

Environmental Management Plan for Fanga'uta Lagoon System

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Planning for the future of the Fanga'uta Lagoon System

The Fanga'uta lagoon system includes some important areas of seagrass and mangroves, important for the environmental and economic health of Tongatapu.

In 1998 a project commenced to help protect the natural resources of Tongatapu for future generations to use. The Tonga Environment and Planning Project (TEMPP) has worked with Department of Environment and Conservation (DEC) to look at the health of the Fanga'uta lagoon system. DEC, in collaboration with other ministries, NGOs and the community, have reviewed these studies and developed strategies for protecting the lagoon's values, while allowing for its many important uses. These strategies have been brought together in this Environmental Management Plan (EMP). The Draft EMP was circulated to communities, ministries and NGOs; and their views, ideas and concerns were recorded in a series of meetings around Tongatapu. It is with this information that this EMP was produced.

At Local Community meetings the following concerns were raised over the future of the Lagoon System

- Catching smaller and less fish.
- Rubbish and Litter
- Loss of mangroves and erosion is threatening peoples properties
- Loss of Seagrass
- Sedimentation
- Pollution
- Loss of species and habitats

The Environmental Management plan

The Environmental Management Plan described here has been designed to improve the existing conditions in the lagoon and ensure that it can provide the maximum use of goods and services in the future. The EMP is a guide for action by Government, and action by individuals taking responsibility for their own environment. To provide guidance for development and spread the benefits of the lagoon as fairly as possible, we have developed a multi-use zoning plan, based on scientific information and the voice of communities. This identifies eight different usage types within the lagoon's main ecosystem boundaries (

Figure 1,

Table 1). All of these have been designed to allow for indefinite or sustainable use of the lagoon and its resources, and depend on the cooperation of all parties involved. The eight proposed zones are:

- Zone 1: Lagoon Entrance Fisheries Area
 Zone 2: Lagoon Subsistence Fisheries Area
 Zone 3: Conservation Areas
 Zone 4: Sustainable Mangrove Use Area
 Zone 5: Village and Agricultural Uses
 Zone 6: Village Special Resource Use Areas
 Zone 7: Urban Use Area
 Zone 8: Special Public Use Areas.

Table 1: Summary of activities recommended within each of the eight zones defined for the Fanga'uta Lagoon EMP.

MHWM=Mean High Water Mark.

Activity	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8
	Mouth Fisheries	Lagoon Fisheries	Mangrove Conservation	Mangrove Use Area	Village & Agriculture	Village Special Use Area	Urban	Public Special Use Area
Land allocation below present MHWM	✗	✗	✗	✗	✗	✗	✓	✗
Commercial Fishing / Aquaculture	✓	✗	✗	✗	N/A	✗	N/A	✗
Subsistence Fishing	✓	✓	✗	✓	N/A	✓	N/A	✗
Mangrove removal	N/A	N/A	✗	✗	N/A	✗	N/A	✗
Seagrass removal	✗	✗	N/A	N/A	N/A	✗	N/A	✗
Mangrove use (wood, handicrafts, medicine)	N/A	N/A	✗	✓		✓	N/A	✗
Mangrove rehabilitation	N/A	N/A	✗	✓	N/A	✓	✓	✓
Reclamation	✗	✗	✗	✗	✗	✗	✓	✓
Seawalls	✗	✗	✗	✗	✗	✗	✓	✓
Dredging / sand & gravel extraction	✗	✗	✗	✗	✓	✗	✓	✗
Anchor and boat disturbance	✗	✗	✗	✗	N/A	✗	✗	✗
Buildings	✗	✗	✗	✗	✓	✗	✓	✗
Rubbish dumping	✗	✗	✗	✗	✗	✗	✗	✗
Industry	N/A	N/A	✗	✗	✗	✗	✓	✗
Tourism	✓	✓	✗	✓	✓	✓	✓	✓
Recreation	✓	✓	✗	✓	✓	✓	✓	✓
Research	✓	✓	✓	✓	✓	✓	✓	✓

Zone 1: Lagoon Entrance Fisheries Area (Purple Zone)

The covers the area between the southeastern tip of Nukunukumotu Island and Nukuleka, out through the mouth of the lagoon and towards Manuka along the northern coast. Its focus is to allow for subsistence and limited commercial fishing, and aquaculture (this is aquaculture that does not require feeding of stock). At the same time, this zone is designed to preserve the migration routes of all fishes that spawn outside of the lagoon, and those whose juveniles use the lagoon as a nursery. Activities that could damage the habitats in this region of the lagoon, such as dredging, reclamations and reef or seagrass damage, have been prohibited to help ensure that fishes continue to use the area to migrate. Mullet are protected in Zone 1 between 15 May and 31 July and may not be caught by any method. This means that fence or arrow traps must be disabled during the closed season. Gill nets are limited to 50m lengths and a mesh size of 75mm.

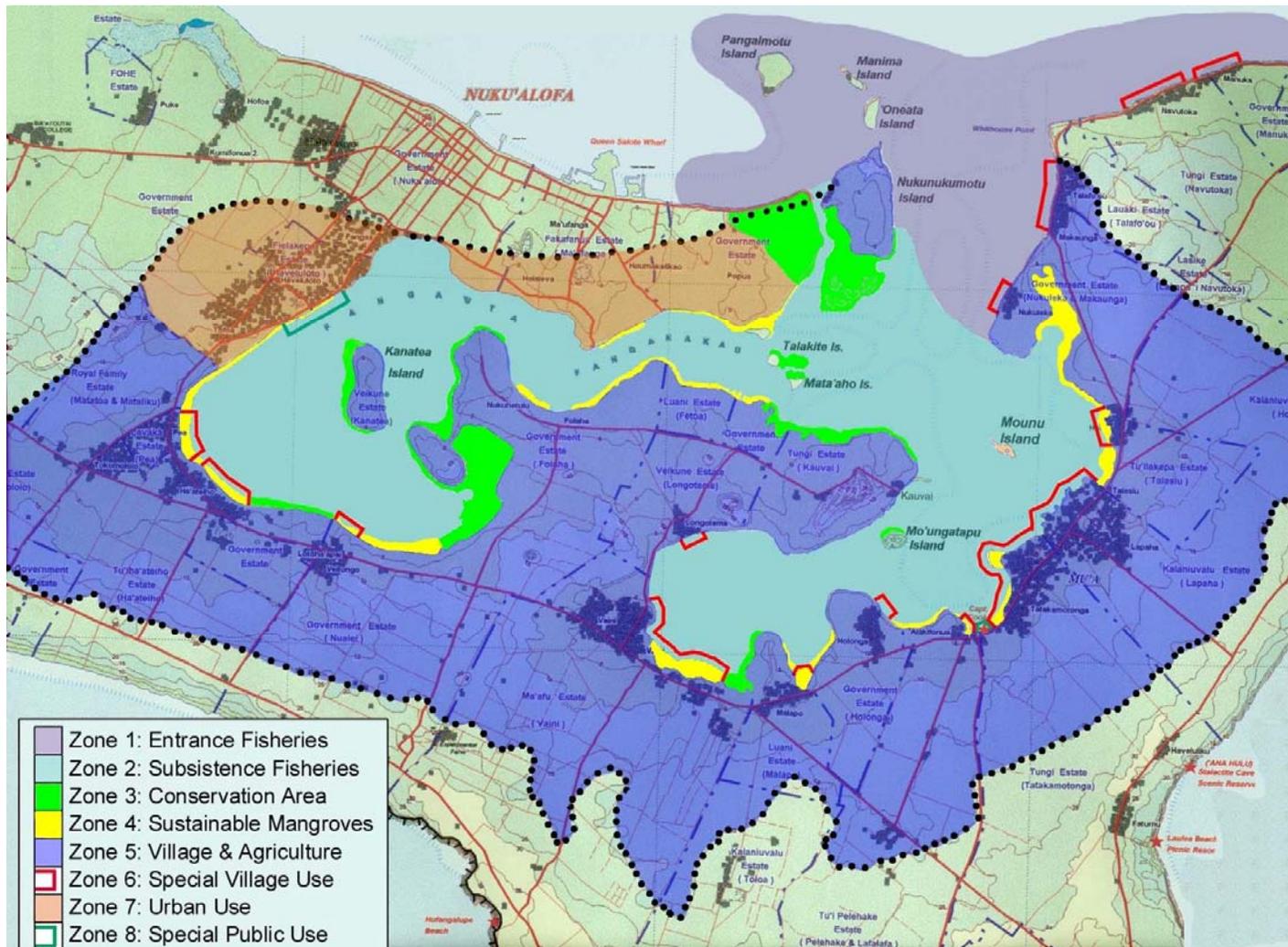


Figure 1: Fanga'uta EMP Map.

The map shows the main ecological boundaries for the lagoon, including the watershed and mullet spawning grounds. Also shown are the eight management zones proposed for the EMP.

Zone 2: Lagoon Subsistence Fisheries Area (Light Blue Zone)

This zone covers the entire water area of the lagoon, except for the mouth and the area to the east of the mouth that encompasses the migration of mullet, the lagoon's most prized fishery. The areas of water beneath mangrove trees are included in this zone. Within this zone, there are no commercial fisheries, but subsistence fisheries are allowed. However, there is a proposed moratorium on all fishing for one year (30 April 2001-30 April 2002) before these regulations take effect, and no fishes, shellfish or jellyfish may be collected from any part of the lagoon. After the expiry of the moratorium, fishers may take fishes, shellfish and jellyfish at any time of the year, except for mullet. Mullet can be taken any time of the year, except during a closed season between 15 May and 31 July. Arrow or fence traps are also not permitted within this zone between 15 May and 31 July. Although gill nets are allowed, they must be no longer than 50m and have a mesh size of 3 inches. The minimum size limits for fishes are shown in Table 2.

Table 2: Minimum recommended size limits for selected fishes in the Lagoon System.

Columns 3 and 4 show the way that average sizes of fish have changed between 1986 and 2001 (WP49). The values in the last column are from Fishbase (www.fishbase.org) and represent the theoretical average size at which fishes should be caught for a maximum sustainable harvest. Note that these sizes are a few centimetres larger than the size fishes must attain before they can reproduce (Column 5).

Name	Scientific name	Average Size 1986 (cm)	Average Size 2001 (cm)	Size at first maturity (cm)	Size for maximum sustainable harvest (cm)
Manini (Surgeonfish)	<i>Acanthurus triostegus</i>			15.5	16
Tangafa (Napoleon wrasse)	<i>Cheilinus undulatus</i>			111	155
Ngatala (Grouper)	<i>Epinephelus merra</i>			19	20
Matu (Silverbiddy)	<i>Gerres oyena</i>			18.5	19
Mu (Bream)	<i>Gymnocranius</i>			21	23
Nue (Drummer)	<i>Kyphosus cinerascens</i>			27	30
Sipesipa (Ponyfish)	<i>Leiognathus spp.</i>	30-40	15-20	15	15
Tanutanu (Emperor)	<i>Lethrinus harak</i>	30	20	29	33
Koango (Emperor)	<i>Lethrinus nebulosus</i>	40	30	37	44
Kanahe / 'Unomoa (Mullet)	<i>Liza macrolepis</i>			34	39
Fate (Snapper)	<i>Lutjanus kasmira</i>	20	15	19	20
'Unomoa / Fua (Mullet)	<i>Mugil cephalus</i>	20-55	15-50	55	68
Vete (Goatfish)	<i>Mulloidichthys flavolinetaus</i>			19	20
Ma'ava (Rabbitfish)	<i>Siganus argenteus</i>			18	19
O (Rabbitfish)	<i>Siganus spinus</i>			15	16
Kavakava (Grunter)	<i>Terapon jarbua</i>	15	15	22	23
Haku (Alligatorfish)	<i>Tylosaurus crocodilus</i>	60	60	77	100
Kanahe (Mullet)	<i>Valamugil seheli</i>	30	25	34	39

Zone 3: Conservation Areas (Green Zone)

This zone encompasses the most important patches of mangroves remaining in the lagoon, near Nukuhetulu and at Nukunukumotu Island, plus those in some smaller patches around the lagoon. It also includes a few terrestrial areas around Siesia. The purpose is to create areas of mangrove forest that are set aside to function fully as fish habitats and part of the lagoon's cleaning system. Apart from recreation and research, each to be carried out without any harm to the mangrove system, no fishing, collecting or harvesting of wood, mangrove roots or medicines are allowed in these areas. Mangrove rehabilitation is not recommended for these areas, largely because they will not require it. It is important that incidental damage to these areas does not occur from pigs, or developments elsewhere in the lagoon. EIAs accompanying development projects should specifically address any risks to the Zone 3 mangroves or coastal forests.

Zone 4: Sustainable Mangrove Use Areas (Yellow Zone)

All remaining mangrove areas in the lagoon are classified in Zone 4. This zone allows for sustainable use of the mangrove resources, including for wood, dyes and medicines. It also allows for collection of fishes and other animals within the mangroves. The key is that the mangroves should be used in such a way that they are not damaged beyond their ability to recover and grow. Collections of wood or materials for dyes and medicine should be made so that only 10% of a tree is damaged at one time. Wood and bark should be collected from branches, not the main trunk of the tree. Collections of leaves and flowers may be from any part of the tree. It would be useful to establish a new tradition of tying a biodegradable marker around each tree that harvested for mangrove products. A maea string (made from the outer bark of the tapa tree, the hiapo) could be tied around a tree to let others know that it has had bark, roots or other parts taken from it. This could be used as a signal to let other people know that this tree needs to be rested to ensure its use is sustainable. When the maea rots and falls away, the tree would be ready for another harvest. All mangroves should be protected from damage by pigs. Plantings of mangrove trees are encouraged to ensure replacement of any trees lost or damaged in the past.

Zone 5: Village and Agricultural Uses (Blue Zone)

This zone covers most of the lagoon system watershed. It allows for village settlements as well as agricultural uses of the land. The focus of lagoon management in this area is on minimising the movements of nutrients, mud, sewage and chemicals into the lagoon via the groundwater, any drainage systems or run-off. It is also focused on proper rubbish disposal.

All land within the watershed should be well planted with trees, grasses or crops as much of the time as possible, to ensure that the soil is stabilised and in the best condition for dealing with any accidental sewage overflows or pollution from other sources. Each village could work at ensuring that all of its land is covered by vegetation, and if it needs to be opened for a development (housing, agriculture), that the time without cover is kept to a minimum. For villages and landowners with hilly land, this is especially important, particularly close to the lagoon itself.

Farmers should try to find out about organic systems of land management and minimise the use of chemical fertilisers and pesticides in this zone. This could be a gradual process, done

with the assistance of the Agriculture Department. Those that do use chemicals on their land should inform themselves of the correct rates of application so that there is minimum waste and losses into the groundwater, which eventually finds its way into the lagoon.

The correct handling of sewage within this zone is important. Septic systems will continue to be used, and must be well designed and maintained to ensure that they do not spill sewage effluent into the groundwater. Septic tanks need to be pumped once every 2 years to eliminate the sludge that can otherwise clog the system and let sewage overflow. If any other systems are introduced, they must treat the sewage until it is harmless in terms of bacteria and nutrients. It is recommended that people building new homes, particularly in low-lying areas, consider composting toilets or other systems.

There should be no further reclamations or seawalls built in this zone. These destroy an important part of the life-support system of the lagoon (beaches and mangroves). Human developments are kept entirely on land, and not allowed to extend into the mangroves or other tidal areas.

All rubbish should be properly disposed of in the official Tapuhia dump, and areas on the fringes of the lagoon cleaned up. Rubbish should be no longer burned or buried at home, or used as landfill for low-lying pieces of land. All hazardous wastes such as oil and chemicals are to be recycled or disposed of properly and not dumped anywhere within this zone on the ground.

Domestic animals, particularly pigs, are to be restrained by fencing to prevent them causing damage on the lagoon foreshores.

Zone 6: Village Special Resource Use Areas (Red Zone)

This area has been specially allocated at the request of some of the village communities. The Village Special Use Zone is specific to each village and sets aside exclusive use of the lagoon's resources in the area bound by the shoreline in front of a village and out to a line 50 m into the lagoon from Mean Low Water Mark (MLWM). This does not prevent people from that village using other parts of the lagoon, except for the Special Use Zones belonging to other villages. The zone crosses into Zones 2 and 4, the rules of which are to be observed by people with access to Zone 6. People who are not resident in the village adjacent to each special use zone, may not fish there, use the mangroves, use any other resources or pollute the area.

Domestic animals, particularly pigs, are to be restrained by fencing adjacent to this zone to prevent them causing damage on the lagoon foreshores.

The presence of this zone does not restrict "outsiders" from accessing the lagoon through the zone. It only restricts resource use.

Zone 7: Urban Use Area (Orange Zone)

This zone covers about half of the urban area of Nuku'alofa. It allows for urban settlement, industrial uses, and limited reclamations and seawalls. The reclamations and seawalls are limited to those areas already damaged in the past, and which do not involve further losses of

mangroves (other than small patches with <5 trees which are replaced by plantings elsewhere). Those areas between existing reclamations that have so far not been modified may be brought into alignment to smooth out the shoreline. The seawalls that bind them should be of environmentally friendly designs and shapes, and preferably be placed behind any mangroves or beaches.

Any rubbish dumped in the past on the fringes of the lagoon is to be cleaned up and the rubbish disposed of in the dump at Tapuhia. Rubbish is no longer to be burned or buried at home or used as landfill in low-lying areas. Drainage channels are to be constructed so that they carry storm water and run-off out to sea and do not dump it into the lagoon. All sewage systems are to be well-designed and maintained, with adequate sludge removal and treatment of effluent, so that these do not find their way into the lagoon. If at a later date, a reticulated sewerage system is developed for Nuku'alofa, this will be accompanied by a full EIA and must dump the wastes well away from the lagoon management area.

All government departments, industrial areas and businesses are to be responsible for ensuring that chemicals, oils and other wastes cannot find their way into the lagoon through any of the pollution pathways (see above). Recycling and proper disposal of wastes is critical in Zone 7.

Effort is to be made to cover as much land as possible with vegetation to minimise sedimentation and run-off into the lagoon. Wherever possible, it is recommended that a nature strip of trees and grasses be developed on the shores of the lagoon.

Domestic animals, particularly pigs, are to be restrained by fencing to prevent them causing damage on the lagoon foreshores.

Zone 8: Special Public Use Areas

Zone 8 has been included to allow the public of Nuku'alofa access to the foreshores of the lagoon system for recreational, educational and other purposes. It extends from the P.I.E. Shop to the Ambassador Night Club at Toloa. Its main purpose is to be used for picnics and recreation while preserving the natural ecosystems present. Other 'Special Public Use Areas' could be added later.

Implementation of the EMP

The EMP if implemented, can deliver potential environmental and community benefits. A strategy for implementation needs to be developed. This section outlines a suggested strategy.

The plan includes many actions designed to be implemented in the short, medium and long term: enforcement, education and communication, research and monitoring. The actions are to be carried out by Government agencies, non-government organisations (NGOs) and communities, working together.

Co-ordination

Plan implementation is to be co-ordinated and overseen by a Lagoon Management Task Force comprising 12-15 members. Membership is to comprise Government agencies (one senior representative from each involved - maximum of 6) and one from NGOs (maximum of 4), with five representatives chosen on a rotating basis from lagoon communities. As these communities will be the main groups affected by the progress of the implementation, it is vital that they have a substantial voice in the co-ordination process.

This Task Force should meet regularly, every two to three months. Activities needing more hands-on management, should be handled by *ad hoc* mini-committees or working groups of three to five members, which can meet as often as required.

Funding

One of the most important functions of the Task Force will be to seek outside funding for implementation of priority and higher-input measures of the EMP. The funds required to undertake these actions reside in a competitive environment, where other agencies also seek funding.

For this reason, good resource planning is essential to ensure that available resources are used to maximum benefit on the right project and at the right time. It also provides a basis on which to approach external funding sources.

In order to secure such funding, a key working group should be established to develop a funding strategy on acceptance of a final EMP. This funding strategy should:

- Provide indicative costing for all actions recommended in the EMP and background document, also indicating whether the item is recurrent or 'one-off' expenditure.
- Identify actions that can be undertaken concurrently and co-jointly, whether by the community, or by several government or non-government agencies.
- Identify possible funding sources and the priorities of those sources, and correlate their criteria for eligibility with the actions identified in the EMP.
- Prioritise the actions based on funding availability and the priorities identified by the EMP.

- Recommend how best to achieve the funding for the actions whether sole or co-funded.

Recommended strategies from communities

During the village-level consultations, numerous concerns were raised and strategies recommended by communities (see below, 5.2) of which the following are key points:

- The Nobles, Town Officer and village communities and groups should be more involved and prominent in the process of developing and implementing the EMP;
- Village Fisheries Management Committees should be formed to prepare local management measures and to control outsiders fishing near the village fishing grounds;
- Minimum mesh sizes and maximum mesh lengths should be established and enforced by the Ministry of Fisheries;
- Present fishing bans should be enforced;
- Mangrove protection and replanting should be considered a priority and pigs should be fenced;
- All rubbish dumping to be banned, enforceable by fines;
- People should work together to decrease the importation of certain luxury products such as disposable nappies and plastic bags;
- There should be an increase in the use of local media channels to educate people of the benefits of improving their local marine environment.

Actions and Agencies Responsible

Table 3: Major actions identified in the Plan.

Action	Responsibility/Agencies
Implementation of EMP Zones	
Land allocation below present MHW	Ministry of Lands, Survey and Natural Resources (MLSNR)
Commercial Fishing Aquaculture	Ministry of Fisheries (MoF)
Subsistence fishing	MoF, communities
Mangrove removal	MoF, MLSNR, DEC
Seagrass removal	MoF, MLSNR, DEC
Mangrove use	MoF, MLSNR, DEC, communities
Mangrove rehabilitation	MLSNR, DEC, NGOs, communities
Reclamation	Ministry of Works (MoW), MLSNR
Seawalls	Ministry of Works
Dredging/sand and gravel extraction	Ministry of Works- Ports and Marine (P&M), MLSNR
Anchor and boat disturbance	P&M, Tonga Visitors Bureau (TVB), DEC, communities

Buildings	MLSNR, MoW, Ministry of Health (MoH)
Rubbish dumping	MoW, MoH, DEC, communities
Industry	Ministry of Labour Commerce and Industry, TVB, DEC
Tourism	TVB, DEC
Recreation	TVB, DEC, NGOs, communities
Research	DEC

Fishing

Moratorium on fishing for one year.	MoF
Enforce fisheries closures (commercial fishing, mullet, fish traps and moratorium)	MoF
Set limits on fishing gear (50m length, 75mm mesh size)	MoF
Establish enforce and educate on minimum fish sizes. (See Table 7)	MoF, NGOs

Mangroves

Education campaign on methods of sustainably using mangroves	DEC, NGOs, communities
Prevention of mangrove clearing	MLSNR, DEC, NGOs, communities

Seagrass

Prevent clearing, anchor and boat damage	Establish working group between MoF, DEC, P&M and MLSNR
Stop seagrass decline caused by pollution, seawalls, dredging and runoff	Establish working group between MoW, DEC, P&M and MLSNR
Educate on the importance of seagrass for sustainable fisheries	MoF, DEC, NGOs, communities

Farm Practices

Promote organic farming practice	Ministry of Agriculture and Forestry (MAF) DEC, NGOs
Educate on the proper application of fertilizer and pesticides	MAF, Importers, NGOs
Encourage revegetation and vegetation retention on agricultural allotments.	MAF, NGOs

Urban Areas

Improve the operations of sewage/septic systems	Ministry of Health (MoH)
Encourage the proper disposal of garbage, oils and chemicals and prevent dumping within zone 5	MoH, DEC, Chamber of Commerce, oil companies
Cleanup of foreshore	NGOs, DEC, MoH Community Groups
Stop further sea wall development encroaching on lagoon	MLSNR, MoW
Stop further subdivision and development of residential land into the lagoon	MLSNR, MoW
Encourage fencing to stop pigs damaging the lagoon foreshore and mangroves.	NGOs, community groups, MoH, Prime Ministers Office
Create legal basis for 'Village Special Resource Use' areas.	MoF, DEC, MLSNR, communities