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Community

Communauté
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Geoscience, Energy and Maritime Division of SPC

Preliminary ESIA, Geotechnical Report, Coastal Hazard and Risk Assessment Tuvalu

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1 Introduction

The Tuvalu Coastal Adaptation Project (TCAP) is a 7-year climate change adaptation project with US\$36.0M financing from the Green Climate Fund (GCF) and US\$2.9M co-financing from the Government of Tuvalu (Government). The project is implemented by the United Nations Development Programme (UNDP) in partnership with the Government.

The project has three key outputs:

1. Strengthened institutions, human resources, awareness and knowledge for resilient coastal management.
2. Reduced vulnerability of key coastal infrastructure (including homes, schools and hospitals) to wave induced damages.
3. Establishment of a sustainable financing mechanism for long-term adaptation efforts.

Key component 2 involves the implementation of coastal protection measures on the islands of Funafuti, Nanumanga and Nanumea. An environmental and social impact assessment (ESIA) is required to support the development of coastal protection on these three islands. The Pacific Community (SPC) was engaged by UNDP to conduct the ESIA for these three islands, as well as the collection of additional scientific data on the islands of Nui, Niulakita, Niutao and Nukulaelae to assist with coastal vulnerability and hazard assessments. The selected islands where investigations were carried out is shown in Figure 1 and the activities carried out on each island is summarised in table 1.

2 Scope of Works

The scope of works was developed by SPC in conjunction with UNDP and comprised the following essential elements:

- Desktop review of existing information.
- Geotechnical investigations
- Oceanographic instrumentation
- Global Navigation Satellite Systems (GNSS) surveys
- Building asset surveys
- Multi-stakeholder consultations
- Preliminary terrestrial biological surveys

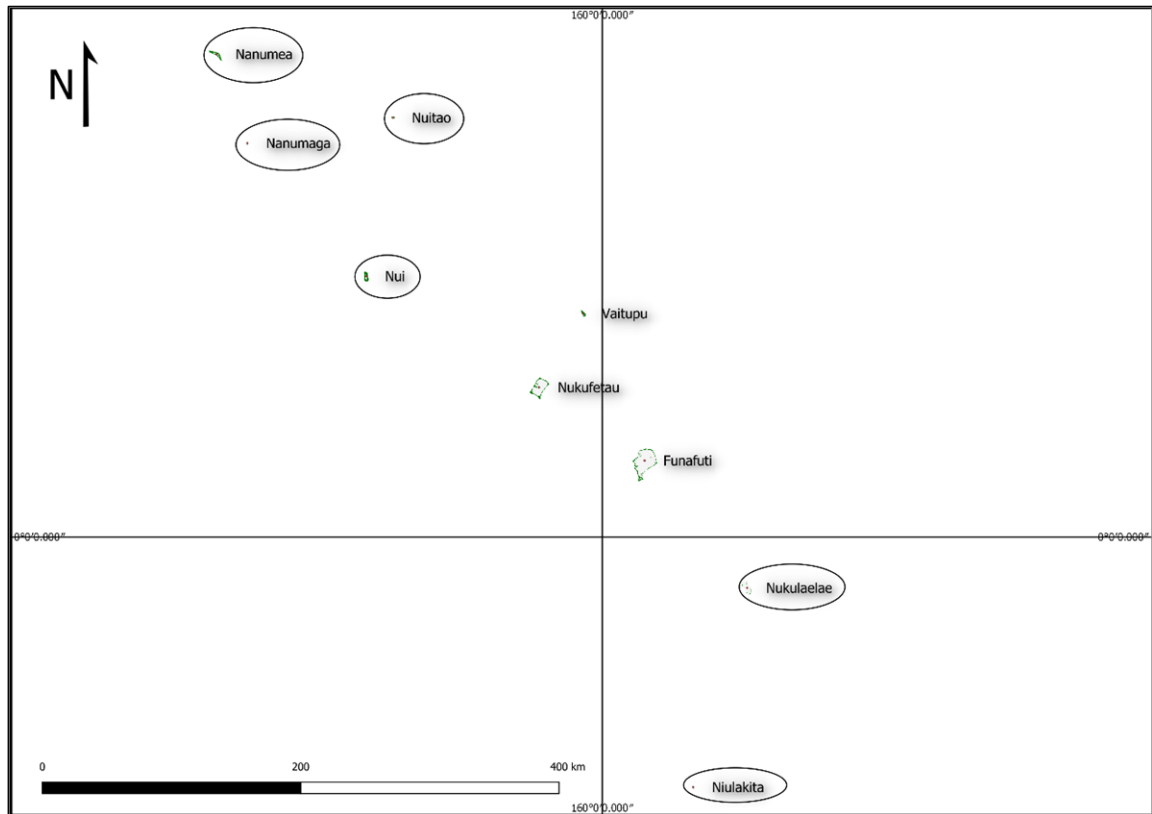


Figure 1: Showing the Islands which will be under investigation.

Table 1: Outline of activities carried out on each island

Activity	Funafuti	Nanumanga	Nanumea	Nui	Niulakita	Niutao	Nukulaelae
Desktop study	X	X	X	X	X	X	X
Geotechnical Investigation		X	X				
Oceanographic Instrumentation		X	X	X	X	X	X
GNSS Survey		X	X	X	X	X	X
Building Asset Survey		X	X	X	X	X	X
Multi-stakeholder consultations	X	X	X				
Preliminary terrestrial biological surveys		X	X				

This report is a factual record of the data collected during the investigations. Interpretation and analysis of the data will be documented by SPC in the ESIA and subsequent reports at a later date.

3 Scientific Investigations

The Geoscience, Energy and Maritime Division of SPC in collaboration with the Tuvalu lands department conducted scientific field investigations on six of island atolls during 22nd August to 20th October. Three teams of surveyors which consisted of both SPC staff and Tuvalu Lands Department conducted surveys for the six islands. Before any of the surveys were carried out, consultation with the Kaupules and also the community was conducted to receive permission and assistance from the islands governing body and locals.

3.1 Geotechnical Investigation

Geotechnical investigations were conducted by SPC on Nanumea Island from 30/08/2019 to 12/09/2019 and Nanumanga Island from 12/09/2019 to 25/09/2019. The investigations were led by Gary Lee (Geotechnical Officer-SPC) with support from Donato Roqica (Senior Geological Assistant-SPC), Viliame Momoivalu (Project Implementation Officer-SPC), Poate Degei (Advanced Technical Officer-SPC), Sapolu Tetoa (Department of Lands and Survey), Ane Talia (Department of Lands and Survey), Mataafa Olioliga (Nanumea Island Assistant) and Ligovasa Petelama (Nanumanga Island Assistant). The team would like acknowledge assistance and guidance provided by Faatasi Malologa (Director Lands and Survey), Kapule Nanumea, Kapule Nanumanga, Arthur Webb (UNDP), Alan Resture (UNDP), Puanita Ewekia (UNDP), and the communities of both Nanumea and Nanumanga.

The objective of the geotechnical investigations is to inform the proposed coastal protection works on Nanumea and Nanumanga, to enable appropriate consideration of geotechnical conditions and associated risks during the ESIA stage of the development process.

The scope of works was developed by SPC in conjunction with UNDP considering the project budget, timeframe and logistical constraints. The scope comprised the following essential elements:

- A desktop study of available information to establish the extent of existing data.
- A geotechnical walkover of the project site, including the location of the proposed coastal protection and potential local sources of construction aggregates.
- Participation in consultations with relevant stakeholders.
- Metal detector clearance of investigation locations prior to intrusive testing.
- Scala penetrometer testing.
- Hand auger testing and sample collection in unconsolidated sediments.
- Test pit excavations and sample collection in unconsolidated sediments.
- Rotary coring with a portable drill core and sample collection in rock.
- Particle size distribution testing on selected samples.
- Composition analysis of selected samples.
- Unmanned Aerial Vehicle (UAV) imagery collection of selected areas.

Investigation locations were selected following the geotechnical walkover and were located both along the alignment of the proposed coastal protection works, and in the areas identified as potential local sources of construction aggregates. A summary of the geotechnical investigation locations conducted on Nanumea and Nanumanga are presented in Tables 2 and 3 respectively, coordinates were recorded in WGS84 datum using a Garmin GPSmap 78s

handheld GPS. Site maps of the investigation locations are presented in the relevant appendices.

Table 2: Nanumea Island Geotechnical Investigation Summary

ID	Latitude	Longitude	Type of investigation completed
NME 1	5° 40.147'S	176° 6.628'E	Scala penetrometer, Hand auger
NME 2	5° 40.243'S	176° 6.656'E	Scala penetrometer, Hand auger
NME 3	5° 40.320'S	176° 6.717'E	Scala penetrometer, Hand auger
NME 4	5° 40.395'S	176° 6.796'E	Scala penetrometer, Hand auger
NME 5	5° 40.477'S	176° 6.867'E	Scala penetrometer, Hand auger
NME 6	5° 40.552'S	176° 6.926'E	Scala penetrometer, Hand auger
NME 6.2	5° 40.580'S	176° 6.910'E	Rotary coring
NME 7	5° 40.607'S	176° 7.014'E	Scala penetrometer, Hand auger
NME 8	5° 40.660'S	176° 7.068'E	Scala penetrometer, Hand auger
NME 9	5° 40.731'S	176° 7.139'E	Scala penetrometer, Hand auger
NME 9.2	5° 40.742'S	176° 7.130'E	Rotary coring
SD-NME 1	5° 42.078'S	176° 8.211'E	Scala penetrometer, Test pit
SD-NME 2	5° 42.030'S	176° 8.212'E	Scala penetrometer, Test pit
SD-NME 3	5° 41.990'S	176° 8.190'E	Scala penetrometer, Test pit
SD-NME 4	5° 41.949'S	176° 8.165'E	Scala penetrometer, Test pit
SD-NME 5	5° 41.905'S	176° 8.139'E	Scala penetrometer, Test pit
SD-NME 6	5° 41.851'S	176° 8.108'E	Scala penetrometer, Test pit

Table 3: Nanumanga Island Geotechnical Investigation Summary

ID	Latitude	Longitude	Type of investigation completed
NMG 1	6° 17.007'S	176° 18.929'E	Scala penetrometer, Hand auger
NMG 2	6° 17.052'S	176° 18.906'E	Scala penetrometer, Hand auger
NMG 3	6° 17.108'S	176° 18.883'E	Scala penetrometer, Hand auger
NMG 4	6° 17.157'S	176° 18.856'E	Scala penetrometer, Hand auger
NMG 4.2	6° 17.145'S	176° 18.833'E	Rotary coring
NMG 4.3	6° 17.163'S	176° 18.854'E	Scala penetrometer
NMG 5	6° 17.212'S	176° 18.839'E	Scala penetrometer, Hand auger
NMG 5.2	6° 17.205'S	176° 18.813'E	Rotary coring
NMG 6	6° 17.268'S	176° 18.832'E	Scala penetrometer, Hand auger
NMG 7	6° 17.314'S	176° 18.827'E	Scala penetrometer, Hand auger
NMG 8	6° 17.364'S	176° 18.824'E	Scala penetrometer, Hand auger
NMG 9	6° 17.406'S	176° 18.833'E	Scala penetrometer, Hand auger
NMG 10	6° 16.779'S	176° 19.248'E	Rotary coring
SD-NMG 1	6° 16.450'S	176° 19.299'E	Scala penetrometer, Test pit
SD-NMG 2	6° 16.450'S	176° 19.245'E	Scala penetrometer, Test pit
SD-NMG 3	6° 16.494'S	176° 19.199'E	Scala penetrometer, Test pit
SD-NMG 4	6° 16.531'S	176° 19.170'E	Scala penetrometer, Test pit
SD-NMG 5	6° 18.009'S	176° 19.190'E	Test pit
SD-NMG 6	6° 18.021'S	176° 19.200'E	Test pit
SD-NMG 7	6° 18.027'S	176° 19.184'E	Test pit

As a safety precaution prior to conducting intrusive testing, each investigation location was screened with a JW Fishers Pulse 8X metal detector which has a 6ft maximum detection range (see Figure 2). In particular the team was concerned about the potential risk of Unexploded

Ordinance (UXO) from WWII. The team did not encounter any UXO's while screening at the investigation sites however empty shells were observed on the surface within the vicinity of the project site on Nanumea.

Scala penetrometer testing was conducted using New Zealand standard equipment as outlined in the standard 'NZS 4402:1988. Test 6.5.2'. The Scala penetrometer test is commonly used to assess the strength of near surface soils, and was specifically designed for cohesionless sands and gravels, which is the material encountered on Nanumea and Nanumanga. Scala penetrometer testing was conducted at selected investigation locations prior to hand auger (or test pit) testing in order to determine the in-situ penetration resistance of the soil. The test was performed by driving a 20mm steel cone into the ground by dropping a 9kg weight a standard height of 0.51m and recording the number of drops required to drive the cone each 10cm increment into the ground (see Figure 3). The test was performed to a maximum depth of 5m below ground surface level.



Figure 2: Metal detector screening.



Figure 3: Scala penetrometer testing.

Hand auger testing using a 65mm diameter auger-bit was completed to collect soil samples to a maximum depth of 5m below ground surface level. Casing with a diameter of 80mm was advanced after each drill run to prevent the walls of the auger hole from collapsing and

contaminating the samples (see Figure 4). The recovered samples were logged according to the New Zealand Geotechnical Society Guidelines (NZGS) Field Description of Soil and Rock Guidelines (2005). Samples were placed in core boxes and photographed (see Figure 5). Upon completion of logging and photography, specific samples were selected for laboratory testing, and the remaining sample was placed back in the auger hole to rehabilitate the site to its original condition. The same methodology was applied to test pit excavations, which were performed using a shovel.



Figure 4: Hand auger and casing.



Figure 5: Example of hand auger sample placed in core box.

Rotary coring using a Shaw Portable Drill was conducted when rock was encountered (see Figure 6). 41mm diameter core was collected and logged according to the New Zealand Geotechnical Society Guidelines (NZGS) Field Description of Soil and Rock Guidelines (2005). Recovered core was stored in core boxes and all core was returned to Fiji for further analysis and storage at the SPC archive in Suva.



Figure 6: Rotary coring using the Shaw Portable Drill.

A Phantom 4 UAV was used by the team to capture photographs and videos of selected areas, particularly along the proposed alignment of the coastal protection and at sites identified as potential local sources of construction aggregates for the project.

A total of 54 samples (23 from Nanumea and 31 from Nanumanga) were collected from the hand augers and test pits for laboratory testing at the SPC laboratory in Suva, Fiji. Table 4 summarises the details of the samples. SPC will conduct particle size distribution testing and composition analysis on these samples, the results of this testing will be presented in a subsequent geotechnical report.

Table 4: Laboratory testing sample summary

Nanumanga		Nanumea	
ID	Depth (m)	ID	Depth (m)
NMG 1	0.5-1.0m	NME 1	0.0-0.4m
NMG 1	1.8-2.0m	NME 1	0.6-1.0m
NMG 1	3.0-3.1m	NME 1	1.5-1.8m
NMG 2	0.0-0.3m	NME 2	1.0-1.2m
NMG 2	0.7-1.2m	NME 2	2.4-2.8m
NMG 3	0.8-1.1m	NME 3	0.6-1.0m
NMG 3	3.2-3.5m	NME 3	2.4-2.8m
NMG 4	0.2-0.6m	NME 4	0.7-1.0m
NMG 4	1.3-1.5m	NME 4	3.0-3.3m
NMG 4	2.7-3.0m	NME 5	0.0-0.2m
NMG 5	1.3-1.6m	NME 6	0.0-0.2m
NMG 5	3.2-3.5m	NME 7	0.5-0.7m
NMG 6	0.0-0.4m	NME 7	0.8-1.1m
NMG 6	1.2-1.5m	NME 7	2.0-2.2m
NMG 6	4.8-5.0m	NME 7	3.0-3.3m
NMG 7	0.0-0.4m	NME 8	0.8-1.2m
NMG 7	1.2-1.5m	NME 9	0.6-0.9m
NMG 7	4.2-4.5m	SD-NME 1	0.0-0.2m
NMG 8	0.0-0.5m	SD-NME 2	0.0-0.2m
NMG 8	2.0-2.3m	SD-NME 3	0.3-0.5m
NMG 8	3.2-3.5m	SD-NME 4	0.2-0.4m
NMG 9	0.0-0.4m	SD-NME 5	0.0-0.2m
NMG 9	3.3-3.6m	SD-NME 6	0.3-0.5m
SD-NMG 1	0.0-0.4m		
SD-NMG 2	0.0-0.4m		
SD-NMG 3	0.0-0.4m		
SD-NMG 4	0.0-0.4m		
SD-NMG 5	0.0-0.2m		
SD-NMG 5	0.2-0.4m		
SD-NMG 5	0.4-0.6m		
SD-NMG 6	0.0-0.2m		

A detailed geotechnical report will be prepared by SPC at a later date as part of the ESIA report.

3.2 Oceanographic Instrumentation

Surface wave parameters and water elevation were measured in situ using Tide and Wave Recorders (TWR) RBRsolo³ D” pressure sensors. Three TWRs were deployed on the northern islands of Nanumea, Nanumaga, Nui and Niutao while only two were deployed on the southern islands of Niulakita and Nukulaelae. Reconnaissance surveys were carried to determine the most suitable area to deploy tide gauges while taking into consideration accessibility to the tide gauges, tidal information (time of high and low tides) and whether the area was safe for deployment. The TWR were left in the water for a minimum period of 35 days at depth ranges of 0-5m, 5-10m and >10m as seen in the examples of Figure 7,8 and 9. Depending on the boat schedule to the outer islands, the TWR may be left for a period longer than 35 days. Trimble controllers was used to record the locations of the TWR. Settings for the TWR, details of the instrumental operating parameters, deployment dates and locations are listed in the tables 5 and 6.



Figure 7: Example of TWR deployment on in depths 0-5m on reef flats



Figure 8: Example of TWR deployment in channel with depths between 5-10 meters.

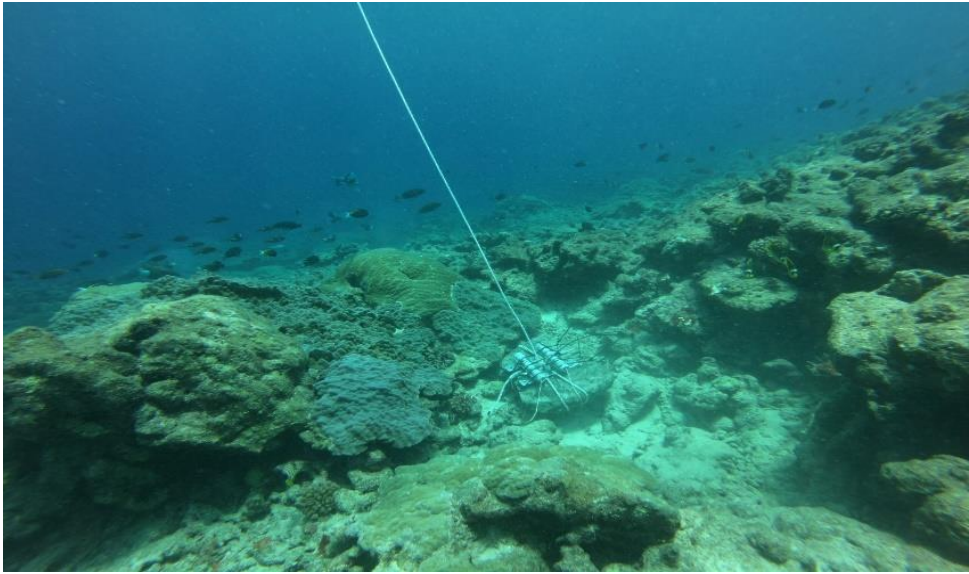


Figure 9: Example of TWR deployment in open sea with depths greater than 10 metres

Table 5: Instrument settings and Summary

Instrument	TWR
Description	Tide and wave recorder
Make	RBR
Model	RBRsolo D
Type	Pressure sensor
Digital recorder	Internal
Data recorded	Tides and waves
Sampling Intervals	2Hz
No. Samples/burst	2048 for waves
Averaging Interval(s)	120 for tides
Record Intervals	600 for tides and 10,800 for waves

Table 6: Summary of instrument deployment.

Island	Location	Serial No.	Longitude	Latitude	Depth (m)	Date of Deployment
Nanumanga	Open Ocean	41243	176°18'45.37"E	6°17'04.11"S	15	2nd Septemer,2019
Nanumanga	Mid Reef	41346	176°18'45.13"E	6°17'04.52"S	10	2nd Septemer,2019
Nanumanga	Reef Flat	41226	176°18'45.37"E	6°17'04.81"S	5	2nd Septemer,2019
Nanumea	Open Ocean	41312	176° 06'48.971" E	5° 40'44.851" S	15	2nd Septemer,2019
Nanumea	Channel	41311	176° 06'30.716" E	5° 40'07.937" S	10	2nd Septemer,2019
Nanumea	Reef Flat	41227	176° 06'59.622" E	5° 40'37.508" S	5	2nd Septemer,2019
Nui	Channel	41348	177° 8'31.88"E	7°14'44.28"S	15	26th September, 2019
Nui	Reef Flat	41350	177° 8'44.02"E	7°14'56.36"S	10	26th September, 2019
Nui	Open Ocean	41349	177° 8'34.32"E	7°15'3.68"S	5	26th September, 2019
Niutao	Open Ocean	41242	177°19'52.6"E	6°06'08.9"S	10	12th September,2019
Niutao	Open Ocean	41241	177°19'52.6"E	6°06'08.9"S	5	12th September,2019
Nukulaelae	Outside Reef	41237	179° 48.049' E	9° 22.254' S	15	20th September, 2019
Nukulaelae	Channel	41236	179° 48.208' E	9° 22.353' S	5	20th September, 2019
Niulakita	Open Ocean	41315	179°28'19.84"E	10°47'03.41"S	15	8th October, 2019
Niulakita	Reef Flat	41316	179° 28'11.75"E	10° 47'25.89"S	5	8th October, 2019

3.3 GNSS Survey

The pole to gauge calibration was carried out using a Trimble controller and two GNSS receivers. The survey was conducted for a duration of 25 hours to record a full tide cycle. This was carried out for all the islands except for Niulakita which was conducted for the duration of only 13 hours (half a tide cycle) due to lack of available resources. The Trimble controller was used to configure the two GNSS receivers to function separately as a base station and a rover. The first GNSS receiver was set up as a base station using a known Bench Mark (BM) and another GNSS receiver was set up on a boat adrift outside the reef. Figures of the equipment used and set up of each station is shown in Figure 10 and 11. Data collected from the pole to gauge calibration and the TWR will be used in wave model predictions.



Figure 10: Set up of a base station over a bench mark in Niulakita for GNSS observation.



Figure 11: GNSS receiver installed on fishing boat, ready for pole to gauge calibration

Topographic mapping was carried out using the Trimble controller and a GNSS receiver (See figure 13). Points of random points, major landmarks such as buildings and other land features were recorded and used to assess the accuracy of the LiDAR data that was supplied from Fugro.



Figure 12: Topographical survey on Reef Flat on the island of Niutao.

3.4 Building Asset Survey

Asset Surveys were also carried out using the Juno 3B series. Using a preloaded dictionary of assessed the building usage, building structures, type of materials used and other elements of the buildings were recorded. Most of the major infrastructures on the islands were recorded before recording makeshift buildings and huts. The building asset data collected with the pole to gauge calibration and TWR will be used to assess the hazards and risk assessment.

3.5 Multi-stakeholder Consultations (Kaupules, Falekaupules and communities)

The *Kaupule* of each *Falekaupule* which is established under Section 5(1) of the *Falekaupule Act (1997)* with six members who are elected as executive arm of the *Falekaupule* and performs all the functions conferred on the *Falekaupule*. The team comprising of SPC, UNDP and Tuvalu Department of Lands firstly met with Kaupules of each island as soon as arriving on the island to advice and consult members about the visiting team and its objective, the different works that will be carried out, casual workers (divers and geotechnical work) and also machineries (bikes, boats and tractors) that will be needed to carry out the baseline studies. Most importantly, the *Kaupule's* approval and blessing for the team to enter their land/ sea and carry out the works, dates of consultation was acquired and granted.



Figure 13 SPC and UNDP team's initial meeting with Kaupule of Nanumea Island



Figure 14 Presentation of scope of work for Tuvalu Coastal Adaptation (TCAP) to the Nanumea Island community

There was a community island consultation conducted in the evening for the two islands, Nanumea and Nanumaga but for Funafuti it was conducted in the morning. This was to allow

villages in their normal day to day chores in the daytime and prepare themselves to attend the meeting. There was a good representation of men, women and youth group present during the consultation. The presentation was conducted done by Punita Ewekia (UNDP) in the native Tuvalu dialect and questions and clarification was answered by the SPC team.

3.6 Summary of Issues Raised During the Community Consultation

1. Sand and its location

There was a comment on the location and volume of the sand (2500m³) that will be used in filling the geo-tech bags for the construction of the top berm barrier. The northern foreshore which had been forecasted to be the site for sand extraction is usually eroded by high waves and is not feasible to be used. There used to be a seawall on the same location which have all vanished. This has also increased salt water intrusion to the land. The sand which has accumulated in the last Tropical Cyclone have all migrated and return to the ocean. The TCA Project should find an alternative site for sand extraction and this should be from another island not Nanumaga.

GL mentioned that the initial proposal of extracting sand from the northern end of the island was because of the observations and findings in the initial trip. An alternative that can be done was to conduct a feasibility study to calculate the cost of transporting sand to Nanumaga, stockpile cost and barge to transport the sand.

VM mentioned that during the study in 2015 after TC Pam there was vast movement and accumulation of sand on the northern end of the island but it has been 4 years and the sand had migrated and lost to the ocean through natural process. All possible options to extract sand would be considered and the best suited for the project would be identified.

Lapana Ene highlighted that the idea to extract sand from the northern end of the island directly opposes the many coastal adaptation consultation and also the objective of the TCA Project. He questioned the cost for companies to transport sand to the island for the project.

2. Top Berm Barrier, sheet pile and seawall

There was question on the feasibility of the Top Berm Barrier. The 1.0m-2.0m height of the berm that is proposed will be sustainable to protect the shoreline and homes for instance. In the last TC Pam the waves were at a height taller than 1.0m.

VM replied that the team had deployed tide gauges on the reef flat and outside the reef as this will provide data on the heights of waves reaching the shoreline. This data will help in the final designs of the top berm barrier.

There were suggestion to construct seawall on areas where the Top Berm Barrier could not be constructed due to land restrictions. This will help continue the accessibility to the shore.

GL replied that the vertical sheet pile best suits the areas with restriction to land as it would help stabilise the whole area. In the past, seawall did not work properly on this areas as the last construction had failed a couple of time.

Another suggested to construct sheet pile around the island and no Top Berm Barrier.

VM mentioned that homes on the island has been constructed with a good distance from the shoreline. In constructing the sheet pile on the shoreline it stops waves from moving in and out of the shoreline eliminating the concept of a 'healthy shoreline'

3. Environmental Social Impact Assessment (ESIA)

There was a suggestion to explain more on the ESIA and what powers it has on development and projects.

VM explained that ESIA is a requirement for any development proposal that might have significant impacts to the surrounding environment. The physical environment (geology, topography, weather patterns, waves, rivers and sea), biological environment (plants, birds, fish and animals) and socially (human lives – health, education, food, livelihood). Every developing and developed countries have similar requirements under law for any development proposal. Identifying the impacts, management plans will be drawn up to minimise or eliminate this negative impacts.

4. Tetrapod

There was a comment that the best coastal protection for Nanumaga shorelines are the tetrapod as in the coasts of Maldives and Japan.

PE mentioned that tetrapod are stable and also very expensive to be mobilised. The budget for the proposed Nanumaga project is not enough for the construction of the tetrapods. The initial proposal that has been agreed on by the Green Climate Fund (GCF) and UNDP needs to be observed as there are monitoring mechanisms in place. The agreement will only change if UNDP drafts a new proposal and the proposal is endorsed by the GCF.

5. Buoy

Comment was raised by Lapana Ene, on the buoys he had observed on the outer reef. He had made plans to request a few young men to get the buoys in as they are not aware of the objective of the buoys.

VM apologised for not informing earlier on the deployment of the tide gauges in the earlier week. The tide gauges will provide data to show the heights and strengths of the waves. This shows the importance to conduct initial meeting with the 'Kaupules' inform them on the objectives and scope of work of the visiting team.

6. Budgets

Questioned the involvement of the SPC in the TCA Project in using funds and reducing the amount for the construction of the foreshore reclamation.

Puanita explained how the UNDP has established 3 different Outputs for TCA Project and the involvement of SPC follows these Outputs. She then clarified on the budgets on the different Outcomes, that the implementation period is 7 years with an estimated lifespan of 40 years and the importance of moving the funds around.

There was a comment on the budget for Outcome 2 comparing Funafuti's budget to that of Nanumea and Nanumaga being so high when it should be centred to the capital city. PE clarified on the budgets and the different works involved for the outer islands Nanumea and Nanumaga.

7. Cost Benefit Analysis

SK commented on the ESIA leading to 'Cost Benefit' identifying the positive and negative impacts and the request for project development being initially discussed by Arthur Web and it had political pressure to acquire from the donor. The decision and findings of the ESIA would also be donor driven.

PE explained that the ESIA study will need to meet the requirements of Ministry of Environment Tuvalu through its Environment Protection Act 2008 and also the safeguards for UNDP and Green Climate Fund.

8. QEP and process

There was a comment by the Funafuti community in the process leading up to the construction of Queen Elizabeth Park (QEP) as there were no consultation undertaken, no ESIA study and nothing from the Department of Environment.

PE apologized that during the construction of QEP it did follow the same procedures but since the proposed Funafuti reclamation is funded by GCF it will need to observe and meet all requirements by the government of Tuvalu and safeguards.

9. Funafuti Capacity Building

Comment was raised on the cost of a dredging machine and if TCA Project could purchase a dredging machine. At the same time provide trainings to the people of Funafuti to conduct ESIA's, surveyors and geologists.

PE explained that these professions needs specialised trainings and University certificates, diplomas and degrees.

10. Reclamation with a channel

There was a comment raised that the Kaupule had discussed in its initial consultation with Arthur Web (AW) for the possibility to construct a channel in between the existing foreshore and the newly reclaimed area. This is to allow accessibility, enjoyment and beach culture, rate of flow and strength of currents. That there is a need for a Cost Benefit Analysis for a project (a) with channel and (b) without a channel.

Another member disagreed with the idea of a channel as this would complicate the TCAP Funafuti reclamation proposal as the Funafuti community needed to trust the process and UNDP in providing the most suitable for the community. He added that there was only 2 main objectives and that is to (a) provide coastal protection and (b) land for expansion for Funafuti. It reached a decision in choosing which approach to be taken. There was a show of hands to project with a channel or without a channel. The result favoured a project without a channel as there were 24 hands raised with 6 opposing.

11. Lesson learnt

Comment raised on the designs of reclamation to be conducted where UNDP could use the newly constructed QEP for comparison and better improvements. Lesson learnt during the construction and implementation of QEP could be adopted in making decision for proposed Funafuti reclamation.

4 Conclusion

In conclusion, the Geoscience, Energy and Maritime Division of SPC conducted a variety of geophysical, geological and oceanographic investigations on the six islands between the dates 22 August and 20 October. This report provides an interim factual record of the data collected during the investigations and a subsequent interpretive report will be prepared by SPC at a later date.

APPENDIX 1: Nanumaga

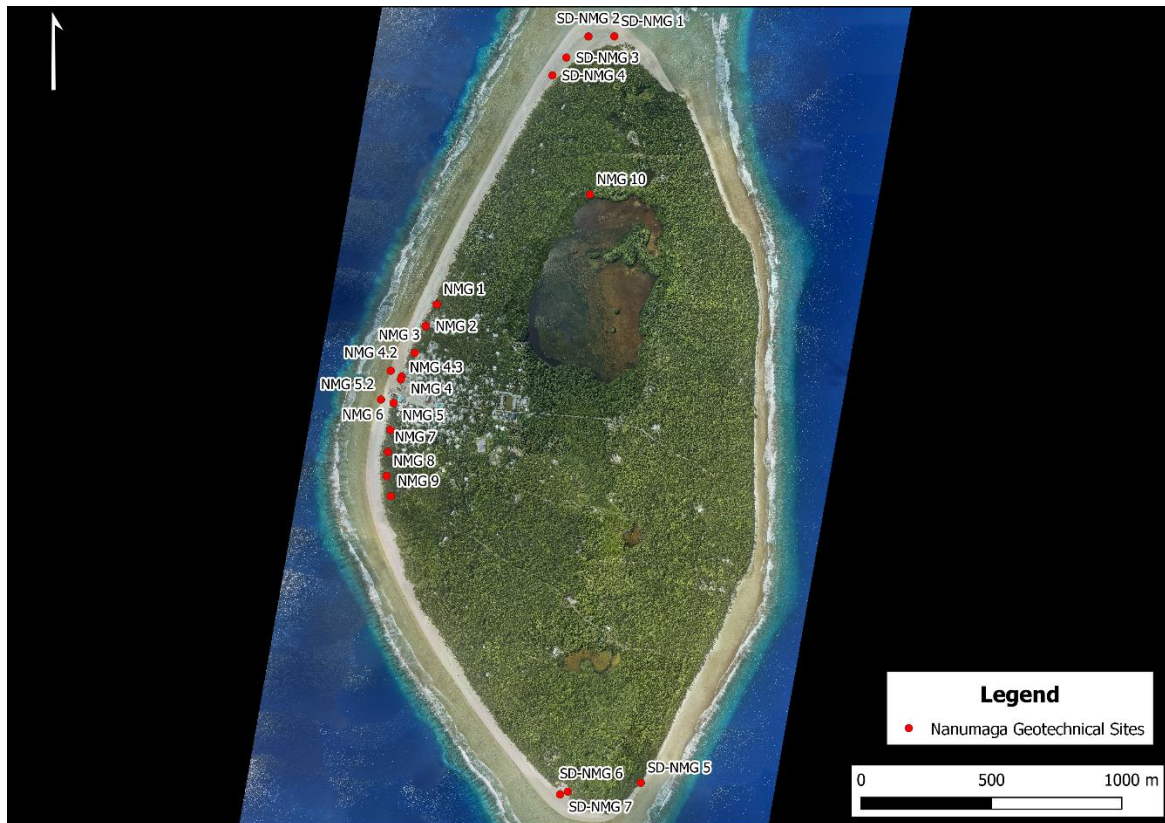


Figure 15: Sites where the geotechnical work was carried out on Nanumaga.



Figure 16: Deployment of RBR tide and wave recorders on Nanumaga.

APPENDIX 2: Nanumea

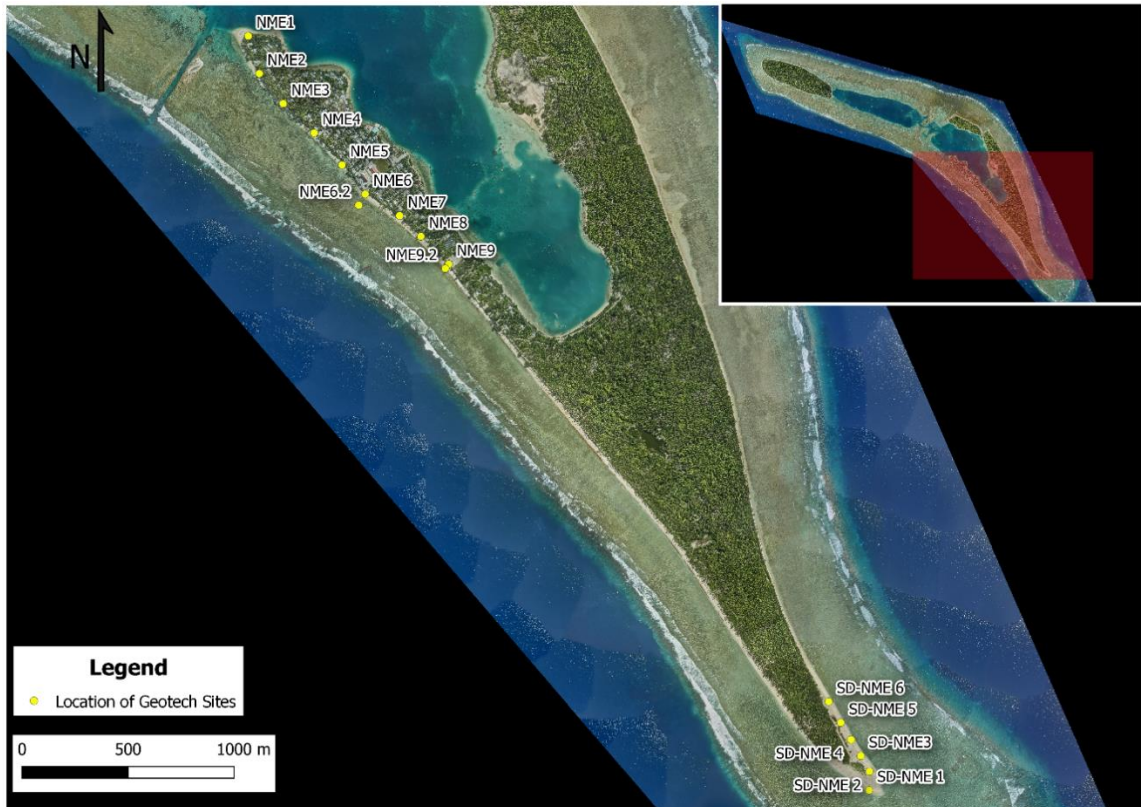


Figure 17: Geotechnical work carried out on the island of Nanumea



Figure 18: Deployment of the RBR tide and wave recorders on Nanumea.

APPENDIX 3: Nui

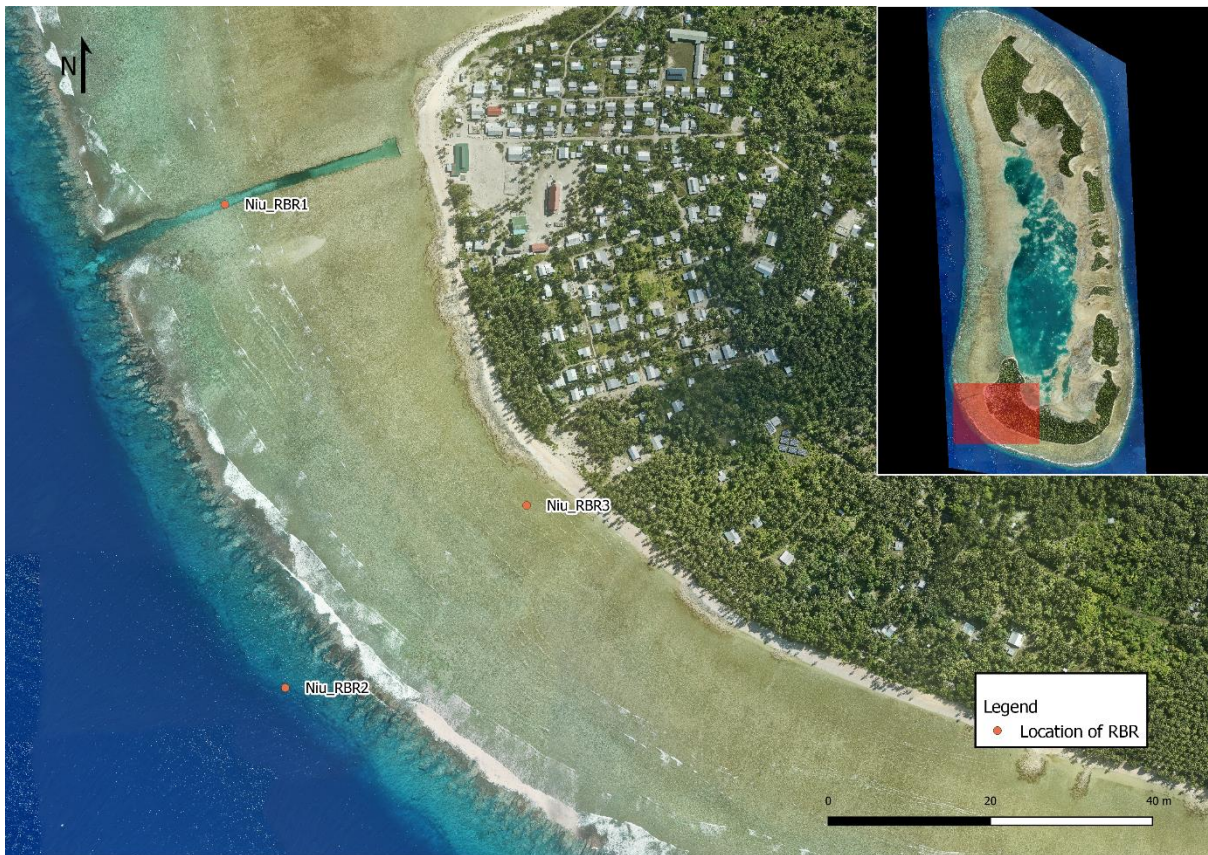


Figure 19: Deployment of the RBR tide and wave recorders Nui.

APPENDIX 4: Niutao



Figure 20: Deployment of the RBR tide and wave recorders on Niutao.

APPENDIX 5: Nukulaelae



Figure 21: Deployment of the RBR tide and wave recorders on Nukulaelae.

APPENDIX 6: Niulakita



Figure 22: Deployment of the RBR tide and wave recorders on Niulakita.

APPENDIX 7: Minutes of Meeting with the Kaupules of the Nanumea, Nanumaga and Funafuti



ESIA

TUVALU COASTAL ADAPTATION PROJECT (TCAP)

NANUMEA KAUPULE

30th August 2019

ATTENDANCE

- | | |
|------------------------------------|---------------------------------|
| a. Tofinga Paileta (Chief Kaupule) | e. Gary Lee (SPC) |
| b. Tekava Soke | f. Alan Resture (UNDP) |
| c. Esela Lopati | g. Puanita Taomia Ewekia (UNDP) |
| d. Toai Vevea | h. Viliame Momoivalu (SPC) |

MEETING AGENDA

1. PRAYER

A word of welcome, introduction of the members of the Nanumea Kaupule and prayer by the Chief Kaupule, Mr. Tofinga Paileta

2. INTRODUCTION

Mr. Alan Resture, (TCAP Project Manager) then introduced the team that was visiting Nanumea, which included 2 personnel from UNDP, five from SPC (Tomasi Sovea, Gary Lee, Donato Roqica, Poate Degei, Viliame Momoivalu) and 2 representative from the Lands Department Tuvalu (Sapolu Tetoa, Ane Tale)
UNDP/ GoT --> SPC

3. UNDP/ SPC

- VM introduced about the TCAP project in Nanumea (Berm and 'seabees')
- VM briefed about the UNDP/ SPC/ TDoL working arrangement, UNDP being the proponent/ administrator of the TCAP and has engaged SPC to carry out baseline investigation including the Geotechnical surveys, tide gauge deployments and consultations for the Environment Social Impact Assessment (ESIA) studies.
- Discussed the requirements of ESIA as stipulated in the Tuvalu Environment Protection Act 2008 and also safeguards for UNDP and Green Climate Fund. The different stages of ESIA namely Screening, Scoping, Terms of References, Review and Decision. Basically looking into the development proposal, and the existing environment (Biological, Physical and Social Environment) and the impacts both negative and positive the
- The teams' duration of stay at Nanumea was discussed.
- The need for two boats, captain, a diver to help the tide gauge team deployment team was discussed.
- The permission to enter the coast, sea and land were acquired. This also included the dates and venues for the consultation to the Nanumea community.

4. Gary Lee (Geologist, SPC)

- DCD 1000mm
- "Density of the ground"



- c. "Found action like"
- d. Hard coarse
 - Go through the sand
 - Brush cutter engine
 - 100:200m
- e. The need for a casual worker to assist the geotechnical team in which a University or high school dropout was preferred and tractor to help mobilise the machines from the demarcated points of survey was also discussed.
- f. He also mentioned about the Asset Survey Assessment and also the usage of a drone for capture of videos and photos

5. Puanita Ewekia (TCAP Communication, UNDP)

- a. Explained about the formulation of a Communication Strategy Plan. This plan will be based on the comments received during the Community Consultation. The plan will set the framework for communication amongst the villages, workers, Kaupules and TCAP UNDP.

6. Future Work

- a. VM briefed that there will be a follow up consultation later, when all the baseline works and requirements in the TOR completed. It will follow the same consultation in Nanumea, Nanumaga and in Funafuti to present the findings of the ESIA study and Environment Management Plans (EMP) that has been formulated to minimise the negative impacts if not eliminate it.

7. Approval

The *Pule Kaupule* thanked the UNDP/ SPC/ DoL Tuvalu team and the effort to have a meeting with them. They also thanked the team for clarifying more on the TCAP project. He said he represented all the *Kaupule* and people of Nanumea by granting approvals and blessings to the field work.

8. Prayer

Closing prayer to end the meeting was done by Toai Vevea

9. End of Meeting

Meeting proper ended with the payment of sitting allowance for the Kaupule at AUD \$80 per person and also the refreshments that was provided by the Kaupule.



ESIA

TUVALU COASTAL ADAPTATION PROJECT (TCAP)

NANUMAGA KAUPULE

13th September 2019

ATTENDANCE

- | | |
|------------------------------|---------------------------------|
| a. Lapana Ene (Pule Kaupule) | f. Gary Lee (SPC) |
| b. Paka Simona | g. Donato Roqica (SPC) |
| c. Petelama Puti | h. Puanita Taomia Ewekia (UNDP) |
| d. Petaia Polapola | i. Viliame Momoivalu (SPC) |
| e. Fealua Maea | |

MEETING AGENDA

1. PRAYER

A word of welcome, introduction of the members of the Nanumaga Kaupule and prayer by the *Pule Kaupule*, Mr. Lapana Ene

2. INTRODUCTION

Mrs. Puanita Ewekia (TCAP Communication Officer) then introduced the team that was visiting Nanumaga, which included 2 personnel from UNDP, three from SPC (Gary Lee, Donato Roqica, and Viliame Momoivalu)

3. UNDP/ SPC

- GL introduced the Geotechnical studies and how similar work conducted in Nanumea will also be done in Nanumaga. The geotechnical work will identify the different layers under the top layers and the stability of the land. The geotechnical work will be carried out on demarcated areas (100m or 150m apart) where the Berm is to be constructed.
- VM introduced about the TCAP project in Nanumea (Berm and thin sheets). He briefed about the UNDP/ SPC/ TDoL working arrangement, UNDP being the proponent/ administrator of the TCAP and has engaged SPC to carry out baseline investigation including the Geotechnical surveys, tide gauge deployments and consultations for the Environment Social Impact Assessment (ESIA) studies.
- Discussed the requirements of ESIA as stipulated in the Tuvalu Environment Protection Act 2008 and also safeguards for UNDP and Green Climate Fund. The different stages of ESIA namely Screening, Scoping, Terms of References, Review and Decision. Basically looking into the development proposal, and the existing environment (Biological, Physical and Social Environment) and the impacts both negative and positive the
- The teams' duration of stay at Nanumaga was discussed.
- Apologized on behalf of the SPC personnel and three from the Department of Lands Tuvalu that were in Nanumaga Island in the last 2 weeks deploying tide gauges offshore.
- The permission to enter the coast, sea and land were acquired. This also included the dates and venues for the consultation to the Nanumaga community.



4. Gary Lee (Geologist, SPC)

- a. GL discussed the need for a casual worker to assist the geotechnical team in which a University or high school dropout was preferred and also the hiring of a tractor to help mobilise the machines from the demarcated points of survey was also discussed.
- b. He also mentioned about the Asset Survey Assessment and also the usage of a drone for capture of videos and photos

5. Puanita Ewekia (TCAP Communication, UNDP)

- a. Explained about the formulation of a Communication Strategy Plan. This plan will be based on the comments received during the Community Consultation. The plan will set the framework for communication amongst the villages, workers, Kaupules and TCAP UNDP.

6. Future Work

- a. VM briefed that there will be a follow up consultation later, when all the baseline works and requirements in the TOR completed. It will follow the same consultation in Nanumea, Nanumaga and in Funafuti to present the findings of the ESIA study and Environment Management Plans (EMP) that has been formulated to minimise the negative impacts if not eliminate it.

7. Sand Pit

GL had questioned if like Nanumea, does the Kaupule have by-laws in regards to extraction of sand from within the island. He mentioned the importance of sand as it will be used to fill up geotechnical bags that will be used to construct the Berm Top Barriers.

In response, the Secretary for Fale Kaupule mentioned that for large scale project there is prohibition of extraction of sand within the island and the need to import sand as in the case of the Solar project.

8. Approval

The *Pule Kaupule* thanked the UNDP/ SPC Tteam and the effort to have a meeting with them. They also thanked the team for clarifying more on the TCAP project. He said he represented all the *Kaupule* and people of Nanumaga by granting approvals and blessings to the field work.

9. Prayer

Closing prayer to end the meeting was done by Paka Simona

10. End of Meeting

Meeting proper ended with the payment of sitting allowance for the Kaupule at AUD \$80 per person and also the refreshments that was provided by the Kaupule.



ESIA

TUVALU COASTAL ADAPTATION PROJECT (TCAP)

FUNAFUTI KAUPULE

3rd October 2019

ATTENDANCE

- | | |
|--------------------------------------|--|
| a. <u>Siliga Kofe (Pule Kaupule)</u> | e. <u>Penehuro Hauma</u> |
| b. <u>Karl Tili</u> | h. <u>Puanita Taomia Ewekia (UNDP)</u> |
| c. <u>Semi Vine</u> | i. <u>Viliame Momoivalu (SPC)</u> |
| d. <u>Vagauna Penileta</u> | |

MEETING AGENDA

1. PRAYER

A word of welcome, introduction of the members of the Nanumaga Kaupule and prayer by the *Kaupule*, Mr. Karl Tili.

2. INTRODUCTION

Mrs. Puanita Ewekia (UNDP TCAP Communication Officer) then introduced both herself and VM (SPC). She briefly spoke on the TCA Project and the involvement of SPC in carrying out field surveys in the outer islands Nanumea and Nanumaga in the last 4 weeks.

3. UNDP/ SPC

- VM introduced about the TCAP projects in Nanumea (Berm and 'Seabees'), Nanumaga (Berm and thin sheets). He briefly explained about the UNDP/ SPC/ TDOL working arrangement, UNDP being the proponent/ administrator of the TCAP and has engaged SPC to carry out baseline investigation including the Geotechnical surveys, tide gauge deployments and consultations for the Environment Social Impact Assessment (ESIA) studies that will conducted for the TCA Project.
- Discussed the requirements of ESIA as stipulated in the Tuvalu Environment Protection Act 2008 by the Department of Environment Tuvalu and also safeguards for UNDP and Green Climate Fund. The different stages of ESIA namely Screening, Scoping, Terms of References, Review and Decision. The ESIA study explains the development proposal, and the existing environment (Biological, Physical and Social Environment) and the impacts both negative and positive the development proposal will have.
- As for the Funafuti reclamation project the main objective of the team is the dissemination of the project to all the Funafuti community especially those residing on the adjacent shoreline of the proposed project site. At the same time record comments from the communities.
- The permission to enter the coast, sea and land were acquired for future works was acquired. The dates and venues for the consultation to the Funafuti community was discussed.



4. Channel for Funafuti Reclamation

- a. SK gave his blessings and permission for SPC to carry on with its work on the Funafuti reclamation project. He mentioned that the Funafuti community are delighted about the project because of the benefits of more land space and protection it brings to the community and can't wait to see it materialise.
- b. He also mentioned that he had earlier proposed to the UNDP TCAP for the inclusion of a channel to be constructed between the existing foreshore and the new reclamation site. This will also be a topic to be discussed during the consultation.

5. Puanita Ewekia (TCAP Communication, UNDP)

- a. Explained about the formulation of a Communication Strategy Plan. This plan will be based on the comments received during the Community Consultation. The plan will set the framework for communication amongst the villages, workers, Kaupules and TCAP UNDP.

6. Future Work

- a. VM briefed that there will be a follow up consultation later, when all the baseline works and requirements in the TOR completed. It will follow the same consultation in Nanumea, Nanumaga and in Funafuti to present the findings of the ESIA study and Environment Management Plans (EMP) that has been formulated to minimise the negative impacts if not eliminate it.

7. Approval

The *Pule Kaupule* thanked the UNDP/ SPC Team and the effort to have a meeting with them. They also thanked the team for clarifying more on the TCAP project. He said he represented all the *Kaupule* and people of Nanumaga by granting approvals and blessings to the field work.

8. Prayer

Closing prayer to end the meeting was done by Karl Tiji

9. End of Meeting

Meeting proper ended with the payment of sitting allowance for the Kaupule at AUD \$80 per person and also the refreshments that was provided by the Kaupule.

APPENDIX 8: Minutes of Community Consultation for Nanumea, Nanumaga and Funafuti



TUVALU COASTAL ADAPTATION PROJECT (TCAP) NANUMAGA COMMUNITY CONSULTATION 17th SEPTEMBER 2019

ATTENDANCE

Name	Occupation	Name	Occupation
1. Takepa	Uni puke fema	19. <u>Taulaga</u>	<u>Kalava</u>
2. Seti	Hui Tupu	20. Luka	Talafai
3. Sosene	Matai Secretary	21. <u>Lotelika lousi</u>	CHC Nanumaga
4. Sefutewi	Secretary	22. Tony	Talafai
5. Apatamu	Mouhala	23. <u>Leka</u>	Poiteloto
6. Apeui	Molua	24. Taulele	Talafai
7. Apipa	Matai	25. Kitahi	Poiteloto
8. Uoka	Matai	26. <u>Alielu</u>	Poiteloto
9. Maluga Pelosa	Police	27. Tausi	Talafai
10. Olapa Maluga	Kalava	28. Kima	Fafafine
11. Asueni	Matai	29. Luani	Fafafine
12. Liliame	Head Teacher	30. Kemila	Pafine
13. Petelama	Kaupule	31. Meleseini Alesana	Falekaupule Clerk
14. Liufau L	M	32. Rasita Isopo	Fafine
15. Lita	Community Worker	33. Gary Lee	SPC
16. Uini	Kalava	34. Lutelu F	Masomahi
17. Iemueli	Mouhala	35. Lapana Ena	Pule Kaupule
18. Pousima	Kalava		

MEETING AGENDA

1. WELCOME & PRAYER

A word of welcome to the members of the meeting, and briefly introducing the TCAP UNDP staff (Puanita Ewekia) and SPC representative (Viliame Momoivalu, Gary Lee, Donato Roqica) by Mr. Lapana Ene. He then prayed and committed to the meeting and food to our Heavenly Father.

2. INTRODUCTION

Mrs. Puanita Ewekia (UNDP TCAP Communication Officer) then introduced both herself and VM (SPC). She briefly spoke on the TCA Project and the involvement of SPC in carrying out field surveys in the outer islands Nanumea and Nanumaga in the last 4 weeks. She then presented in Tuvaluan on the scope of work for TCAP Funafuti reclamation and Environmental Social Impact Assessment (ESIA).



3. QUESTIONS AND COMMENTS

3.1 Sand and its location

There was a comment on the location and volume of the sand (2500m³) that will be used in filling the geo-tech bags for the construction of the top berm barrier. The northern foreshore which had been forecasted to be the site for sand extraction is usually eroded by high waves and is not feasible to be used. There used to be a seawall on the same location which have all vanished. This has also increased salt water intrusion to the land. The sand which has accumulated in the last Tropical Cyclone have all migrated and return to the ocean. The TCA Project should find an alternative site for sand extraction and this should be from another island not Nanumaga.

GL mentioned that the initial proposal of extracting sand from the northern end of the island was because of the observations and findings in the initial trip. An alternative that can be done was to conduct a feasibility study to calculate the cost of transporting sand to Nanumaga, stockpile cost and barge to transport the sand.

VM mentioned that during the study in 2015 after TC Pam there was vast movement and accumulation of sand on the northern end of the island but it has been 4 years and the sand had migrated and lost to the ocean through natural process. All possible options to extract sand would be considered and the best suited for the project would be identified.

Lapana Ene highlighted that the idea to extract sand from the northern end of the island directly opposes the many coastal adaptation consultation and also the objective of the TCA Project. He questioned the cost for companies to transport sand to the island for the project.

3.2 Top Berm Barrier, sheet pile and seawall

There was question on the feasibility of the Top Berm Barrier. The 1.0m-2.0m height of the berm that is proposed will be sustainable to protect the shoreline and homes for instance. In the last TC Pam the waves were at a height taller than 1.0m.

VM replied that the team had deployed tide gauges on the reef flat and outside the reef as this will provide data on the heights of waves reaching the shoreline. This data will help in the final designs of the top berm barrier.

There were suggestion to construct seawall on areas where the Top Berm Barrier could not be constructed due to land restrictions. This will help continue the accessibility to the shore. GL replied that the vertical sheet pile best suits the areas with restriction to land as it would help stabilise the whole area. In the past, seawall did not work properly on this areas as the last construction had failed a couple of time.

Another suggested to construct sheet pile around the island and no Top Berm Barrier. VM mentioned that homes on the island has been constructed with a good distance from the shoreline. In constructing the sheet pile on the shoreline it stops waves from moving in and out of the shoreline eliminating the concept of a 'healthy shoreline'



3.4 Environmental Social Impact Assessment (ESIA)

There was a suggestion to explain more on the ESIA and what powers it has on development and projects. VM explained that ESIA is a requirement for any development proposal that might have significant impacts to the surrounding environment. The physical environment (geology, topography, weather patterns, waves, rivers and sea), biological environment (plants, birds, fish and animals) and socially (human lives – health, education, food, livelihood). Every developing and developed countries have similar requirements under law for any development proposal. Identifying the impacts, management plans will be drawn up to minimise or eliminate this negative impacts.

3.5 Tetrapods

There was a comment that the best coastal protection for Nanumaga shorelines are the tetrapods as in the coasts of Maldives and Japan. PE mentioned that tetrapods are stable and also very expensive to be mobilised. The budget for the proposed Nanumaga project is not enough for the construction of the tetrapods. The initial proposal that has been agreed on by the Green Climate Fund (GCF) and UNDP needs to be observed as there are monitoring mechanisms in place. The agreement will only change if UNDP drafts a new proposal and the proposal is endorsed by the GCF.

3.6 Buoy

Comment was raised by Lapanā Eng, on the buoys he had observed on the outer reef. He had made plans to request a few young men to get the buoys in as they are not aware of the objective of the buoys.

VM apologised for not informing earlier on the deployment of the tide gauges in the earlier week. The tide gauges will provide data to show the heights and strengths of the waves. The tide gauges had been deployed a week before the consultation with the Nanumea Kaupule and the Nanumea Community consultation.

4. Conclusion and End of Meeting

The meeting proper ended with a word of thanks by PE to the organisers in allowing UNDP and SPC to present about the TCA project. There will be another consultation when the ESIA report is completed.

**TUVALU COASTAL ADAPTATION PROJECT (TCAP)
FUNAFUTI COMMUNITY CONSULTATION
8th OCTOBER 2019**

ATTENDANCE

1. Alefaio Elia Tavita	19. Ueese Malia O'Brien	37. Meieme Tuafafa Laatasi
2. Ane Siliga Kofe	20. Vaega Andrew Ionatana	38. Mesako Usufono
3. Apete Teagi	21. Vaimoe Siaso Finiki	39. Mose Panapa Isaia
4. Elisala Teitimani Loisio	22. Mitiana Aisake Epati	40. Pele Luni Penileta
5. Elisala Setema Talesi	23. Taualo Penivao	41. Pulafagu Toafa
6. Iosua Peniata Tui	24. Faga Patala	42. Sekau Puava Lalua
7. Liveti Toma	25. Anitelea Semeli Manase	43. Tavale Tomasi Tamatoa
8. Laisa Kaiiau Niu	26. Fagauta Falaima Natano	44. Tealuga Teava Saulo
9. Lasalo Uluao Lauti	27. Faleonofia Siloua Ave	45. Uale Mataio
10. Lutelu Tepupu Ikinifo	28. Fepuali Lita Fepuali	46. Aoga Kofe
11. Magaia Suka Taupale	29. Futi Teakafili	47. Asenafi Moaga
12. Malia Teleke Teagai	30. Iopu Kaitu Nokisi	48. Tepua Teagai
13. Mika Viliamu	31. Kaitu Rev Teleke P Lauti	49. Kalepou Tili
14. Peniasi T	32. Satalaka Misilusi	50. Taufailima
15. Penitala Siose P Teo	33. Lasela Senitetela Taulamati	51. John Teikafili
16. Simeona Mate	34. Lui Liki Kafolau	52. Tinivaili Tambu
17. Tanei Vagauna P	35. Maimoaga Leupena	53. Nia Faleula
18. Teasi Sakalia Ianuali	36. Maseiga Tumua Laatasi	54. Safoe Seanoa Opeta

MEETING AGENDA**1. WELCOME & PRAYER**

A word of welcome to the members of the meeting, and briefly introducing the TCAP UNDP staff (Puanita Ewekia) and SPC representative (Viliame Momoivalu) by Mr. Siliga Kofe. He later prayed and committed the meeting to our Heavenly Father.

2. INTRODUCTION

Mrs. Puanita Ewekia (UNDP TCAP Communication Officer) then introduced both herself and VM (SPC). She briefly spoke on the TCA Project and the involvement of SPC in carrying out field surveys in the outer islands Nanumea and Nanumaga in the last 4 weeks. She then presented in Tuvaluan on the scope of work for TCAP Funafuti reclamation and Environmental Social Impact Assessment (ESIA).

3. QUESTIONS AND COMMENTS*3.1 Budgets*

Questioned the involvement of the SPC in the TCA Project in using funds and reducing the amount for the construction of the foreshore reclamation. Puanita explained how the UNDP has established 3 different Outputs for TCA Project and the involvement of SPC follows these Outputs. She then clarified on the budgets on the different Outcomes, that



the implementation period is 7 years with an estimated lifespan of 40 years and the importance of moving the funds around.

- 3.2 There was a comment on the budget for Outcome 2 comparing Funafuti's budget to that of Nanumea and Nanumaga being so high when it should be centred to the capital city. PE clarified on the budgets and the different works involved for the outer islands Nanumea and Nanumaga.

3.3 *Environment Social Impact Assessment (ESIA)*

A comment raised on ESIA comparing Funafuti reclamation to that of Nanumea and Nanumaga proposed coastal adaptation of top berm barrier. PE explained that for ESIA for the proposed Funafuti reclamation will require more work compared to the top berm barrier for the outer islands simply because the significant impacts involved in foreshore reclamation. She also explained that there will be another consultation to present the findings of the ESIA study to the Funafuti community as part of the review process.

Comment on providing the whole sum of the budget to the committee. PE explained the process that needs to be observed when acquiring funds from Green Climate Fund and agreements to the initial proposals of the projects which include the use of the budgets which cannot be altered unless UNDP amends the proposal and is endorsed GCF. The breakdown of 36M and 2.9M totalling to 38.9M.

3.4 *Cost Benefit Analysis*

SK commented on the ESIA leading to 'Cost Benefit' identifying the positive and negative impacts and the request for project development being initially discussed by Arthur Web and it had political pressure to acquire from the donor. The decision and findings of the ESIA would also be donor driven. PE explained that the ESIA study will need to meet the requirements of Ministry of Environment Tuvalu through its *Environment Protection Act 2008* and also the safeguards for UNDP and Green Climate Fund.

3.5 *QEP and process*

There was a comment by the Funafuti community in the process leading up to the construction of Queen Elizabeth Park (QEP) as there were no consultation undertaken, no ESIA study and nothing from the Department of Environment. PE apologized that during the construction of QEP it did follow the same procedures but since the proposed Funafuti reclamation is funded by GCF it will need to observe and meet all requirements by the government of Tuvalu and safeguards.

3.6 *Funafuti Capacity Building*

Comment was raised on the cost of a dredging machine and if TCA Project could purchase a dredging machine. At the same time provide trainings to the people of Funafuti to conduct ESIA's, surveyors and geologists. PE explained that these professions needs specialised trainings and University certificates, diplomas and degrees.



3.7 Reclamation with a channel

There was a comment raised that the Kaupule had discussed in its initial consultation with Arthur Web (AW) for the possibility to construct a channel in between the existing foreshore and the newly reclaimed area. This is to allow accessibility, enjoyment and beach culture, rate of flow and strength of currents. That there is a need for a Cost Benefit Analysis for a project (a) with channel and (b) without a channel.

Another disagreed with the idea of a channel as this would complicate the TCAP Funafuti reclamation proposal as the Funafuti community needed to trust the process and UNDP in providing the most suitable for the community. He added that there was only 2 main objectives and that is to (a) provide coastal protection and (b) land for expansion for Funafuti. It reached a decision in choosing which approach to be taken. There was a show of hands to project with a channel or without a channel. The result favoured a project without a channel as there were 24 hands raised with 6 opposing.

3.8 Lesson learnt

Comment raised on the designs of reclamation to be conducted where UNDP could use the newly constructed QEP for comparison and better improvements.

4 Conclusion and End of Meeting

The meeting proper ended with a word of thanks by PE to the organisers in allowing UNDP and SPC to present about the TCA project and there will be another consultation when the ESIA report is completed. There was a prayer for meeting and also for the food and spread that had been provided for the meeting.