelines. All hazardous materials to be approved for use onsite. All hazardous materials and construction fuel will be stored in appropriate storage facilities (e.g. fuel and chemical will be stored in a bunded area). • Hydrocarbon wastes shall be stored in colour coded using WHO colour conventions and labelled drums placed in secure storage areas on site. • Where possible, fuel and chemical storage and handling shall be undertaken at designated petrol stations on the island, or at the project site on impermeable bunded surfaces (preferable over drip trays). Ensure onsite refueling activities occur in designated areas of the site where appropriate temporary protection measures have been designed/located and are no less than 20 meters from surface waters and drainage lines. • Onsite storage and transfer of fuel and chemicals shall be kept to a minimum. • Emergency clean up kits for oil and chemical spills will be available onsite and in all large vehicles.	Minor, part of standard practices	Contractor	Prior to commencement of works	Demobilisation
UXO	• The dredge will be fitted with a suitable screen to exclude ERW at the cutter head and a beach-screening cage to capture ERW at the discharge end of the dredge pipe as was used in the Tuvalu Borrow Pit Project. • The Contractor will ensure all project staff and visitors, including all contractor personnel, to the project site receive a suitable ERW awareness briefing before being permitted to commence work or visit the site. • The discovery of any UXO/ERW must immediately be reported to the Supervision Engineer and TCAP National Project Manager.	Included in Contract Costs	Contractor	Ongoing	Ongoing
Spill Management and Response	• Spill Response Plan to be included in the C-ESMP and implemented during construction. • Comprehensive site induction prepared by the Contractor will be required for all personnel involved with the project, with specific attention made to environmental and social receptors. • All personnel involved in the handling of dangerous goods should be trained and inducted in the handling, emergency procedures and storage requirements for different types of substances. • Vehicles and machinery will be refueled by authorized and trained personnel only in designated areas to reduce the likelihood of spillage in a sensitive environment. • Drip trays will be used during refuelling or servicing to prevent spillages onto the ground. • No refuelling of machines or vehicles will be permitted in the marine environment. • Development of procedures for cleaning up and reporting of accidental spills as part of the Spill Response Plan.	Minor, part of standard practices	Contractor	Prior to commencement of works	Demobilisation
Influx of labour	• All workers to have undertaken approved HIV/AIDS and GBV prevention training in Tuvalu and to have signed code of conducts as included in the contract.	Included in Contract Costs	Contractor	Prior to arrival of workers	Demobilisation

	• All foreign workers must have valid visas. • Workers to respect village and landowner boundaries, observe codes of conduct and avoid damage to properties and resources.				
Air Quality	• Implement effective dust management measures in all areas during design, construction and operation. • Manage dust/particulate matter generating activities to ensure that emissions do not cause an environmental nuisance at any sensitive areas. • Locate material stockpile sites as far as practicable from sensitive receptors. Cover if necessary. • Waste storage areas and receptacles should be covered and located as far as possible from sensitive locations. • Restrict speed limits of all vehicles on unsealed roads. • Cover loads of haul and equipment and plant when not in use and in transit. • Ensure dredge vessel, all equipment and machinery are in good working order and regularly maintained. • Turn off or shut down all machinery or vehicles when not in immediate use. No idling of unattended vehicles is permitted.	Minor, part of standard practices	Contractor	Start of construction works	End of construction works
Noise and Vibration Disturbance	• Equipment should be in good repair and fitted with appropriate noise attenuation e.g. mufflers on engines • Where stationary machinery or generators are required, they should be sited such that noise emissions are aware from sensitive receptors. • Minimise nuisance from noise, especially closer to residential areas and sensitive receptors, through establishment and communication to affected parties of working hours, including night works and avoid increase of noise and number of work equipment at outside of advertised hours. Advertise working hours at the site entrance. • Workers in the vicinity of sources of high noise shall wear necessary protection gear rated for the situation they are being used. • Provide temporary construction noise barriers in the form of solid hoardings where there may be an impact on specific residents. • Signage to outline complaints procedure and contact details of recipient of complaints. • Hours of operation restricted to daytime (7am-7pm) unless otherwise agreed by the Kaupule and PMU. • The Contractor should conduct employee and operator training to improve awareness of the need to minimise excessive noise in work practices through implementation measures. • Identify properties and structures that will be sensitive to vibration impacts resulting from construction.	Minor, part of standard practices	Contractor	Start of construction works	End of construction works

Laydown sites	• Implement the EDSCP • Bunded and covered areas will be installed for the storage and handling of hazardous materials and/or substances, the wash down of machinery and the preparation of concrete. • Run off from these bunded areas will be collected, treated and tested before being either reused for construction purposes or allowed to discharge into the ground, away from the marine environment. Discharge will be at a rate to allow absorption without causing surface flooding • Segregated storage for solid waste will be provided. This area will be clearly marked and designed to ensure that all waste is secure. • Worker inductions will include a tour of the laydown area and required practices from workers. • Spill response kits will be available, and workers trained in their use.	Included in Contract Costs	Contractor	Prior to commencement of works	Demobilisation
Concrete Production	• Concrete production will be located away from any body of water and foreshore vegetation. • Concrete will be prepared on bunded and covered hard stand surface of laydown areas. • All wastewater from concrete production will be collected and treated to lower the pH and allow particulates to settle out before being recycled for construction purposes. • Treated and tested wastewater may be discharged for absorption into the ground. Discharge will be at a rate to allow absorption without causing surface flooding. • Slurry from concrete production will be collected and treated. Treatment can vary depending on viscosity of slurry but can include the same measures described for treating concrete waste water or can be by facilitating the solidification of the slurry to form a gel which can be stored and disposed of according to the Solid Waste Management Plan. • Solid and cured concrete waste is considered safe to be reused by the community for infrastructure maintenance. • The Contractor's will have a spill response plan in place to manage accidental spills or leakages of concrete wastewater or slurry.	Included in Contract Costs	Contractor	Start of construction works	End of construction works
Demobilisation	• All residual material to be removed from the island unless specifically requested by the Kaupule. • Site rehabilitation works of laydown site, stockpile site and laydown area to include scarifying soil and spreading vegetative material to assist with natural regeneration processes unless the area is required for community use. • Replant coconut and other site-specific trees.	Minor, part of standard practices	Contractor	End of construction works	Demobilisation
Health and Safety	• Provide fully stocked first aid stations at each construction site with workers trained in emergency First Aid.	Minor, part of standard practices	Contractor	Prior to commencement of works	Demobilisation

	• Provide appropriate Personal Protection Equipment (PPE) for all construction workers and ensure they are used • Maintain daily contractor's diary and record any OHS accidents or incidents. • Include any OHS accidents or incidents in monthly report. • Report any serious accident or incident to Supervision Engineer. • Prohibit usage of drugs and alcohol on construction sites and undertake regular alcohol testing.				
Employment	• The Contractor will provide the islands workers with training to ensure that they are able to, among other things, satisfy the necessary requirements for OHS, environmental compliance and understand correct construction techniques. The long-term impact of this is an upskilled workforce on the island who will be able to bring these training and experience benefits to other construction work on the island.	Included in Contract Costs	Contractor	Start of construction works	Demobilisation
Community Health and Safety	• General public is not permitted in high risk areas and where heavy machinery is in operation. • Ensure reversing signals and audible signalling are installed on construction vehicles or provide flagmen/spotters as required to ensure safe operations. • Mark dangerous areas with reflective tape or other hazardous areas during the hours of darkness. • Provide safe access around work sites to keep public away from harm. Use safety barriers and fences as required. • Co-ordination with the Port of Tuvalu and the Harbour Master about vessel traffic near the construction site as well as approved mooring areas and mooring practices.	Included in Contract Costs	Contractor	Start of construction works	Demobilisation
Community Engagement and Grievances	• Implement Stakeholder Engagement and Consultation Plan. • Ensure opportunities (through implementation of the SECP) to incorporate men and women's views and interests into project decision and implementation are purposefully created and enabled in the stakeholder engagement processes throughout the project life. • Maintain a grievance register. • Ensure that public consultation and disclosure communication is completed at regular intervals to ensure that the public are fully aware of the TCAP program of activities and the complaints process. • Signage should be used in public areas around the TCAP project sites advising the complaints procedure and contact details of key project individuals responsible for responding to issues raised.	Included in Contract Costs	Contractor and NPM	Prior to commencement of works	Demobilisation

TCAP Operational Phase Mitigation Plan

Project Activities	Mitigation Measures	Cost	Responsibility	Start	End
Catalina Harbour Use	• Ongoing messaging around the open public use of the harbour for the entire community • Management of harbour area to ensure that larger boats don't block the safe wharf areas for protracted periods of time. This should be done through a Letter of Agreement and a draft limit of vessels to use the harbour. Larger vessels are to use the other wharves or the port. • Suggestion for the provision of shaded areas for fishermen to offload and sell their catches • Carry out facility inspection after each cyclone event	Part of regular departmental budget		Prior to handover	Ongoing
Ongoing Development of Reclaimed Area	• No development within minimum 20m set back area • Recommend to GoT to create replacement recreational area in setback area • Do not increase number of vehicle crossing points across storm drain and vehicle are only permitted to use allocated roads/tracks designed with reclamation area. • Conduct the planned whole of island vulnerability assessment and adaptation plan for Funafuti that effectively identifies and responds to risks associated with community livelihood assets and human securities in changing climate in the medium to long term. • Develop and implement a community based coastal protection plan and monitoring and evaluation system that engages a wide cross-section of the community in practical adaptive learning and resilience building.	To be included in government budget		Prior to handover	Ongoing
Ongoing Maintenance of Geotextile Mega Containers	• To ensure post construction resilience of the geotextile containers, local construction workers will be trained on how to repair the geotextile and appropriate stockpiles of repair materials will be handed over to the public works department once construction is completed. • To help avoiding damage to the geotextile containers the communities will be educated on best practices to use such as advise around not fixing anchors to the containers and to contact public works department if damage is observed.	To be included in government budget	Department of Public Works	Prior to handover	Ongoing
Stormwater Management	• Regular cleaning of storm drains • No earthworks on reclaimed land which could change drainage patterns	Part of regular maintenance budget	Department of Public Works	On handover	Ongoing

APPENDIX C: MONITORING TABLE

TCAP FUNAFUTI PRE-CONSTRUCTION PHASE MONITORING CHECKLIST

Pre-Construction Checklist		
Impact Area:	**Management Measures:**	**Frequency / Responsibility**
Environmental and Social Impacts	• Development consents and environmental permits are in place • C-ESMP has been developed and approved. • C-ESMP includes all required subplans • Project workers have been trained on the requirements of the ESIA and have undergone cultural familiarisation	Once / PMU and Supervision Engineer
Solid and hazardous waste	• Waste collection at workers camp and laydown area is established and well signed • Waste collection storage arrangements in place and compliant with approved C-ESMP	Once / Supervision Engineer
Dredging	• Dredge Management Plan and Sampling and Analysis Plan approved and implemented. • Dredge operations using floating pipe to discharge slurry in reclamation site. • Dredge excavation sites clearly identified in DFOP and fall within existing dredge zones • Magnetometry survey of proposed dredge site is completed. • UXO/ERW Plan is approved	Once / Supervision Engineer and TCAP NPM
Construction of Retaining Wall	• Detailed survey of vegetation along shoreline completed. • Epifaunal species within footprint relocated.	Once / Supervision Engineer
Employment	• Contractor is maximising use of the islands workforces in cooperation with PWD and the Kaupule	Once / Supervision Engineer
Community health and safety	• HIV/GBV/Code of Conduct training and acknowledgements have been completed • Medical clearance certificates provided for all foreign workers • Complaints process available for public inspection.	Once / Supervision Engineer
Protection of flora and fauna	• Clear demarcation of machine operating zone on reef flat, beach access and buildings. • Reclamation design does not extend to existing vegetation line.	Once / Supervision Engineer
Soil and water pollution	• Appropriate spill response plan in place	Once / Supervision Engineer
Materials Supply	• All imported materials with appropriate biosecurity clearances	Once / Supervision Engineer
Laydown and Stockpile Area	• Laydown areas established on pre-approved sites as per C-ESMP • Hazardous storage area set up and compliant • Water run off management systems in place to approved standard	Once / Supervision Engineer

TCAP FUNAFUTI CONSTRUCTION PHASE MONITORING CHECKLIST

Impact Area:	Management Measures:	Frequency / Responsibility
TCAP Funafuti: Construction Phase Monitoring Plan		
Construction machinery	• Machinery well maintained and in good working order • No evidence of machinery working outside demarked area. • Construction machinery stored/parked away from coastal environment • No damage to roads or any damage repaired immediately. • Any construction damage to property or vegetation is reported, repaired and/or compensated	
Dredging and Filing	• Dredge Fill and Operation Plan being effectively implemented. • Dredge plume is not widespread. • Live corals within 100m being monitored and photographed by Contractor as part of proactive monitoring. • Dredge waters only discharged within retained reclamation area. • Wastewater being effectively filtered by retaining structure with sediments contained. • Dewatering not occurring towards the island.	Weekly/Supervision Engineer
Construction of Retaining Wall	• Areas accidentally damaged during works are restored. • Clear working area boundaries set and clearly demarcated. • Machinery on the beach working in clearly defined and minimal areas • Disturbance of vegetation to be limited to that required and approved for construction works • Ensure that any erosion and sediment control devices are installed, inspected and maintained as required. • Stormwater management measures in place and working as designed.	Weekly/Supervision Engineer
Solid and hazardous waste	• Waste measures being effectively implemented as per approved C-ESMP • Waste collection at laydown area is secure, well signed and clean • Hazardous waste is stored according to C-ESMP • Good housekeeping around project sites and workers accommodation • All waste is disposed of offshore • Contaminants of Concern (COC) documentation in place and reviewed	Weekly / Supervision Engineer

Impact Area:	Management Measures:	Frequency / Responsibility
Community infrastructure, health, and safety	• Traffic management (including vessels) measures are under effective implementation • Public signage of complaints procedure • Signs and fences restrict or direct pedestrians and public where appropriate. • No damage to public or community infrastructure • Dust suppression is effective • Noise is within permitted limits • Required signage is in place	Weekly / Supervision Engineer
Protection of Vegetation Line	• No unauthorised removal of trees in vegetation line • No damage to vegetation line • Construction machinery barriers are in place • No evidence of construction machinery working outside marked areas	Weekly / Supervision Engineer
Protection of coastal environment	• Construction machinery barriers are in place • No evidence of construction machinery working outside marked area • Signs of erosion along vegetation line • No stockpiles or solid waste on the foreshore.	Weekly / Supervision Engineer
Soil and water pollution	• Appropriate spill response plan/kit in place for waste area • No visible spills on soil or uncovered ground • Drainage, water treatment and soakage systems clear and fit for purpose • Division bunding around large areas of vegetation clearance	Weekly / Supervision Engineer
Hazardous substances storage	• Substances stored within bund on impermeable surface • Spill kit complete and accessible • Spill training completed • No evidence of spills on the ground • MSDS available at storage locations • UXO ERW screening mechanism attached and working as designed.	Weekly / Supervision Engineer
Laydown and Stockpiles Site	• Laydown areas established as per C-ESMP • Laydown areas dust levels managed efficiently • Traffic measures correctly implemented at laydown site • Water run off management systems operating correctly • Dust management effectively implemented • PPE present and correctly used • Refueling occurring over drip trays in dedicated areas • Bunding is functional at stockpile site • No complaints received regarding noise disturbance or air quality • Concrete production management measures being implemented properly	Weekly / Supervision Engineer

Impact Area:	Management Measures:	Frequency / Responsibility
Construction works	• Erosion and sediment control devices are in place, are maintained and working effectively • Water run off management systems operating correctly • Complaints register being updated and complaints reported and responded to in a timely manner. • Majority of workforce are from the islands and the island community are satisfied with the processes.	

APPENDIX D: DEPARTMENT OF ENVIRONMENT SCOPING FORMS

	DEPARTMENT OF ENVIRONMENT **Scoping Form** **EIA Amendment Regulations 2017**	**Office Use Only** DAA ___/__ Date Received __/__/__ Amount Paid $

Send or deliver applications to the Department of Environment, Ministry of Foreign Affairs, Trade, Tourism, Environment & Labor, Government of Tuvalu, Private Mail Bag, Funafuti, TUVALU. For enquiries phone: (688) 20179 or email: env@gov.tv or buchtersn@gmail.com

Notification and Application for Development Approval

Per Section 6C of the Environmental Protection (Environmental Impact Assessment) Amendment Regulations 2017, the Department must undertake a scoping exercise where the screening process assesses a development activity either as a category A or B.

The outcome of EIA scoping is a set of Terms of Reference (TOR) that outline the required content, and provide advice on the format, of an EIA report. The TOR help proponents and consultants to prepare a quality EIA report with sufficient and relevant information, so that a project's environmental consequences can be adequately analyzed and understood.

Important note: This Tuvalu Department of Environment TOR shall be read in conjunction with the TOR of funding agencies and other bodies involved in this project. It does not take precedence over any other TOR and other identified environmental factors to be considered.

1. Section 1 – Project Details **Project Name: Tuvalu Coastal Adaptation Project- Funafuti** **Project Proponent (Developer) : TCAP**
2. Full Assessment:
This section applies if the development is deemed to require a Full EIA Assessment under Section 5 of the EIA Screening Template. This list forms the Terms of Reference to guide the Full EIA Assessment as requested by the Department.
TOR for Full EIA
- Description of the proposed development, including full description of construction duration and methodology
- Purpose and objectives of the project
- The precise location and boundaries of the proposal shown on a detailed map
- Detailed engineering plans and other relevant drawings of proposed project
- Summary of alternatives considered, including locations and methods, and the alternative of no action
- Summary of consultation undertaken (what Kaupule consultation/community meetings etc, number of attendees, and summary of discussions and findings). (see DOE consultation checklist)

- A description of existing environment including:
  - A description of the existing environment in the project area – i.e., vegetation communities, marine species and coral, with particular focus on endangered species and habitats
  - A description and modeling (if relevant) of current functions of lagoon and marine environment in the project area
  - Description of current and potential future use of adjacent properties
  - Summary of historic and cultural use of the project footprint

- Summary of proposed future projects in the vicinity of the project area
- Other appropriate studies, drawings and/or data

- Assessment of foreseeable environmental impacts, with particular focus on the following:
  - *Coastal Process, including full details on*
    - *Dredging (methodology, equipment, location, alternatives considered, best practice, cumulative effects from previous dredging programs, etc)*
    - *Effects of Sedimentation*
    - *Hard Shore Revetment*
    - *Modelling showing functions of lagoon in project area after reclamation*
  - *Marine Environment (vegetation, fish habitat, seagrass communities, coral habitat)*
  - *Vegetation Communities if clearance required for project staging area etc*
  - *Invasive species (koe Leafworm)*

- Consider long-term and short-term impacts, adverse and positive impacts, and primary and secondary consequences
- summary of their likelihood, significance and risk
- a consideration of cumulative environmental impacts (impacts that may occur in combination with other activities in the location)

Note: As discussed above, this list includes the environmental factors deemed important by the Tuvalu Dept of Environment. It is not an exclusive list and shall be read in conjunction with the TOR of funding agencies and other bodies involved in this project.

- Describe alternatives considered and measures proposed to take to mitigate or avoid identified adverse impacts.

- Assessment of foreseeable social impacts, including:
  employment opportunities; housing; utilities, public health and safety; cultural heritage and resources of cultural, archaeological or historical value; and gender inequalities including women employment.

  Particular focus on the following:

  - *Livelihood of the Community*
  - *Effects on all adjacent landowners*
  - *Changes to cultural area (Catalina Ramp)*

Describe alternatives considered and measures proposed to mitigate or avoid identified adverse impacts.

- Statement of all major conclusions, highlighting any unavoidable adverse environmental impacts, issues that are controversial and or that remain to be resolved

- A list of all persons who prepared the EIA, their qualifications

- Environmental Management Plan

Table showing potential environmental impacts and what mitigation measures proposed to be employed to minimize environmental effects