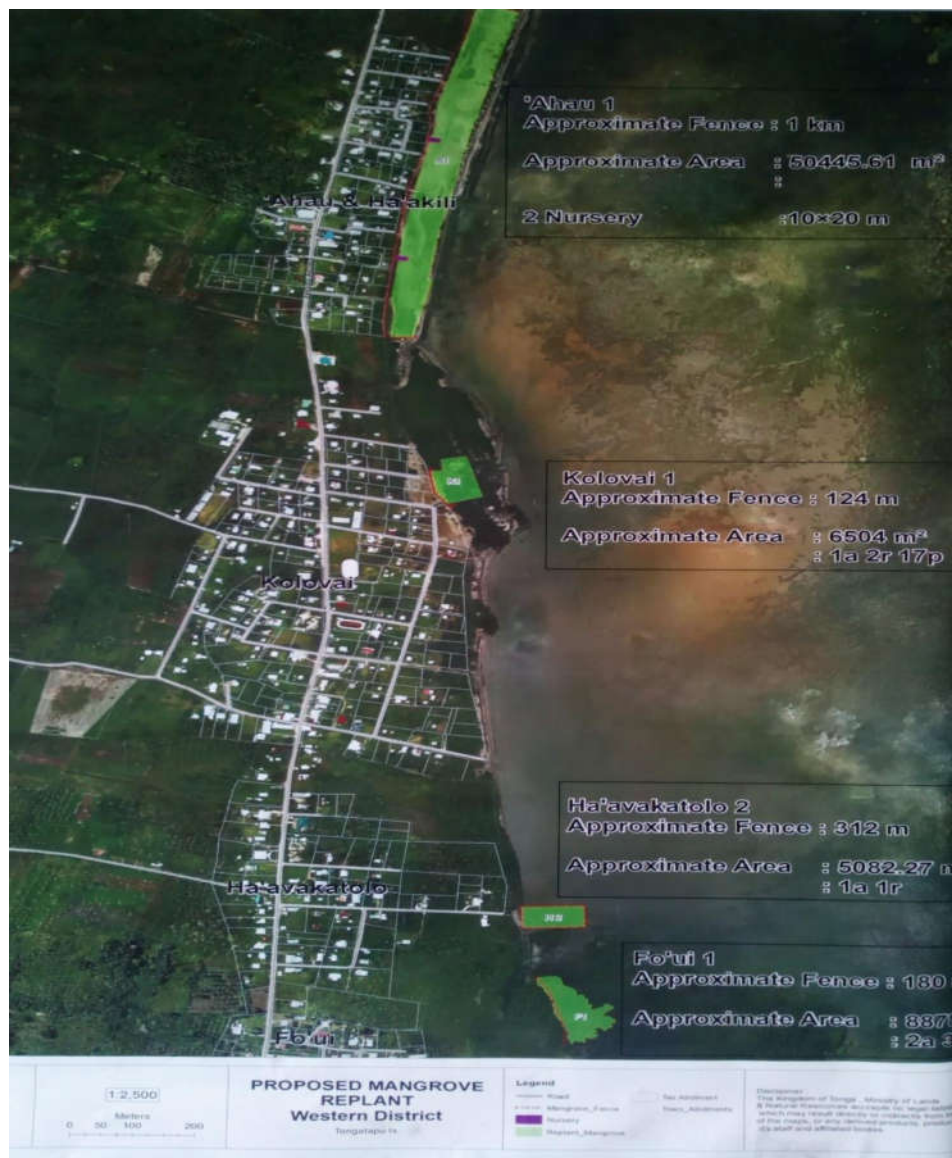




Mangrove Replanting Plan for Hihifo District – Fo'ui, Ha'avakatolo, Kolovai and A'hau – November 2017



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1. SUMMARY

The GIZ ACSE Coastal Protection Trial project that currently implemented in Western Tongatapu is aimed at increasing the resilience of six coastal communities to the impacts of climate change and to ensure sustainable livelihoods of these communities. Component four (4) of the project focuses on Mangrove rehabilitation – one of the most considerable options for fragile island ecosystems like Tonga.

This assignment is tasked with developing a Mangrove Replanting Plan (MRP) for Fo’ui, Ha’avakatolo, Kolovai and ‘Ahau. Community consultations with these communities have been ongoing although there are activities that still under discussion such as fencing of these sites, selecting and replanting of right species and monitoring through sound management in collaboration with key stakeholders such as the Hihifo Coastal Committee, implementing agencies and communities.

It is anticipated that by the end of the project the “Green Buffer Zone” is fully established and added another 7 hectares of mangrove and coastal forest to the existing biodiversity stock in these coastal communities. These swathes of forests and coastal vegetation will ensure not such coastal protection but also food security to over 2,368 people living in these areas.

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3.0 BACKGROUND

Residents of the 6 low lying villages namely Fo'ui, Ha'avakatolo, Kolovai, 'Ahau, Kanokupolu and Ha'atafu in the western side of Tongatapu or the Hihifo District, have for several decades experienced coastal flooding. This is manifested in the fact that the topographic elevation of frontages of these coastal villages (excluding Ha'atafu which rises to an elevation of circa 15m to the north) are less than 2m above the mean sea level. The coastal flooding issues are linked to a combination of climate change related factors (such as storm surge events) in tandem with inappropriate anthropogenic related interventions including poor seawall design, sand mining and land development.

The EU GIZ funded ACSE Project particularly the Coastal Protection Trials in western Tongatapu have had approved a series of innovative ecosystem based adaptation (EbA) coastal protection trial measures that will benefit the people of the 6 pilot villages (Fo'ui, Ha'avakatolo, Kolovai, 'Ahau, Kanokupolu, Ha'atafu). These trial measures have been consulted upon with local communities in an attempt to address the problem of coastal inundation in a sustainable and cost effective manner and are framed within an innovative "Green Buffer Coastal Flood and Erosion Risk Management Strategy" which is hereby being promoted for the whole Hihifo District. This Strategy shall include a series of supporting engineering intervention techniques including the construction of low cost bamboo groynes and breakwaters, creation of new mangrove nursery areas and the construction of secondary defence structures composed of sand bag structures. The interventions are to be phased based on prioritised need, with the frontages at Kolovai and Ahau proposed as the key engineering trial areas for immediate action.

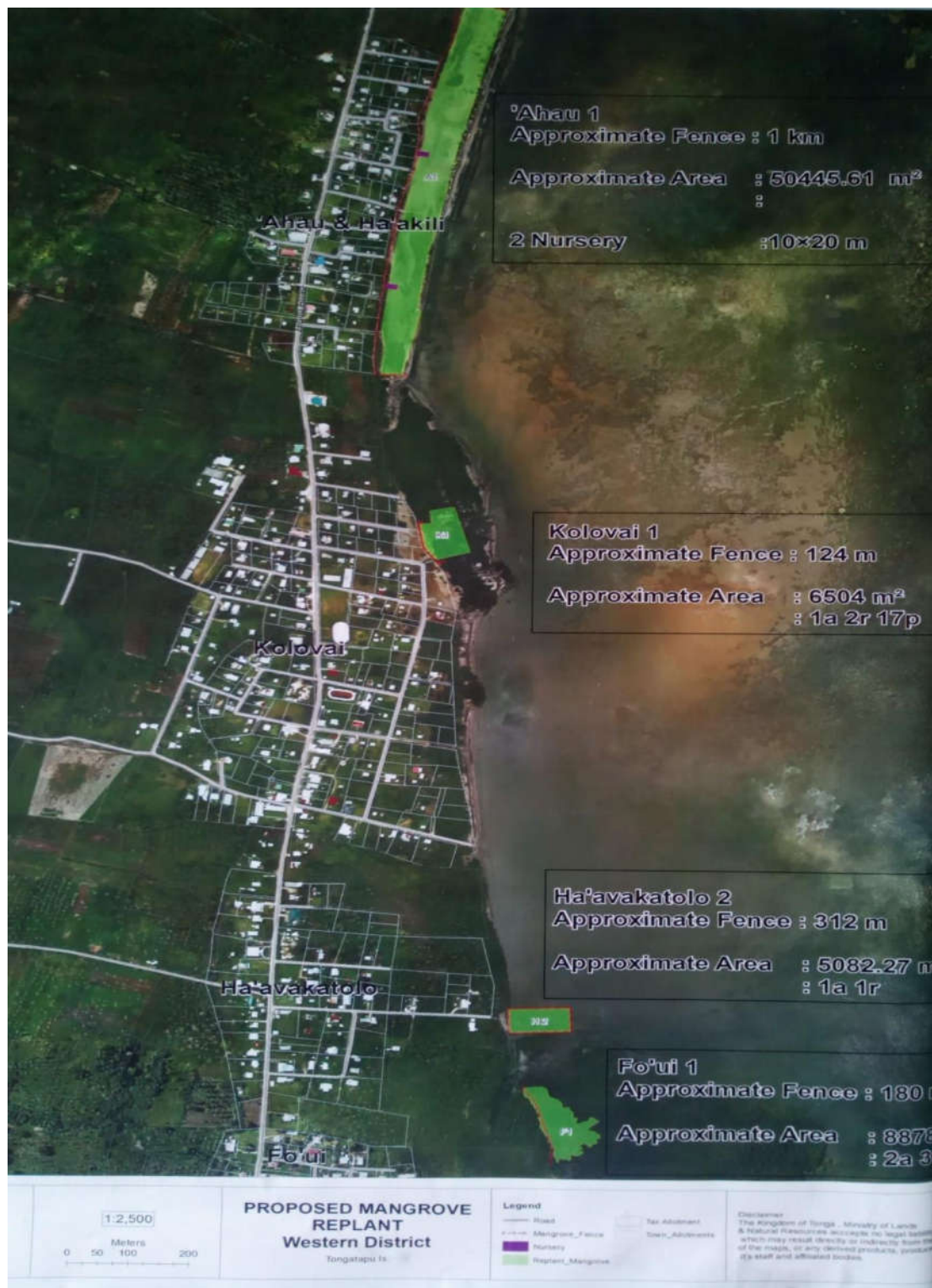
The "Green Buffer" strategy being pursued represents a real climate change adaptation set of measures that could (depending on monitoring results) prove to be cost effective and replicable to many parts of Tonga in the coming years

3.1 Demographic history of these sites is as followed:

Community	2006		2011		2016	
	Households	Population	Households	Population	Households	Population
Fo'ui	84	584	93	572	106	657
Ha'avakatolo	44	235	44	259	40	195
Kolovai	124	607	121	607	118	618
'Ahau	57	367	62	395	60	386
Kanokupolu	53	324	55	313	67	339
Ha'atafu	39	236	42	222	47	269

Source: Department of Statistics, 2016.

4. Plan in Details



Village	Approximate area	Species	Seedlings required	Nursery required
1. Fo'ui: Out of the six coastal communities Fou'ui appears to have the best mangrove protection than the others. However a portion of the mangroves are gradually disappearing (as shown in the Map 1) and it poses a big threat to the community. Replanting this affected area will surely strengthen the natural protection level. It is also important to note that the area is overlapped to the adjacent of Havakatolo and a joint effort from these two communities will provide a stronger management structure for these coastal areas	Approximately 0.8879 hectares in the north coast of Fo'ui are planned to replant. The area is prone to seasonal flooding due to storm surge and high spring tides. Site investigation reveals that the area has a high probability to recover for at least three years if special management of pigs be practiced. Controlled of pigs for a certain period of time will flourish natural regeneration	There are two main species that are growing well in Fo'ui; i. <i>Rhizophora samoensis</i> ii. <i>Rhizophora stylosa</i> . Other species that that might add value particularly from landward include <i>Cerbera manghas</i> , <i>Excoecaria agallocha</i> and <i>Xylocarpus granatum</i> . The latter species (<i>X. granatum</i>) is very rare on the main island due mainly to its commercial and medicinal values.	i. Rhizophora samoensis: 1,500 ii. Rhizophora stylosa: 1,500 iii. Cerbera manghas: 200 iv. Excoecaria agallocha: 600 v. Xylocarpus granatum: 639 Total: 4,439	Materials such as pots, watering equipment, hoses, watering cans etc. will be provided to 4 or 5 households to manage well in the next 5 – 6 months before planting. The other landward species <i>C. manghas</i> may refer to the Forestry nursery which is part of their current stock for supply
2. Ha'avakatolo: Map no. 2 below indicates the trial area at Ha'avakatolo. The planned work for the trial site will strengthen the existing mixed mangrove forest in the next few years to counter storm surge and strong north cyclonic trade winds.	Replanting area at Ha'avakatolo accounted for approximately 1 acre (0.5 ha).	There are two dominant species found in Ha'avakatolo and are recommended for this trial 1. <i>Rhizophora samoensis</i> 2. <i>Rhizophora stylosa</i> .	1. Rhizophora samoensis: 2,000 2. Rhizophora stylosa: 541 Total: 2,541	At least 3 volunteer households need to take care of potted seedlings before planting. This would easily manage the seedlings from the summer heat and strong current of the site.
3. Kolovai The restoration area in Kolovai is sheltered from the north trade winds by a thick mangrove plants which provide an ideal	Like Ha'avakatolo, a total area of one acre planned to be replanted in Kolovai. This area was	In addition to the common <i>Rhizophora samoensis</i> and <i>R. stylosa</i> species, <i>Excoecaria</i>	1. Rhizophora samoensis: 1,500 2. R. stylosa: 1,000 3. Excoecaria agallocha: 752 Total: 3,252.00	One nursery will be established in Kolovai

<p>site for replanting. It is anticipated that this additional mangroves will reinforce the existing stock of mangroves thus, reduce impacts from seasonal storm surge and strong winds during hurricane season. Map 3 will show the planting area for Kolovai</p>	<p>covered with mangroves but gradually dying out. There is no specific answer for this problem although most people pointed at the rubbish dump and pig pan at the landward side of this area.</p>	<p><i>agallocha</i> will add another protection value for Kolovai.</p> <p>Species quantity</p> <p>A total of 3252 seedlings needed for planting in this area. Table below summarizes the distribution by species</p>		
<p>4. ‘Ahau</p> <p>‘Ahau is at the heart of the “Green Buffer Zone” concept since all vegetation within the whole community’s coastline has been cleared decades ago. Our investigation was unable to find the true reason for this massive destruction although there is sufficient information to say that somehow the construction of the rugby field for Tonga’s first international rugby match with Fiji here in Tonga was held in this specific area. However, there are about 20 households lineup along the coast with low or no vegetation cover to cope with the north cyclonic trade wind. Map No.4 below shows the proposed replanting area with the two nurseries for ‘Ahau.</p>	<p>A total area of 5 hectares of mangroves and coastal forests planned to be replanted in ‘Ahau and this will definitely make a huge contribution to the national floral stock. Apart from the coastal protection there will be an increase in the level of food security for the inshore marine resources for the Hihifo community. This would be the largest replanting site to be ever recorded in Tonga</p>	<p>Four (4) genuine mangrove species are needed for this restoration site. These are <i>Rhizophora samoensis</i>, <i>Rhizophora stylosa</i>, <i>Exoecaria agallocha</i> and <i>Xylocarpus granatum</i>. Other relevant species for the landward section of the area would include <i>Cocos nucifera</i>, <i>Callophyllum inophyllum</i> and <i>Terminalia catappa</i> all could add protection value to the coastal fringe.</p>	<p>1. <i>Rhizophora samoensis</i>: 10,000</p> <p>2. <i>Rhizophora stylosa</i>: 10,270</p> <p>3. <i>Exoecaria agallocha</i>: 1,000</p> <p>4. <i>Xylocarpus granatum</i>: 250</p> <p>5. <i>Cocos nucifera</i>: 200</p> <p>6. <i>Callophyllum inophyllum</i>: 200</p> <p>7. <i>Terminalia catappa</i>: 100</p> <p>Total: 22,020</p> <p>It is also important to note that about 1/8 the proposed restoration site have already covered by a mix stand of <i>Rhizophora</i> species and few <i>Xylocarpus granatum</i> trees on the northwestern section. Supplementary coastal plants not only provide protection but will also improve community’s livelihoods</p>	<p>Two nurseries are planned for ‘Ahau. One to the North and the other to the South</p>

5. Collection of seedlings

The timing for this trial works in Western Tongatapu is well aligned with the natural summer supply of propagules and seeds, which can be collected from different sites in the main island. *Xylocarpus* seeds can be collected from the northern Vava'u Group.

6. Planting time

Planting time and other activities are outlined in the timeframe.

7. Fence work

Risk of roaming pigs destroying the restoration works is high. So fencing the trial sites should be treated as priority as fencing will not only protect the new replanting mangroves but will stabilize the natural environment of the whole area and may also thrust the natural regeneration process as well.

8. Maps of the proposed planting areas

Map No1

Area to be planted in Fo'ui are marked with short stars



Map No.2

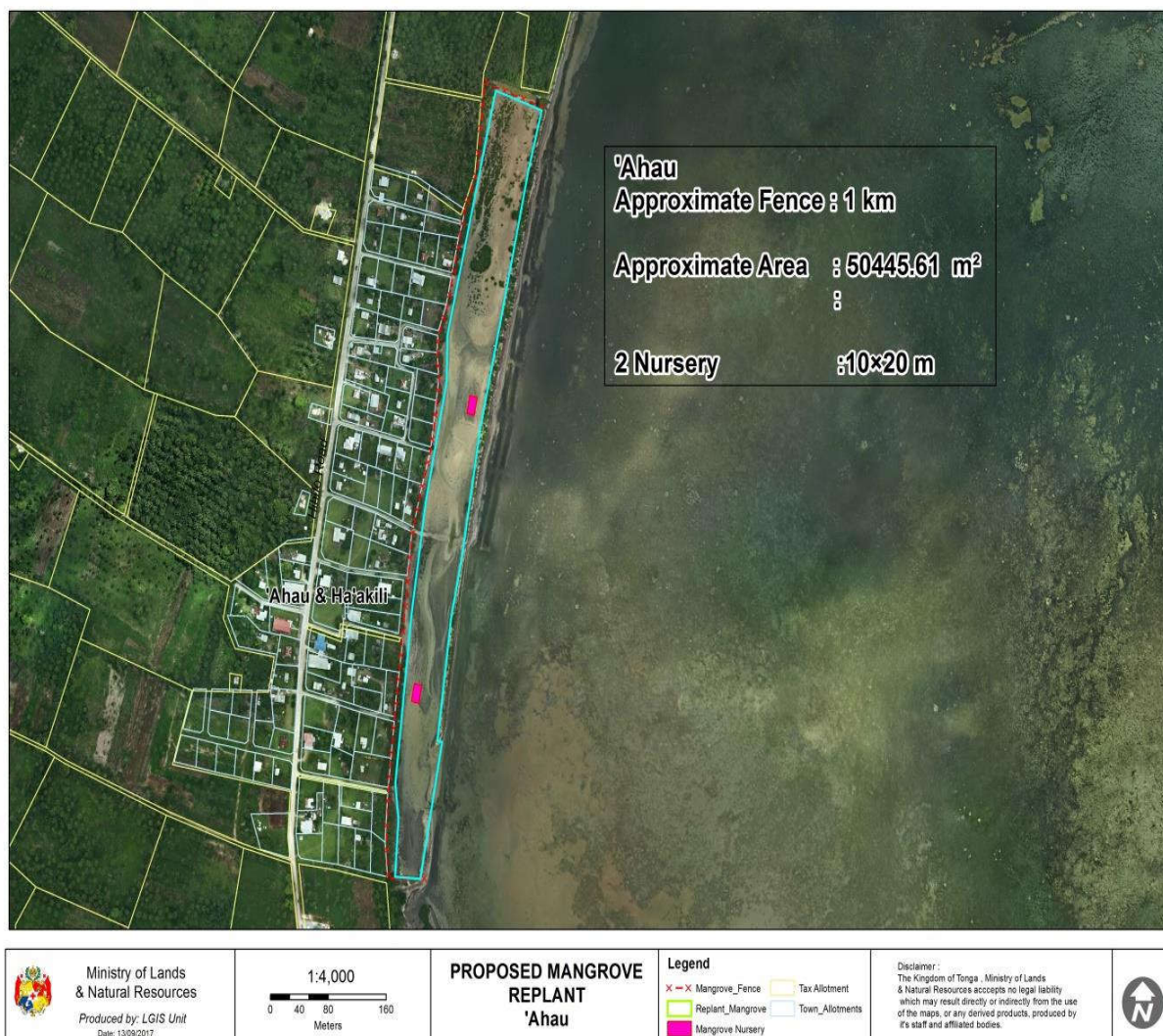
Areas to be planted in Ha'avakatolo connecting to the planting area in Fo'ui



Map 3. Planting areas in Kolovai with closer images on the right



Map No. 4: 'Ahau Planting area (inside the light blue square) and the proposed locations of the two nurseries (highlighted in pink)



9. Summary of activities and Work Plan

9.1. Activities

Activity 1.1: Identifying replanting sites at each community

Activity 1.2: Species identification

Activity 1.3: Building of nurseries

Activity 1.4: Collection of seedlings, propagules and seeds for the nurseries

Activity 1.5: Order of coastal plants for restoring the landward borders of the restoration site.

Activity 1.6: Replanting

9.2. Work Plan

Output and activity	N	D	J	F	M	A	M	J
Output 1								
Activity 1.1								
Activity 1.2								
Activity 1.3								
Activity 1.4								
Activity 1.5								
Activity 1.6								

10. Tentative Budget

Item	Unit Price	Cost in Pa'anga (TOP)
Lunches	@30/person or 240/day (240×20days)	4,800
Equipment	- Rods/grinder/welding works for the metal corer Shovels/2 wheel barrows/ h/gloves	1,000
Materials and supplies	Chainlink @170.00 (2.5mm) (86 Rolls)	14,620
Consumable poles	@180/slabs of timber 2×180 for 'Ahau 1x120 for Kolovai 1x100 for transportation	1,000
Rental car	150/day 150×15days	2,250
	Total	23,670

10. REFERENCES

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Yarita, S., Aholahi, H., (2012). Mangrove Reports 2: Distribution of Mangroves on the island of Tongatapu. Department of Environment and Climate Change. Nuku'alofa, Tonga.

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